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Time Series

Pstat 274/174, UCSB

Dec.09.2018

Time Series of Monthly Australian Imports from Japan

In international trade, the import or export is a significant part between countries. Australia-Japan relations have grown strong over years, and both nations are considerably close and having close ties with the Western world, which might be the reason why Japan could be one of Australia’s major trading partners. In this report, the main objective of this project is to predict monthly Australian imports from Japan using time series from July 1965 to October 1992. We use R software to construct the best possible time series to predict the imports patterns and behavior. The model prediction is tested for a period from July 1965 to December 1992, which makes the record from July 1965 to December 1992 to be our training dataset. The model prediction is tested for a period of January 1993 to October 1993 using an autoregressive integrated moving average (ARIMA) model fitted to the time series imports record to better understand the data patterns and provide a better accurate forecast.

By performing data exploratory analysis, we can know that the variance is non-stationary and BOX-COX transformation is needed to the original data. Then, we difference at lag 12 and lag 1 to remove the seasonality and trend. By looking at the ACF and PACF plots of stationary series, we adopt the AIC and BIC model selection criteria. Lastly, by comparing the numbers of parameters and diagnostics plots, we decide our final model to be SARIMA (2,1,0) \* (2,1,3)12. We also apply the periodogram to check the residuals of our model to see if it is a white noise, to make sure our residuals have a constant variance. Using our model to forecast 10 values ahead, which is predicting the imports data from Jan.93 to Oct.93 at monthly intervals, the overall trend and seasonality are captured precisely, which indicates our model is strongly predictive.

The key objective of the study is to forecast the monthly Australian imports from Japan data to capture future behaviors from Jan.93 to Oct.93, which consists of 10 fact values. The broad objective is compartmentalized into specific to include data transformation for variance stability for normal distribution check. Although there are some predicted values do not within the 95% confidence band since there are some outliers in the actual data, most of the values are lying within the 95% confidence interval.