Abstract

This thesis explored and reviewed the empirical and theoretical research on the volatility of high frequency trading data with the application to the foreign exchange rates market. With the availability of ultra-high frequency observation, realized variance/covariance can be estimating arbitrarily with high sampling frequency. Estimating the volatility or the covariance of the different financial assets are our key interest throughout our paper. *Pre-averaging* method by Jacod, Li, Mykland, Podolskij and Vetter (2009) is introduced for nonparametric estimation for univariate case. It serves as a better method as it achieves optimal convergence rate with no assumption on the underlying distribution. We then extend our analysis in the multivariate case with careful consideration of issues like microstructure noise and non-synchronous trading. One possible remedy is to introduce the pre-averaged version of Hayashi and Yoshida estimator which can be used straightly on the raw and non-synchronous prices. In addition, High frequency filtering (HFF) technique by Chen, Lin, Pan and Spokoiny (forthcoming) can also be adopted to ensure the estimator is robust against the aforementioned issues. We also correct our estimator to be semi-positive definite (SPD) without compensating convergence rate. Subsequently, simulation and application to real currency data analysis are new area of research which illustrates the performance compared with several alternative methods. Lastly, we utilize our estimator to implement pair-trading strategy of two currency pairs of portfolio and present our result.