

AMS394 Homework 2

Please save your code and result in doc or txt document. You should submit your homework via blackboard by 1:00 pm, July 25. Please provide complete codes and results for full credit.

Problem (1) Use the `d_logret_6stock` dataset to answer the questions.

- (1) Perform a t-test for American Express with the null hypothesis that the mean of its return is zero.
- (2) Perform a Wilcoxon signed-rank test for American Express with the null hypothesis that the mean of its return is zero.
- (3) Perform a two-sample t-test to conclude if the mean returns of Pfizer and American Express are same or not.
- (4) Perform a two-sample Wilcoxon test to conclude if the mean returns of Pfizer and American Express are same or not.
- (5) Compare the variance of returns for Pfizer and American Express.

Problem (2). In an effort to link cold environments with hypertension in humans, a preliminary experiment was conducted to investigate the effect of cold on hypertension in rats. Two random samples of 6 rats each were exposed to different environments. One sample of rats were held in a normal environment at 26°C. The other sample was held in a cold 5°C environment. Blood pressures and heart rates were measured for rats for both groups. The blood pressure for the 12 rats are shown in the accompanying table. Do the data provide sufficient evidence to indicate that rats exposed to a 5°C environment have a higher mean blood pressure than rats exposed to a 26°C environment? Test by using $\alpha = .05$.

26°C		5°C	
Rat	Blood Pressure	Rat	Blood Pressure
1	152	7	384
2	157	8	369
3	179	9	354
4	182	10	375
5	176	11	366
6	149	12	423

Problem (3) . To determine whether glaucoma affects the corneal thickness, measurements were made in 8 people affected by glaucoma in one eye but not in the other. The corneal thickness (in microns) were as follows:

Person	1	2	3	4	5	6	7	8
Eye affected	488	478	480	426	440	410	458	460
Eye not affected	484	478	492	444	436	398	464	476

- According to the data, can you conclude, at the significance level of 0.10, that the corneal thickness is not equal for affected versus unaffected eyes? Please write the entire R code to check the assumptions necessary and to perform the test.
- Calculate a 90% confidence interval for the mean difference in thickness.

Problem (4) Over then past 5 years, the mean time for a warehouse to fill a buyer's order has been 25 minutes. Officials of the company believe that the length of time has increased recently, either due to a change in the workforce or due to a change in customer purchasing policies. The processing time (in minutes) was recorded for a random sample of 15 orders processed over the past month.

28 25 27 31 10 26 30 15 55 12 24 32 28 42 38

Questions:

- Please check the normality of the data.
- Please test the research hypothesis at the significance level $\alpha = 0.05$.

Problem (5) Use the d_logret_6stock dataset to answer the questions.

- Regress the return of Pfizer on the returns of Exxon (with intercept). Report the estimated coefficients.
- Regress the return of Pfizer on the returns of Exxon (without intercept). Report the estimated coefficients.
- Compute the correlation of Pfizer and Exxon, and test if their correlation is zero.

Problem (6)

A marketing manager conducted a study to determine whether there is a linear relationship between money spent on advertising and company sales. The data are listed in the following table.

Advertising expenses (1000s of \$), x	2.4	1.6	2.0	2.6	1.4	1.6	2.0	2.2
Company sales (1000s of \$), y	225	184	220	240	180	184	186	215

Some summary statistics are as follows: $\sum x = 15.8$, $\sum y = 1634$, $\sum xy = 3289.8$, and $\sum x^2 = 32.44$.

- (a) What is the correlation coefficient between these two variables?
- (b) Write down the least squares regression equation.
- (c) What is the coefficient of determination of your regression?
- (d) At $\alpha = 0.01$, is there a significant linear relationship between these two variables?
- (e) Suppose a company plans to spend \$1,800 on advertisement, what is the expected sales?

Problem (7) With the `rmr` data set (ISwR package), plot metabolic rate versus body weight. Fit a linear regression model to the relation. According to the fitted model, what is the predicted metabolic rate for a body weight of 80kg?