HW 9

This Homework is due in two weeks

1) The file NormTemp.MTP (used in HW2) contains data on body temperatures for 130 randomly selected subjects. The first column (Temp) contains the temperatures themselves. For each subject, this temperature, in degrees Fahrenheit, represents an average of several readings taken over the course of two consecutive days. The second column (Gender) is 1 for male, 2 for female, and the third column (HeartRate) is measured in beats per minute.

A) Make side-by-side boxplots for the temperatures of males and females. Do there seem to be any differences?

B) Use the two-sample t-test to formally test for a difference in mean body temperature between males and females. In Minitab, this can be done using the commands Stat → Basic Statistics → 2-Sample t → Samples in one column, Samples: Temp, Subscripts: Gender. Use Options → Alternative to select the alternative hypothesis, in this case “not equal”. Do not check the “Assume equal variances” box. (In general, I recommend not checking this box, since it’s an overly restrictive assumption).

Based on the 95% CI, is there evidence that the mean temperature depends on gender? Explain. For the t-test, state the null and alternative hypotheses in terms of body temperatures. Based on the Minitab t-test output, can the null hypothesis be rejected at level .05? At level .01? Give an interpretation of the p-value.

C) Repeat parts A) and B) for HeartRate.

2) Sincich, Ex. 7.56. Use Minitab for the calculations. The commands are Stat → Basic Statistics → 2 Proportions → Summarized data (Enter the data in the boxes). Select the alternative hypothesis by clicking on the Options box.

3) The file Diamond.MTP contains data on pricing of ladies’ diamond rings, based on the weights of the diamonds. The data were originally given in a full page advertisement placed in the Straits Times newspaper issue of February 29, 1992, by a Singapore-based retailer of diamond jewelry. The 48 rings considered in this data set were similar in terms of design, gold weight, and the diamond qualities of cut, color and clarity. Therefore, the carat size of the diamond stones becomes the obvious factor to use in pricing the rings. The variables in Diamond.MTP are Weight (in carats), and Price (of the ring, in Singapore Dollars).

A) Make a scatterplot of Price versus Weight, and comment on the reasonableness of fitting a linear regression model to this data.

B) Run the regression of Price on Weight, using Stat → Regression → Regression → Response: Price, Predictors: Weight. Copy and paste the Minitab regression output.

C) What is the equation of the fitted line? Use this equation to predict the price of a diamond ring which weighs 0.23 carats.
D) Is there evidence of a significant linear relationship between the price and the weight of the diamond? Justify your answer.

E) Interpret the estimated slope of the fitted model, and construct a 95% CI for the true slope coefficient. What is the practical meaning of the true slope coefficient?

F) Discuss and give a practical interpretation of the coefficient of determination, R-Squared.

G) Does the negative estimated intercept of the fitted model bother you? What is the interpretation of the true intercept? Is there evidence at the 1% level of significance to suggest that the true intercept is negative?

H) What is the estimate of the typical fluctuation of data points from the true regression line, measured in the vertical direction?

I) At the 1% level of significance, can we reject the null hypothesis that the true slope is 3500 in favor of the alternative that it is not 3500?

J) Using Minitab, construct a 95% confidence interval for the expected price of a ring which weighs 0.23 carats. (See Handout 30 for Minitab commands).

4) The file EPSReturn.MTP (considered in HW2) contains data on the stock returns and earnings per share (EPS) for 52 major companies. The EPS values for the companies are those announced in December 1997, while the stock returns are calculated for January 1998. It is of interest to try to use EPS to predict the stock return.

A) Construct a Minitab Fitted Line plot of Return versus EPS, using the commands Stat → Regression → Fitted Line Plot, Response (Y): Return, Predictor (X): EPS. Click on Options → Display Confidence Interval, Display Prediction Interval. Does the plot indicate that the linear regression model fits well? Does it suggest any possible violation of the assumptions which underlie the linear regression model?

B) Run the regression, using Minitab. Is there evidence to suggest that EPS is useful for predicting the stock returns? (Use a 5% level of significance). Compute the p-value for the estimated slope based on a left-tailed (one-sided) alternative hypothesis.

C) What does the R-Square suggest about the strength of the linear relationship?

D) Get a point forecast and a 95% prediction interval for the return of a stock with an EPS of 6. Is this a useful interval? (Refer also to the plot from A).