

## ALY-6050 Module Three Project

### *Project: Forecasting Financial Time Series*

The project consists of three parts. The submission of this project will consist of two attachments:

1. A Word document that is prepared according to the APA standards of formatting. In the Word document, explain the experiments and their respective conclusions, and additional information as indicated in each problem. Save your word document in the format: [ALY6050\\_MOD3Project\\_LastNameFirstInitial.docx](#)
2. Either an Excel workbook or an R script file (.R file) that contains all the work and the calculations indicated in parts 1-3 of the project. Please save your Excel workbook or R script file in the following format: [ALY6050\\_MOD3Project\\_LastnameFirstinitial](#); for example, [ALY6050\\_MOD3Project\\_DowJ](#).

### **Project:**

The Excel workbook [ALY6050\\_MOD3Project\\_Data.xlsx](#) contains the historical stock prices for the following stocks of 252 market days.

- Coca-Cola (NYSE:KO)
- Costco Wholesale (NASDAQ:COST)

### **Part 1: Short-term Forecasting:**

- (i) Use a simple line plot of both time series to detect seasonal, irregular, or trend behaviors if any. Write a summary of your observations of both time series in your report.
- (ii) Perform exponential smoothing to forecast both prices for period 253. Use successive values of 0.15, 0.35, 0.55, and 0.75 for the smoothing parameter  $\alpha$ . Next, calculate the MAPD (Mean Absolute Percentage Deviation) of each forecast; and based on the MAPDs, determine the value of  $\alpha$  that has yielded the most accurate forecast for each stock. In your report, describe your results; and explain why in your opinion such values of  $\alpha$  have yielded the most accurate forecasts for the two stocks.
- (iii) Use your exponential smoothing forecast of part (ii) with  $\alpha=0.55$  and perform an adjusted exponential smoothing to forecast both prices for period 253. Use successive values of 0.15, 0.25, 0.45, and 0.85 for the trend parameters  $\beta$  for both stocks. Next, calculate the MAPEs (Mean Absolute Percentage Error) of your forecasts and determine the values of  $\beta$  that have provided the most accurate forecasts for both stocks. In your report, describe your results and explain why, in your opinion, such values of  $\beta$  have yielded the most accurate forecasts.

### **Part 2: Long-term Forecasting**

- (i) For each stock, use a 3-period weighted moving averages to forecast its value during periods 1 through 100. Use the weights 0.5 (for the most recent period), 0.3 (for the period before the most recent), and 0.2 (for two periods ago). Next, use the observed value for period 101

as the base of a linear trend, and use that linear trend to forecast the values of both stocks for periods 101 through 257. Write a summary of your results in your report. Describe how accurate this method of forecasting has been by comparing the forecasted values for periods 253-257 with their actual “Close” values on those specific days (Hint: check the actual values on <https://finance.yahoo.com>).

(ii) Calculate the MAPEs (Mean Absolute Percentage Error) of your forecasts in question (i) above and compare them with the values obtained for your forecasts in Part 1. For each stock, describe which method has yielded a most accurate forecast.

### **Part 3: Time Series using R:**

You may want to consult the following resources:

- The sample codes in the “Weekly Material” folder.
- <https://a-little-book-of-r-for-time-series.readthedocs.io/en/latest/>
- <https://otexts.com/fpp2/arma.html>

- (i) Use R to download 5-year worth of data for KO and COST (see the sample codes)
- (ii) Fit an AR(1) time-series model to KO and COST. You may do so manually or using ARIMA( ) command in R. Plot the actual series + forecasts up to several months (One chart for KO, one chart for COST).
- (iii) Use auto.arima( ) functions to fit a time-series model. What model did it choose? Plot the actual series + forecasts up to several months (One chart for KO, one chart for COST).
- (iv) Repeat the auto.arima( ) time-series forecasting using dry wine prices in “dry\_wine.csv”. Plot the actual series + forecasts
- (v) Provide a written summary comparing the results produced by
  - a. analytical evaluation of KO and COST using Excel
  - b. numerical evaluation of KO and COST using auto.arima( )
  - c. numerical evaluation of dry wine prices using auto.arima( )

Why do you get different conclusions? What is the preferred method? What did you learn? How would you improve on your analysis?

## Project Rubric

Project Rubric					
Criteria	Ratings				Pts
R (or Excel): Problem Modelling & Set-up	20.0 pts Completely and concisely modeled the problem in Excel (or R) for each method	16.0 pts Accurately modeled the problem in Excel (or R) for each method	10.0 pts Correctly modeled the problem in Excel (or R) for each method, but the model lacks detailed insight into the problem or the set-up is awkward.	5.0 pts Modeled the problem in Excel (or R) for each method, but there are some gaps in the problem modeling and setup	20.0 pts
R (or Excel): Problem Solution & Accuracy	40.0 pts Efficiently obtained correct and accurate solutions in Excel (or R) by using the appropriate analytic tools of the software	32.0 pts Obtained complete and accurate solutions in Excel (or R) by using the appropriate analytic tools of the software	20.0 pts Obtained correct solutions in Excel (or R) using the appropriate analytic tools of the software, but the application of the tool is awkward.	10.0 pts Obtained a solutions in Excel (or R) by using the appropriate analytic tools of the software, but the solution is not complete.	40.0 pts
Word/Report: Problem Description & Introduction	10.0 pts Provides a thorough and concise summary of the problem descriptions and introduced the problem using rich and significant ideas	8.0 pts Provides an accurate and succinct summary of the problem descriptions and problem introduction	5.0 pts Provides an accurate summary of the problem descriptions and problem introduction, but the description is too wordy or not succinct	2.5 pts Provided a summary of the problem descriptions and problem introduction, but it is inaccurate or incomplete	10.0 pts
Word/Report: Description of Problem Analysis	10.0 pts Provides a thorough and precise description of the analytic concepts and theories used in analyzing the problem	8.0 pts Accurately describes the analytic concepts and theories used in analyzing the problem	5.0 pts Describes the analytic concepts and theories used in analyzing the problem, but description lacks appropriate detail or precision	2.5 pts Describes the analytical concepts and theories used in analyzing the problem, but descriptions are incorrect or the analytical concepts and theories are incorrect	10.0 pts
Word/Report: Description of Conclusions	10.0 pts Provides conclusions and results obtained in the project using a high level of critical thinking and reasoning	8.0 pts Provides relevant conclusions and results obtained in the project that reflect critical thinking and reasoning	5.0 pts Provides conclusions and results obtained in the project, but not all conclusions or results are relevant to the problem or not all conclusions reflect good reasoning	2.5 pts Provides conclusions and results obtained in the project, but they are irrelevant and reflect a lack of critical thinking	10.0 pts
Word/Report: Writing Mechanics, Title Page, & References	10.0 pts Completely free of errors in grammar, spelling, and punctuation; and completely correct usage of title page, citations, and references. The report contains a minimum of 1000 words	8.0 pts There are no noticeable errors in grammar, spelling, and punctuation; and completely correct usage of title page, citations, and references. The report contains a minimum of 1000 words	5.0 pts There are very few errors in grammar, spelling, and punctuation; and completely correct usage of title page, citations, and references. The report contains a minimum of 1000 words	2.5 pts There are more than five errors in grammar, spelling, and punctuation; or the usage of title page, citations, and references are incomplete; or the report contains less than 1000 words	10.0 pts
Total Points: 100.0					