HW3 EE325 Answers

1. The demand for cellphones regression

$$\hat{Y}_i = 14.4773 + 0.0022X_i$$
$$se(\hat{\beta}_1) = 6.1523; se(\hat{\beta}_2) = 0.00032$$
$$r^2 = 0.6023$$
$$n = 34$$

Letting Y = number of cellphone subscribers
X = purchasing power adjusted per capita income

a. Is the estimated intercept coefficient significant at the 5 percent level of significance? What is the null hypothesis you are testing?

$$H_0: \beta_1 = 0;\ H_1: \beta_1 \neq 0$$

$$t = \frac{14.4773 - 0}{6.1523} = 2.3532$$

With 32 degrees of freedom (34-2=32) , the critical point for the 5%level of significance is 2.042 (using 30 d.f. since 32 is not in the table in the textbook's appendix)
Reject the null hypothesis.
We have enough evidence to say that the intercept is statistically significant.

b. Is the slope coefficient significant at the 5 percent level? What is the underlying null hypothesis?

$$H_0: \beta_2 = 0;\ H_1: \beta_2 \neq 0$$

$$t = \frac{0.0022 - 0}{0.00032} = 6.8750$$

With 32 degrees of freedom (34-2=32) , the critical point for the 5%level of significance is 2.042 (using 30 d.f. since 32 is not in the table in the textbook's appendix)
Reject the null hypothesis.
We have enough evidence to say that the slope is statistically significant.

c. Establish a 95 percent confidence for the true slope coefficient.
The 95% confidence interval for the true slope coefficient would be

$$0.0015 \leq \beta_2 \leq 0.0029$$

2. What is known as the characteristic line of modern investment analysis is simply the regression line obtained from the following model:

$$r_{it} = \alpha_i + \beta_i r_{mt} + u_t$$

Where r_{it} = the rate of return on the ith security in time t
r_{mt} = the rate of return on the market portfolio in time t
u_t = stochastic disturbance term

In this model β_i is known as the beta coefficient of the *i*th security, a measure of market (or systematic) risk of a security.

On the basis of 240 monthly rates of return for the period 1956-1976, Fogler and Ganapathy obtained the following characteristic line for IBM stock in relation to the market portfolio index developed at the University of Chicago:

$$\hat{r}_{it} = 0.7264 + 1.0598 r_{mt}$$
$$se = (0.3001) \quad (0.0728)$$
$$r^2 = 0.4710$$
df =238
$$F_{1,238} = 211.896$$

a. A security whose beta coefficient is greater than one is said to be a volatile or aggressive security. Was IBM a volatile security in the time period under study?

$$H_0: \beta_2 \leq 1;\ H_1: \beta_2 > 1$$

$$t = \frac{1.0598 - 1}{0.0728} = 0.821$$

With 238 degrees of freedom , the critical point for the 5%level of significance is 1.645
Cannot reject the null hypothesis.
The conclusion is that over the sample period, IBM was not a volatile security.

b. Is the intercept coefficient significantly different from zero? If it is, what is its practical meaning?

$$H_0: \beta_1 = 0;\ H_1: \beta_1 \neq 0$$

$$t = \frac{0.7264 - 0}{0.3001} = 2.4205$$

With 238 degrees of freedom , the critical point for the 5%level of significance is 1.96
Reject the null hypothesis.
We have enough evidence to say that the intercept is statistically significant.
The intercept value of about 0.73 means that even if the market portfolio has zero return, the security's return is 0.73 percent.

3. Consider the following regression output:

$\hat{Y}_i = 0.2033 + 0.6560 X_t$

$se = (0.0976) \quad (0.1961)$

$r^2 = 0.397$

$RSS = 0.0544$

$ESS = 0.0358$

Where Y = labor force participation rate (LFPR) of women in 1972 and X = LFPR of women in 1968. The regression results were obtained from a sample of 19 cities in the United States.

a. How do you interpret this regression?

There is a positive association in the LFPR in 1972 and 1968, which is not surprising in view of the fact since WW II there has been a steady increase in the LFPR of women.

b. Test the hypothesis: β_2 is greater than 1? Which test do you use?

$$H_0: \beta_2 \le 1;\ H_1: \beta_2 > 1$$

$$t = \frac{0.6560 - 1}{0.1961} = -1.7542$$

With 17 degrees of freedom , the critical point for the 5%level of significance is 1.740
Reject the null hypothesis.
We can reject the hypothesis that the true slope is coefficient is 1 or greater.