Multiresolution Analysis of High Frequency Financial Time Series Data

Daniel Lavelle - 14334496 - 12/4/2019

Abstract

This dissertation explores the usefulness of multiresolution analysis when dealing with high frequency financial time series data. The method is firstly compared to traditional autoregressive methods used to model high frequency time series data. It is then used to examine the risk of Bitcoin, Ryanair and S&P 500 across different timescales.

The model created to compare the multiresolution analysis method and the autoregressive method compares the residuals of the AR(5) model of S&P 500 returns to the details of the multiresolution analysis of S&P 500 returns. This is done using histogram comparison and a correlation plot. The results of this method were inconclusive however they do show that the detail associated with the highest frequencies resembles the residuals of the AR model most closely.

Multiresolution analysis was also used to measure the risk of Bitcoin, Ryanair and S&P 500 across multiple scales. It showed that, as expected, Bitcoin is very risky over time periods greater than one day. However, the analysis showed that Ryanair was at least as risky as Bitcoin over periods less than one day. S&P 500 was shown to be have the lowest risk over time periods less than one day.