Course Name: **Time Series Analytics**

Course Description: This course will teach you a practical approach to the analytics of time series. This comprises the modeling and forecasting of time series data. The goal is to explain why a phenomenon varies over time and to predict its future. The course focus is empirical rather than theoretical. You will learn how to propose models, estimate them with data, diagnose whether they fit, forecast them, and interpret their meanings. Models covered include random samples, random walks, regression, autoregression, moving averages, ARIMA and related structures. Computer demonstrations with both real and simulated data will be used extensively.

Course Outline:

Please complete an outline of topics you plan to cover for each day of the institute.

Day 1:
Introduction to time series analytics
Examples of time series data
Objectives:
   - Explanation
   - Forecasting
The random sample as the basic time series model
Estimating and forecasting a random sample
Finding random samples in real data
A general approach to modeling
   - Actual = Fit + Residual
   - Propose model
   - Estimate model
   - Verify model
   - Use model
Why it matters to have a correct model
   - Bias
   - Margin of error

Day 2:
Computer software
   SAS and Excel
The random walk
   Definition
   Verification
   Forecasting
   Implications
Finding random walks in real data
Autoregression
   Definition
   Verification
   Forecasting
Durbin-Watson statistic
Autocorrelation function
Partial autocorrelation function
Finding autoregressions in real data

Day 3:
Experiences with modeling real univariate time series
A layered approach to time series features:
   Trends
   Seasons and cycles
   Autocorrelation
   Heteroscedasticity

Day 4:
Multivariate time series modeling
Other topics (as time permits)
   Moving averages
   ARIMA
   Panel data