# Production & Inventory Control

For this assignment, you will develop an Excel-based forecasting tool using VBA macros. There are two components to this project: 1) the forecasting tool and 2) a report that describes experimentation and results. This project will be worth 16% of your overall course grade, with the forecasting tool and the report each contributing 8%, respectively.

# Part 1: Forecasting Tool

The data in the Excel spreadsheet “flight\_data” represents the number of airline tickets purchased each month from 1949-1960. You will create an Excel tool that will have the ability to generate forecasts using all five of the forecasting methods we covered in class:

* Simple moving average
* Weighted moving average
* Simple exponential smoothing
* Winter’s method (assuming exactly two seasons of historical data as initial input)
* Linear regression

Your tool must be able to accept a forecasting method and its associated parameters from the user, as well as the range of historical data that should be used for initialization. For example, I should be able to tell the forecasting tool that I want to forecast the monthly demand for January-December 1950, using the demand data from January-December 1949 and applying Winter’s method with N = 4, α1 = 0.1, α2 = 0.0.5, α3 = 0.2. Note that, although I specified the historical data for January-December 1949, only the data for May-December would actually be used (because we are assuming two seasons, and N = 4). But you want the tool to be flexible enough that it can be given a range of historical data to use and then select from that data appropriately, given the forecasting parameters that are provided by the user.

In addition to generating forecasted demand values for the months specified by the user, the tool must also be able to generate metrics that capture the quality of the forecast, compared to the actual observed demand. This will enable the user to experiment with different forecasting approaches, compare metrics, and then select an approach that provides the best results. Think carefully about what is meant by “best”, in terms of forecast accuracy and bias, as well as the consequences (in terms of cost) of overages and shortages for this system.

Once the forecasting tool is developed, you will use it to answer the following two questions (which you will address in your report):

1. Develop a forecast for airline ticket demand for each of the 12 months in the year 1950. Which forecasting approach is best? Why?
2. Develop a forecast for airline ticket demand for each of the 12 months in the year 1960. Which forecasting approach is best? Why?

# Forecasting Tool Guidelines

For full credit, your forecasting tool should:

* Be programmed using VBA macros in Excel
* Produce correct results for all five forecasting methods, for the two specified questions
* Be easy to use and understand

# Part 2: Report

Your mini-project report must be no more than 5 pages long (single-spaced, font size = 12, 1-inch margins), including figures/tables. You do not need to include a title page. The report must contain the following three sections:

1. Introduction & Motivation
   * Describe the issue/question that you are investigating with the forecasting tool that you created
   * Briefly describe the approaches that you used to answer this question
2. Experimentation and Results
   * Present and explain your results for each of the two questions given above:
     + First: Which forecasting approaches did you try, and why?
     + Then: What were the results? It is a good idea to use tables and figures to present your results.
     + Finally: Which approach generated the best forecast? How do you know it’s the best? Be sure to state any assumptions you’ve made about what you mean by “best”.
3. Conclusion
   * What are the main takeaways from this study?
   * Are there any other approaches that could potentially provide better results (i.e., can you think of any ways that your tool could be enhanced to improve the quality of the forecasts it generates)?
   * How might the results of this study be useful for a real-world production or service system? Specifically, who might benefit from this tool, and how?

# Report Guidelines

For full credit, your project report should:

* Correctly analyze forecast outputs
* Be complete (i.e., required format adhered to; each section well developed with sufficient detail)
* Be clear (i.e., easy to understand)
* Be of excellent quality (including spelling, punctuation, grammar, staying within page limits, etc.)
* Provide a thorough and thoughtful discussion of results and implications of these results