Based on the guidance provided by the Prime Minister of Chulwahlar, our initial efforts focused on the importation of the data into R. The data existed as Comma Separated Values files in an Excel format. The three files contained an assortment of data. The first file contains the observed (as-is) data for three plants, Efac, Wuge, and EtelBy. The second file contains the planned data, although we did not devote any attention to the planned data as instructed. The final file contained influencing data that included a wide variety of topics such as weather, births in Chulwahlar, or government data sets like monthly changes in the export price index. Our initial efforts then turned towards cleaning and modification of the data for an in-depth study and forecast of the total as is (TotalAsIs) data and outputs.

The project, “planning and forecasting in a volatile setting: The Chulwahlar Case v0.8alpha” by Amy Wheeler, Nina Weitkamp, Patrick Berlekamp, Johannes Brauer, Andreas Faatz, and Hans-Ulrich Holst proved an extraordinary resource in the cleaning and modification of the data. Considerable code chunks came directly from their source document. This considerably reduced our time and effort at writing, testing, and reviewing code.

We took three primary steps in conducting the analysis and forecast for Chulwahlar exports. The first step involved loading the data and converting it into usable formats such as vectors and ultimately into time series. This allowed for the second step, conducting the analysis and producing an export forecast for the total as is data. The final step focused on Akailke’s Information Criteria (AIC) and Bayesian Information Criteria (BIC) for testing of our model.

The processes of loading and converting the data into vectors within R are contained within the Load Directory (<https://github.com/vishal11680/Unit10/tree/master/Load>). The file “Chulwalar.R” contains the code and notes for the actual loading of data and conversion into vectors. The files “ChulwahlarForecast” have the conversion to time series data. We did a str function to show the two sets of data. The first time series runs from 2008 to 2014 [1:72], and the second time series runs from 2014 to 2015 [1:12]. This concluded the work within the Load Directory, with progressing work now within the Analysis Directory.

The Analysis Directory (<https://github.com/vishal11680/Unit10/tree/master/Analysis>) contains the code used to conduct the analysis of the data and contains a repository of graphs and data that reflect trends, influences, correlations, and various data points illustrating the data. One of the clearest charts for illustrating the export data for Chulwahlar is our TotalAsIs\_stl chart seen below (figure 1). It shows the upward trend in exports over the time frame and the clear seasonal influence on exports. Numerous variables showed a correlation with exports, such as weather (0.8787973). This intuitively makes sense since weather and organic products generally should be correlated. On the opposite side, factors like political party affiliation (0.6307932) and the Satisfaction Index External Index (0.5400499) have a low correlation. The referenced charts may be obtained through the following link: <https://github.com/vishal11680/Unit10/tree/master/Analysis/AnalysisandForecast_files/figure-html> (weather: unnamed-chunnk-11-1, political party: unnamed-chunk-15-1, satisfaction index: unnamed-chunk-13-1).



*Figure 1 TotalAsIs\_stl*

Based on the work, we then created our forecasting models. Three modeling methods were used for the forecast. The models were the Simple Exponential Smoothing (SES), Holts Model, and Holts Winter Model. The following chart shows the various outputs of the models used to forecast future exports.



*Figure Forecasting Models*

We then ran three separate plots for the AIC, AICc and BIC for all the models. After reviewing the plots, the min AICc , min AICc and min BIC, all are from Holt Winter's additive model. Hence, it appears that Holt Winters Additive model is the **best model** to choose for forecasting exports in 2014. The following link is to the plots: <https://github.com/vishal11680/Unit10/blob/master/Paper/Summary.md>