MODERN RETAIL, INC.

REQUEST FOR PROPOSAL
RFP #: TF – F2.H1

TITLE: PHOENIX TEMPERATURE FORECAST – ARIMA
CLOSING DATE AND TIME: SEPTEMBER 16. 2016 @ 5:00 PM

Temp. Forecast – ARIMA: TF – F2.H1

Background and Purpose

By responding to this Request for Proposal (RFP), the Proposer agrees that s/he has read and understood all documents within this RFP package.

Submission Details

Responders to this RFP should supply:

- A business report up to **5 pages** (not including cover page or table of contents), including any supporting plots and tables.
- The commented code used to produce the results.

The report should address **all points described in the "Objective" section** below.

The report should be returned in the following way:

- Electronic (mailto: Aric_LaBarr@ncsu.edu; Subject Line: Phoenix Temperature Forecast – ARIMA)

Objective

Modern Retail Incorporated (hereafter the "Store"), acting by and through its department of *Marketing and Sales Analysis* is seeking proposals for retail analytics services. The scope of services includes the following:

- Creation of an hourly forecast for temperature in Phoenix, AZ for September 1, 2016 from a Seasonal ARIMA model, to be used for evaluating consumer behavior; The Store's analysts believe that extreme outdoor temperatures may affect the sales of the main retail location in Phoenix, AZ; They want a forecast of these temperatures to help them further evaluate this claim.
- The Store's analysts recommend trying both a deterministic and stochastic solution to removing the initial seasonality from the data.
- Creation of easy to read and interpret visualizations of the following:
    - Forecasted temperature values overlaid with the actual temperature values on September 1, 2016 (validation set) for the ARIMA model.
- The Store's analysts are open to either additive or multiplicative seasonal effects; However, the reasons for choosing either must be clearly stated and supported.
- The Store uses Mean Absolute Percentage Error (MAPE) in calculating the accuracy of its forecasts; Report this measure for the 24 hourly forecasted temperatures on September 1, 2016.
    - Previously, work has been done on this same data set using Exponential Smoothing Models (ESM's).
    - The previous best ESM model had a Mean Absolute Percentage Error (MAPE) of 1.979%, however, the white noise of the ESM model was questionable.
    - Compare your best ARIMA model to the MAPE of the ESM.
- The Store's analysts recommend testing the residuals from the final Seasonal ARIMA to check if they are white noise; The p-value and test statistic should be listed as well as results interpreted.

Data Provided

The following two sets of data are provided for the proposal:

- The data set **AUGUST_TRAIN_CLEAN** contains hourly observations from August 1, 2016 to August 31, 2016 and 44 variables. The variable **DryBulbFarenheit** is the temperature of interest.
    - The data is collected directly from the National Climatic Data Center and has been cleaned by the Store for you.
- The data set **SEPTEMBER_VALID_CLEAN** contains the same data for September 1, 2016.