Internet Appendix A25: Market Microstructure

Figure A25.1 Illustrative Pitch Template Example on Algorithmic Trading (reverse-engineered)

Reverse engineered example of market microstructure pitch – from Journal of Finance paper October 2014, Chaboud, Chiquoine, Hjalmarsson andVega, "Rise of the machines: Algorithmic trading in the foreign exchange market"

Pitcher's Name	Dave Michayluk	FoR category	Market Microstucture	Date Completed	3 February 2105
(A) Working Title	Algorithmic trading in the foreign exchange market				
(B) Basic Research Question	Does algorithmic trading improve or hurt price efficiency in the foreign exchange market?				
(C) Key paper(s)	Theoretical Biais, Foucault and Moinas (2011), Equilibrium fast trading, working paper, Toulouse School of Economics. Martinez and Rosu (2011), High frequency traders, news and volatility, working paper, HEC. Foucault, Hombert and Rosu (2013), News trading and speed, working paper, HEC. Biais and Woolley (2011), High frequency trading, working paper, Toulouse School of Economics. Empirical Hendershott, Jones and Menkveld (2011), Does algorithmic trading improve liquidity?, *Journal of Finance* 66, 1-33. Boehmer, Fong and Wu (2012), Algorithmic trading and changes in firms' equity capital, working paper, EDHEC Business School. Hendershott and Riordan (2013), Algorithmic trading and the market for liquidity, *Journal of Financial and Quantitative Analysis* 48, 1001-1024.				
(D) Motivation/Puzzle	The motivation for this research is theoretical conflict and the inability to empirically resolve the issue in the past. From the theory, there is an argument by Biais et al. (2011) and Martinez and Rosu (2011) that the algorithmic traders can react to new information faster than humans and this advantage in processing and acting should improve price informativeness. In contrast, Foucault et al. (2013) argue that without asymmetric trading any speed advantage would NOT improve price informativeness but would increase adverse selection costs. In fact, Biais and Woolley (2011) suggest that commonality between computers and their algorithms would make prices less informative. These opposite predictions beg for an empirical test, but past empirical tests of this issue **rely on proxies** to gauge algorithmic trading or had data over **short time periods**. Hendershott, Jones and Menkveld (2011) use the introduction of Autoquote on the NYSE, Boehmer, Fong and Wu (2012) used the first availability of co-location services used by algorithmic traders and Hendershott and Riordan (2013) use actual algorithmic trading data in the DAX 30 stocks, but they only have one month of data.				
THREE	**Three** core aspects of any empirical research project i.e. the "**ID**io**T**s" guide				
(E) Idea?	Empirical testing of the effect of algorithmic trading with better data in a different market (foreign exchange trading versus equities) can answer the question on the effect of algorithmic trading on price efficiency.				
(F) Data?	Proprietary foreign exchange data will be used to identify which trades are computer generated from an algorithm and which are from human intervention. Access to this data over a long time period is the 'special sauce' that will make this research possible and improves upon earlier research (Hendershott and Riordan (2013)). Data will be over a 5 year period (2003-2007) covering the beginning of algorithmic trading in the foreign exchange market. Data will need to be as granular as possible with quotes and trades data ideally being individually identified as being computer or human generated. An arbitrary cut-off for accumulating data points needs to be chosen to examine autocorrelation and a five-second aggregation is selected.				
(G) Tools?	The extent of involvement of computers in the market over the large sample period is the first piece of the puzzle that needs to be identified. Simple identification of trading partners (human versus computer) can be made to identify which transactions are more efficient. Then two formal tests of price efficiency can be made: examining triangular arbitrage opportunities and autocorrelation. (1) Triangular arbitrage opportunities across three currency pairs can be compared using the extent of algorithmic trading as an explanatory variable. To avoid endogeneity problems the heteroskedastically-consistent Vector Auto Regression approach by Rigobon (2003, Review of Economics and Statistics) can be used to identify Granger causality. (2) Autocorrelation can be examined across the different currency pairs with the extent of algorithmic trading used as an explanatory variable.				

TWO	**Two** key questions
(H) What's New?	What is new is the approach to investigate triangular arbitrage opportunities and autocorrelation in the foreign exchange market using actual algorithmic trading instead of proxies.
(I) So What?	The market share of algorithmic trading keeps increasing and now it may be dominating most markets yet it is so new that we don't know its impact on the market. Examining another market besides equities is a great approach to show that algorithmic trading improves price efficiency and autocorrelation.
ONE	**One** bottom line
(J) Contribution?	By examining a new market (foreign exchange) insights this paper provides insights into the impact of algorithmic trading on price efficiency.
(K) Other Considerations	The paper relies on working papers (from top researchers) for their motivation. This is always risky since the papers may never be published and have not yet been 'vetted' through the process of peer review. This is an important question so if successful a top tier journal would be potentially interested. Low risk of competitor getting ahead since proprietary data is involved. No risk of obsolescence. Risk is in the tools chosen for the task.