
Abstract:
The necessity of more trustworthy methods for measuring the risk (volatility) of financial assets has come to the surface with the global market downturn. Nowadays investors are more vigilant when investments are made on markets. Therefore it is more of a requirement to figure out companies or sectors they should put on money so that the risk is minimized. In this presentation we propose the arc length as a tool of quantifying the risk of a financial time series. As the main result, we prove the functional central limit theorem for the sample arc length of a multivariate time series under finite second moment conditions. The second moment conditions play a significant role since empirical evidence suggests that most of the asset returns have finite second moments, but infinite fourth moments. We show that the limit theory holds for a variety of popular models of log returns such as ARMA, GARCH and stochastic volatility model families. As an application, change points in the volatility of the Dow Jones Index is investigated using the CUSUM statistic based on the sample arc lengths. The simulation studies show that the arc length outperforms squared returns, which holds the functional central limit theorem only under finite fourth moment conditions and performs in a relatively similar manner as absolute returns. Comparison of time series in terms of volatility is also done as another application. At the end of the day results tell us the arc length is useful in measuring the risk of financial time series. This is joint work with Dr. Colin Gallagher and Dr. Robert Lund, Clemson University, SC, USA.