Introduction

You work in an equity brokerage firm, that executes instructions to buy and sell equities (shares) on behalf of large institutional clients (e.g. pension funds). In order to get best possible prices for the clients, your firm needs accurate predictions of the volume of shares to be traded.

Several elements of detail are required, to specify the prediction challenge:

1. When is the prediction being made? We distinguish between predictions made before the start of trading, and ‘intra-day’ predictions that make use of the preceding same-day volume data, e.g. ten minutes beforehand.
2. What value is being predicted? We know that trading algorithms make use of several quantities derived from traded volume, such as:
   * The volume rate throughout the day, expressed as the value of trades completed within a given time interval, e.g. every one minute,
   * The cumulative volume, which is simply the cumulative vs ‘proportion of daily total’ volume
3. What type of prediction is required, and how is it evaluated? mean vs interval predictions

The business analysts have identified the following types of predictions that would be useful to focus on:

* point-estimates of one-minute bucket volumes, made both at start of trading and during the trading day.
* (opening and intra-day) mean cumulative
* (opening and intra-day) mean proportion-of-daily
* opening estimates of (mean & interval) rate

Your challenge is to implement and evaluate volume forecasting algorithms for two of the above types. The following tasks are suggested:

Tasks:

1. Implement the baseline prediction algorithm
2. Write a module to evaluate performance of the predictions
3. Design, implement and evaluate alternative prediction algorithms.
4. Extend the evaluation module so that predictions of intervals can be evaluated
5. Design, implement and evaluate algorithms to provide interval predictions of traded volume.