BUS 712: Data-Driven Decision Making
SYLLABUS
Spring 2019

Instructor: M. Ryan Haley
Email: haley@uwosh.edu

Textbook: Haley et al., *The Core Concepts of Economic and Business Statistics: EMBA Version*

Course Description:
This course provides an accelerated exposure to the fundamental statistical techniques essential to management decision-making, including descriptive statistics, basic probability, estimation, basic hypothesis testing, and an introduction to forecasting.

Objectives:
This component of the PMBA is aimed at assuring that you are statistically literate. That does not mean you will become, or are expected to become, statistical experts. It does mean that you will come to understand the logic of statistics, and understand how statistics can be used to improve business and economic decision-making.

Timeline:

Week	Topic(s)	Chapter(s)
1	Data & Descriptive Statistics	1, 2
2	Normal Distribution & Sampling Theory	3, 4
3	Confidence Intervals & Hypothesis Testing	5, 6
4	Hypothesis Testing & Regression	6,7,8
5	Regression	8
6	Regression & Forecasting	8, 9
7	Forecasting	9

Evaluation:
Your evaluation will be based on a take home mid-course exam **(50%)** and on a final extended problem set **(50%)** described below. Note that the e-textbook contains many practice problems, many of which have verbose answers at the end of the e-text. Students are encouraged to work problems until they are comfortable with the concepts. Forecasting handouts will be added to the course website throughout the second half of the course to augment Chapter 9.

Extended Problem Set

Each 3-4 person group will complete an extended problem set, which has two components:

- Cross-sectional forecast for expected sales of a new franchise.

- Time series forecast for sales to be done five years after the new franchise commenced operations.

These two aspects require proficiency with cross-sectional and time series forecasting techniques. The relevant data appear in the **project_data.xlsx** file on the course website. The two tabs are labelled "cross-sectional" and "time series" to match to the two components noted above.

Cross-sectional Forecast: The specific tasks here are to use the data in the cross-sectional data tab to answer the following:

a) Interpret the marginal (by how much) impact of each covariate.

b) Estimate the expected sales for the newly proposed franchise location assuming the covariates have values 135.123 (population), 34.567 (income), and 1 (Hotelling).

c) Compute an approximate 95% confidence interval for the expected sales figure.

d) Describe two additional covariates you might considering adding to this cross-sectional forecasting analysis; explain your choices.

Time Series Forecast: Imagine now that five years have passed since the new franchise location was operationalized. Now 60 months of monthly sales data exist from that particular location. Now the primary goal is to forecast sales for the franchise using the 60 months of historical sales data. The specific tasks here are the following:

a) Produce a clear and properly labelled time series plot of the historical time series of sales.

b) Forecast sales for the upcoming 6 months using **Exponential Smoothing** (a.k.a., single exponential smoothing). Use Solver to find the smoothing parameter that minimizes the RMSE. Plot the actuals, the fits, and the forecasts. Report the MAPE and RMSE.

c) Forecast sales for the upcoming 6 months using **Holt's Method** (a.k.a., double exponential smoothing).Use Solver to find the smoothing parameters that minimizes the RMSE. Plot the actuals, the fits, and the forecasts. Report the MAPE and RMSE.

d) Forecast sales for the upcoming 6 months using **Multiplicative Time Series Decomposition.** Plot the actuals, the fits, and the forecasts. Report the MAPE and RMSE.

e) Produce a single chart that compares the fit measures (MAPE and RMSE) of all three approaches. Which forecast model works the best?

f) Compute the MPE for each of the three methods. Which of the methods appears to be the most biased? Explain.[1]

Grading:
- Completeness – whether the answers include all of the required elements, as specified above;

- Accuracy – whether all of the statistical/forecasting tests are performed and interpreted correctly.

---

[1] You will want to refer to the Forecast Evaluation handout for additional information about the Mean Percentage Error (MPE).