**1122 BM508 Assignment 4 Spring 2024 Due 5/29/2024 @ 11:59pm**

* Please specify the software you used for the questions.
* Please write down and submit your answers using Word document and attach the outputs generated from your software.
* Do not simply submit the output from Excel, R, or SPSS as your homework without organizing it in the Word document.
* If you are using R, please also submit your codes.
* Late Penalty: 5 points per day!! (If you have any question that may delay your submission, please let me and TA know in advance.)
* Failing to contact the teacher and TA’s in advance and submitting your work 7 days after the due date will not be accepted and graded.

Problem 1 [32%]

To test for any difference in seconds per customer spent to complete the following tasks by bank tellers in a branch of Chase Bank, the following data were obtained. Assume the population time used for each task are normally distributed with the same variance.

|  |  |  |  |
| --- | --- | --- | --- |
| Receiving deposits | Cashing checks | Exchanging foreign currencies | Selling traveler’s checks |
| 164 | 180 | 202 | 186 |
| 200 | 205 | 245 | 235 |
| 235 | 205 | 227 | 197 |
| 176 | 220 | 325 | 264 |
| 131 | 180 | 250 | 236 |
| 185 | 193 | 213 | 219 |
| 112 | 124 | 285 | 355 |
| 147 | 188 | 310 | 234 |

1. What are the statistical hypotheses? (4%)

*H*0​:*μ*1​=*μ*2​=*μ*3​=*μ*4 v.s At least one *μi*​ not = *μj*

b. Complete the ANOVA table. (16%)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Sum of Square | DF | Mean Square | F value | P-value |
| Treatment | 42856.75 | 3 | 14285.5833 | 7.9976 | 0.0005 |
| Error | 50014.75 | 28 | 1786.2411 |  |  |
| Total |  |  |  |  |  |

c. At the 0.05 level of significance, what is your conclusion? (4%)

因為p值 < 0.05 所以拒絕虛無假設，有證據證明每位客戶所花費的秒數有差異。

d. Use Fisher’s LSD procedure to test for the equality of the means for “Exchanging foreign currencies” and “Cashing checks”, assuming alpha=0.05. What is the difference in the mean time taken between two tasks from the sample? (4%) What is your conclusion (4%)

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自動產生的描述

因為70.25 > LSD = 61.2169 所以有證據證明兌換外幣和兌現支票任務之間的平均時間在0.05的顯著水準上存在顯著差異

Problem 2 [12%]

The file *Airfares3.xlsx* contains the prices in U.S. dollars for one-way ticket between the cities for each of the three travel agency websites. Here the pairs of cities are the “blocks” and the treatments are the different websites. Use a = .05 to test for any significant differences in the mean price of a one-way airline ticket for the three travel agency websites. Please provide the computed F statistic (4%), the p-value (4%), and your conclusion (4%).

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自動產生的描述

Computed F statistic for Agency: 2.6079

P-value for Agency: 0.1343

有證據證明旅行社之間平均機票價格的差異在 0.05 顯著水準上不顯著。

Problem 3 [16%]

A factorial experiment was designed to test for any significant differences in the time needed to translate other languages into English with two computerized language translators. Because the type of language translated was also considered a significant factor, translations were made with both systems for three different languages: Spanish, French, and German. Use the data from *Translator3.xlsx* to detect any significant differences due to language translation system, type of language, and the interaction. Use a 0.05 level of significance. Please provide the calculated F-value, p-values for language translation system, type of language, and the interaction, respectively (12%). What is your conclusion based on the results? (4%)

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自動產生的描述

根據以上資訊，有證據證明平均翻譯時間有顯著差異，但系統和語言之間沒有顯著的交互作用。

Problem 4 [40%]

The file “Park*Spend5*” contains sample data from tourists of an amusement park. The file contains the following data on visits by families to the park: amount spent, size of the family, the distance the family lives from the park (the gate attendee asks for the postal code of each family entering the park), whether or not the family has a park membership (1 = yes, 0 = no), expected satisfaction score at entry (pre score), and the post-visit satisfaction score at the exit (post score). Each family were asked about their expected satisfaction of the visit upon entry. Then a follow-up survey was conducted for their satisfaction after the visit. The satisfaction was measured in a scale from 0-100 and was treated as a continuous variable.

You want to detect whether the distance from the park of a family would affect their total spending in the park. Apply simple linear regression model and detect the hypothesis given a significance level of 0.05. Please respond to the follow questions accordingly:

a. Specify the statistical hypotheses: (4%)

*H*0​ : *β*1​= 0 v.s *H1* ​: *β*1​ not = 0

1. Conduct the analysis. Assume y is the dependent variable and x is the independent variable. Write down the equation of the regression model like but use the estimated coefficients (real numbers rounding to rounding to 2 decimal places) based on your analysis. (4%) Please interpret the estimated result of . (4%)

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自動產生的描述

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自動產生的描述

β 1 (0.12) 表明，家庭居住距離公園每增加一公里，花費的金額就會增加約 0.12 美元，但是無證據證明此結果顯著。

1. Check out the model summary. What is the coefficient of determination of this model? (2%) Please interpret the result. (4%)

R ^2 is 0.007.

d. What is the Pearson correlation coefficient between the distance from the park of a family and the total spending? (2%) What is it associated with coefficient of determination? (2%)

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自動產生的描述

皮爾森相關係數約為0.084，顯示與公園的距離與總支出之間的正相關性非常弱。

e. Look at the ANOVA table. What is the computed F-statistic (2%) and p-value? (2%)

The computed F-statistic is 0.7667 and the P-value is 0.383

g. Look at the statistical testing for the coefficient . What is the computed t-statistic (2%) and the p-value? (2%)

t-statistic: 0.876

P-value: 0.383

h. What is the 95%CI for the estimated coefficient ? (4%) Does the range contain 0? (2%)



The confidence interval includes 0

1. What is your conclusion for the tested hypothesis? (4%)

無法拒絕虛無假設，無證據證明距離公園的距離顯著影響家庭在公園的總支出。