Additional Practice Answers

Book questions # 5.3, 5.5, 6.2 (a-e)

5.3

(*a*) se of the intercept coefficient is 6.1523, so the *t* value under H_0 : $\beta_1 = 0$, is: $\frac{14.4773}{6.1523} = 2.3532$. With 32 degrees of freedom, the cutoff 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), so the intercept IS statistically significant.

(*b*) se of the slope coefficient is 0.00032, so the *t* value under H_0 : $\beta_2 = 0$, is: $\frac{0.0022}{0.00032} = 6.8750$. As noted in part *a*, the cutoff for the 5% level of significance is 2.042, so the slope IS statistically significant.

(*c*) The 95% confidence interval for the true slope coefficient would be: $0.0022 \pm (2.042)(0.00032) \rightarrow [0.0015, 0.0029]$.

(*d*) If per capita income is \$9000, the mean forecast value of cell phones demanded is 14.4773 + 0.0022 (9000) = 34.2773 per 100 persons. For the prediction confidence interval, we first need to compute $\text{var}(\hat{Y}_0) = \sigma^2 \left[\frac{1}{n} + \frac{(X_0 - \bar{X})^2}{\sum x_i^2} \right]$.

$\text{var}(\hat{Y}_0) = 422.526 \left[\frac{1}{34} + \frac{(9000 - 15819.865)^2}{12,668,291,885} \right] = 13.9785$. Now the confidence interval is given as

$$\Pr\left[\hat{Y}_0 - t_{\alpha/2}\, se(\hat{Y}_0) \le Y_0 \le \hat{Y}_0 + t_{\alpha/2}\, se(\hat{Y}_0) \right] = 1 - \alpha$$

$$= \Pr\left[34.2773 - 2.042(3.7388) \le Y_0 \le 34.2773 + 2.042(3.7388) \right] = 0.95$$

$$\rightarrow [26.6427, 41.9119]$$

5.5

(*a*) Use the *t* test to test the hypothesis that the true slope coefficient is one. That is obtain: $t = \dfrac{\hat{\beta}_2 - 1}{se(\hat{\beta}_2)} = \dfrac{1.0598 - 1}{0.0728} = 0.821$

For 238 df this *t* value is not significant even at $\alpha = 10\%$. The conclusion is that over the sample period, IBM was not a volatile security.

(*b*) Since $t = \dfrac{0.7264}{0.3001} = 2.4205$, which is significant at the two percent level of significance. But it has little economic meaning. Literally interpreted, 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.

6.2

(*a*) & (*b*) In the first equation an intercept term is included. Since the intercept in the first model is not statistically significant, say at the 5% level, it may be dropped from the model.

(*c*) For each model, a one percentage point increase in the monthly market rate of return lead on average to about 0.76 percentage point increase in the monthly rate of return on Texaco common stock over the sample period.

(*d*) As discussed in the chapter, this model represents the *characteristic line* of investment theory. In the present case the model relates the monthly return on the Texaco stock to the monthly return on the market, as represented by a broad market index.

(*e*) No, the two r^2s are not comparable. The r^2 of the interceptless model is the raw r^2.