Northeastern University
ALY6050
2024 Winter B

ALY6050 Module One Project

Project: *Analysis of a Betting Strategy in Sports*

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_MOD1Project_ 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 1-4 of the project. If using Excel, all work should be completed in the Excel workbook provided. Furthermore, they should be completed in the designated cells as instructed in the workbook. Please save your Excel workbook or R script file in the following format: Excel: ALY6050_MOD1Project_ LastnameFirstinitial; for example, ALY6050_MOD1Project_ HeR.

- **Problem(fictional):**

  Suppose that Boston Celtics and Golden State Warriors (two American NBA teams) are scheduled to play a **best of three(3)** series. The winner of the series will be the first team that wins two of the three games. The probability that Celtics will win a game in their home arena(@TD Garden) is 0.60 and the probability that Warriors will win their home game(@Chase Center) is 0.58. Next, suppose that you place a bet on each game played where you win $150 if Celtics win and you lose $160 if Celtics loses the game.

- In parts 1-4 below, assume that the outcomes of the games are independent of each other.

- **Part 1(50%)**:

  If the first game is played in **Chase Center**, the second game is played in TD Garden, and the third game (if it becomes necessary) is in Chase Center, then complete parts (i)-(v) below.

  (i) Calculate the probability that the Celtics will win the series.

  (ii) Construct a probability distribution for your *net win* (X) in the series. Calculate your expected net win (E(X)) and the standard deviation of X.

  (iii) Use Excel or R to create **5,000** random values for X. Let these random values be denoted by Y. Use these Y values to estimate your expected net win by using a 95% confidence interval. Does this confidence interval contain the E(X) in (ii)?

  (iv) Construct a frequency distribution for Y. Next, use the **Chi-square goodness of fit test** to verify how closely the distribution of Y has estimated the distribution of X.

  (v) Use your observations in parts (ii) and (iii) above to describe whether your betting strategy is favorable to you. Write a summary of your observations and analyses in the Word document.

- **Part 2(20%)**:
  Repeat part 1 above but assume that the first game is played in **TD Garden**, the second game is played in Chase Center, and the third game (if it becomes necessary) is in TD Garden.

- **Part 3(20%)**:
  Repeat part 1 above but now assume that the series is a **best of five(5)** series where the first team that wins **three** games will win the series with games alternating between TD Garden and Chase Center, with the first game being played in **TD Garden**.

- **Part 4(10%)**:
  Repeat part 1 above but now assume both teams will play in the NBA finals. The series is a **best of seven(7)** series where the first team that wins **four** games will win the series in a 2-3-2 format. The team with home-court advantage hosts games 1, 2, 6, and 7, while the opponent hosts games 3, 4, and 5. Let's assume the **Celtics** have the home-court advantage against the Warriors.

  Hint: You can use R or Python(Jupyter Notebook) to solve Part 4.

Reference:

Northeastern University
ALY6050
2024 Winter B

Albright, S. (2016) *Business Analytics.* Sixth Edition. Cengage Learning. Boston, MA.

Project Rubric

Project Rubric					
Criteria	**Ratings**				**Pts**
R (or Excel): Problem Modeling & 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