Introduction: Applied Time Series Analysis

The objective of this topic is to learn and apply statistical methods for the analysis of data that have been observed over time. Our challenge is to account for the correlation between measurements that are close in time. Topics covered include methods for:

* Modeling univariate time series data with Autoregressive and Moving Average Models (denoted as ARIMA models, sometimes called Box Jenkins models).
* Tools for model identification, model estimation, and assessment of the suitability of the model.
* Using a model for forecasting and determining prediction intervals for forecasts
* Smoothing methods and trend/seasonal decomposition methods. Smoothing methods include moving averages, exponential smoothing, and Lowess smoothers.
* Relationships between time series variables, cross correlation, and lagged regression models.
* Intervention Analysis (basically before/after analysis of a time series to assess effect of a new policy, treatment, etc.)
* Longitudinal Analysis and Repeated Measures Models for comparing treatments when the response is a time series.
* Vector Autoregressive Models for Multivariate Time Series.
* ARCH Models for changing variation and periods of volatility in a series.
* Analyzing the frequency domain – Periodograms, Spectral Density, Identifying the important periodic components of a series.

In order to analyze the time series data, we will need to use a statistical software program. To this end, we will utilize R code.