Abstract

High frequency trading has been taking Wall Street by storm, and for a good reason: its immense profitability. According to *New York Times*, it indicated that the majority of high-frequency mangers delivered positive return in 2008, whereas 70 percent of low-frequency practitioners lost money. The profitability is partially a result of exponential growth of high-frequency trading pattern. According to a report from Aite Group, high-frequency trading accounted for over 60 percent of trading volume coming through the financial markets.

In this empirical study, the experiments will be divided into two stages. For the first stage, an investigation of trading performance will be conducted for various algorithmic strategies applied in financial market of TAIEX Futures. In the process, ultra-high frequency datum of TAIEX Futures tick price will be collected and applied. According to a series of vigorous researches in 1990s, it revealed that volatility has some significant properties such as long memory, cluster, mean reversion and negative relationship with commodity price. Therefore, the basic trading filter of these algorithmic strategies is constructed based on the quantity of volatility. Apart from conventional methods of adopting historical volatility or implied volatility as trading filter, we will use instantaneous volatility as the trading filter in our algorithmic strategies. There are two methods to estimate instantaneous volatility: (1) Quadratic variation method and (2) Fourier transform method. Comparisons for applications will be conducted between these two methods in this dissertation. In addition to using volatility as trading filter, the trading information is implemented to correct the information leakage from volatility filter and provide a determination of the trend.

For the second stage, this empirical research will extend to the field of pairs trading. Within this part, we will investigate the trading performance of various algorithmic trading strategies applied in portfolios which will be constructed by Finance Sector Index Futures and Electronic Sector Index Futures. The process of data collection will be similar to the previous stage, the daily datum of Finance Sector Index Futures and Electronic Sector Index Futures will be collected and applied. As opposed to the previous stage, the fundamental trading filter of these algorithmic strategies is based on the value of correlation coefficient. Likewise, the method of Fourier Transform will be used to estimate the correlation coefficient between these two financial products. Based on the estimated value of correlation coefficient, a series of algorithmic strategies can be formed in this dissertation.

In sum, this paper intends to provide a comprehensive report on investigating the performance of algorithmic trading strategies. The report will not only take the net profits as the only indicator for trading performance but also concern other indicators as the evaluation standards, such as maximum strategy drawdown, the number of transactions and the Sharpe ratio which are equally important with the net profits.

Keywords: High frequency trading, ultra-high frequency datum, instantaneous volatility, Quadratic variation method, Fourier transforms method, pairs trading.