Chapter 9
The Human Behavioral Response to Automated Trading

Roumen Vragov
EF International Academy, USA

ABSTRACT
The use of computer algorithms by human traders in markets has been steadily increasing. These electronic agents or proxies vary in terms of purpose and complexity, however, most of them first require some input on the part of the human trader and then perform the rest of the trading task autonomously. This paper proposes a theoretical model of human behavior that can be used to detect behavioral biases in commodity markets populated by humans and electronic proxies. The model’s predictions are tested with the help of laboratory experiments with economically-motivated human subjects. Results suggest that the usefulness of automated trading is initially diminished by behavioral biases arising from attitudes towards technology. In some cases, the biases disappear with experience and in others they do not.

INTRODUCTION
During the last decade the number of E-commerce sites has exploded, and buying and selling of goods on the Internet has become a nontrivial task. Just looking at eBay’s listings on 4/24/2016, 1:38 pm EST revealed 42,120 auctions for digital cameras going on simultaneously. The cameras come in a wide variety of type, resolution, quality, and they were represented by a variety of vendors, each with a different reputation score and history. The same digital cameras can be bought at other auction web sites or purchased directly from the sites of the camera makers or from the websites of a few big retailers. Additional units might be posted as available on sites that offer free ads as Craig’s list. Each of these sites sells items in different ways. They require different user information and apply different restrictions. Navigating through this maze of information is still challenging. It is up to the user to choose which website will better serve her purpose and what her optimal strategy will be given the different rules and requirements of the chosen sites. To deal with this issue programmers have started creating software applications to assist the user in her interactions on-line. These programs have been called robots, auctionbots, software agents, automated traders, proxies, etc. Such a feature is presently available on eBay, under the name of proxy bidding (Roth & Ockenfels, 2002). After a buyer has decided to participate in
The Human Behavioral Response to Automated Trading

an auction, she can give a limit price to her proxy. eBay keeps this information private. The proxy then bids in the auction. Every time the proxy is outbid but the current price remains below the limit price provided by the buyer, the proxy bids a minimum increment over the current bid. Meanwhile the buyer does not have to follow the auction. She can devote her time to more important activities. eBay’s director for customer relations in Australia declared that the proxy-bidding service provided by his company’s web-site was flexible enough to allow buyers and sellers to compensate for some inefficiencies due to eBay’s auction design (Davidson, 2005). According to Hayne et al., (2003) 75% of all users on eBay use this feature. The remaining 25% usually participate directly or use more complicated proxies provided by vendors other than eBay. The usage of proxies for e-Commerce transactions is quickly becoming popular. The proxies can be used for searching for items to buy/sell; searching for the best web sites for buying/selling items; and devising different bidding or pricing strategies. Researchers at IBM report that “[trading] robots can make more cash than people when they trade commodities” (Graham-Row, 2001). Other studies (e.g. Miller, 2002) suggest that markets populated entirely of robots cannot attain efficient equilibria. At the same time agent research in E-commerce has flourished at different Universities in the US and abroad (Go to http://www.multiagent.com/Laboratories/Market-oriented/ for a comprehensive list of related initiatives). Most of the proxies currently used in practice or tested in research laboratories represent automated strategies characterized by different degrees of sophistication that first require some input on the part of the human trader and then perform the exchange task autonomously. Research efforts have been devoted to investigating agent communication protocols (Finin et al., 1995; Papastavrou et al.; 1999, Artikis et al., 2000) as well as to applying the principles of artificial intelligence to software agent design (Hryshko & Downs, 2004; Greenwald, 2003; Wooldridge, 2000).

Proxy trading has quickly become very popular in financial markets as well under the name of automated trading or high-frequency trading (Goldstein, 2013). The move to automation of trading was encouraged by the SEC especially on the NYSE by regulation NMS in 2005 (Jones, 2013). Computer algorithms are currently used to:

1. Break up a high-quantity order into smaller orders that can be executed without drastically affecting the market price;
2. Choose where orders should be routed (Avellaneda, 2011);
3. Serve as automated market makers in regular financial markets (Frankle, 2010) as well as in prediction markets (Othman, 2012);
4. Perform arbitrage and relative value trading;
5. Analyze news and try to quickly take advantage of the newly available information;

There is disagreement in academic circles regarding the social and individual benefits of automated trading. Most empirical studies have shown automated trading to be beneficial but different theoretical models have generated different conclusions. Many traders still remember the flash crash on May 6, 2010 when an automated trading algorithm trading in E-Mini S&P500 futures supposedly caused a large drop in index and stock prices and trading had to be suspended for a short period of time. Another example was Knight Capital Group’s $440 million loss on August 1st, 2012 due to a new trading algorithm (see Jones, 2013 for a review of many recent theoretical models and more details about the crash). With the advent of digital currencies and especially Bitcoin, automated trading has spread to markets where these currencies are exchanged as well. (Zbikowski, 2016; Bell, 2016).