

Forecast Explorer Technical Directions

Every year, educators across the nation set goals for their students. By looking at trends in historical data, educators can set realistic goals for the future. I designed the Outcome Forecasting Tool (OFT) to help educators apply statistical forecasting methods to their data and set more accurate goals. With just a few clicks, the OFT will provide predictions and visualizations using four forecasting methods; simple exponential smoothing, Holt linear exponential smoothing, naïve random walk, and cubic spline smoothing. This article will provide detailed technical directions for using the tool.

About the Tool

The tool is a [Shiny Web Application](#) developed by Matthew Courtney in 2023. It uses the [R statistical programming language](#) to read data off of a spreadsheet and create a summary of any column. The OFT is hosted on the [shinyapps.io](#) server.

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https://www.freeanalyticstools.com/forecast_explorer

Preparing your Data

1. Ensure your data is in a spreadsheet file format that can be read by the tool. This includes Excel spreadsheets with file extensions ".xls", ".xlsx", and ".xlsm", as well as CSV files.
2. Remove any non-numeric data or columns that are not needed for the forecasting. The tool will attempt to convert all columns to numeric, so any non-numeric data will cause errors.
3. Verify that the data is in a time series format, with a column containing date or time information and another column containing the corresponding numeric values.
4. Check for any missing or incomplete data and consider the best method for handling it. The forecasting methods in this tool require complete time series data, so missing values must be addressed before uploading the data to the tool.
5. Consider the frequency of your data and ensure that it matches the intended forecasting horizon. The forecasting methods in this tool work best with data that has a regular frequency, such as daily, weekly, or monthly. If your data has an irregular frequency, consider resampling it to a regular frequency before uploading it to the tool.

Using the Tool

1. Upload File: To upload your spreadsheet file, click on the "Choose a spreadsheet file" button in the sidebar and select the file you want to use. The file should be in one of the supported formats, such as Excel or CSV.
2. Select a Column: Once the file has been uploaded, select the column containing the historical data you want to use for forecasting. The available columns are shown in a drop-down menu labeled "Select your historical data." Choose the column you want to use and the tool will automatically generate forecasts based on that data.
3. Select Forecasting Method: The tool provides four different forecasting methods to choose from, each with its own tab: Simple Exponential Smoothing, Holt's Linear Exponential Smoothing, Naive and Random Walk, and Cubic Spline. Click on the tab for the desired method to see the forecast results.
 - a. Simple Exponential Smoothing Forecast: This method uses a weighted moving average to smooth out the historical data and generate a forecast. The results are shown in a table and a plot. The "Forecast" column in the table shows the predicted values for each future time period, while the "Lo" and "Hi" columns provide upper and lower bounds for the forecast. The plot shows the historical data and the forecasted values.
 - b. Holt's Linear Exponential Smoothing Forecast: This method is similar to Simple Exponential Smoothing but also takes into account the trend of the data. The results are again shown in a table and a plot. The "Forecast" column in the table shows the predicted values for each future time period, while the "Lo" and "Hi" columns provide upper and lower bounds for the forecast. The plot shows the historical data, the forecasted values, and the trend line.
 - c. Naive and Random Walk Forecast: This method is based on the idea that the best estimate for the future is simply the last observed value. In other words, it assumes that there is no trend or seasonality in the data and that the best estimate of the future value is the current value. This method generates a forecast by repeating the last observed value for each future time period. The results are shown in a table and a plot, with the same columns as in the previous methods.
 - d. Cubic Spline Forecast: This method fits a cubic spline to the historical data and uses it to generate a forecast. A cubic spline is a curve that is defined by a set of points and has a smooth shape that can be used to interpolate or extrapolate between the points. The method uses the historical data to fit a cubic spline curve, and then uses the curve to generate a forecast for each future time period. The results are shown in a table and a plot, with the same columns as in the previous methods. The plot shows the historical data, the forecasted values, and the fitted spline curve, which provides a smooth estimate of the trend in the data.
4. Interpret Results: When interpreting the results, it is important to consider the uncertainty in the forecasts. The upper and lower bounds provided in the tables give an indication of the range of possible values for each forecast. It is also important to consider the overall trend of the data and any seasonal patterns that may be present. Finally, it may be

useful to compare the results from multiple forecasting methods to get a better understanding of the range of possible outcomes.

References

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