Time series would subject to two types of analyses: descriptive and inferential. ﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿They are not two separate types. In general, when people properly analyzed data to understand the previous and current patterns, the next step would be to use them forecasting future values. Some common techniques for descriptive analysis include Index Numbers, Exponential Smoothing, etc. For forecasting, there are Exponential Smoothing as well, Holt's Method, etc. The additive model is one of the most widely used algebraic representations of time series models. Just like many other methods, such as﻿﻿﻿﻿﻿ Exponential Smoothing helping ﻿﻿﻿﻿﻿﻿﻿to remove the rapid fluctuations, the additive model helps to ﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿achieve a better understanding of the phenomena﻿﻿﻿﻿﻿﻿﻿ by separating seasonal effect and secular trend, as well as the residual effect (Decomposition).  ﻿﻿﻿﻿﻿﻿﻿﻿

The example that I am going to use is an air traffic passenger counts in San Francisco Airport from 2005 to 2019. The dataset could be ploted like this:

A picture containing bird

Description automatically generated﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿

It is not hard to see that there is might be seasonal fluctuations here in the time series.  ﻿﻿﻿﻿﻿﻿﻿﻿﻿Therefore, we separate them into three components:

A screenshot of a cell phone

Description automatically generated

This helped us to get a better understanding of the trend and get prepared for providing some measure of the reliability of the forecasts. After conducting an ARIMA prediction analysis, we've got a forecast value in red line and 95% interval error bounds in blue dots shown as below,

A screenshot of a cell phone

Description automatically generated

In this case, ﻿﻿﻿the seasonal model used to forecast is an additive model. ﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿The difference between the additive model and the multiplicative model is that the multiplicative model often provides a better forecasting model when the time series is changing at an increasing rate over time. ﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿Therefore, in this case, I prefer to use the additive model, because the fluctuation around the trend is equally intensive. ﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿The multiplicative model is more fits for the fluctuations are more and more intensive.﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿﻿

Reference:

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