

Part C: Multiple Linear Regression - t, F-tests, Extra Sums of Squares

Q.C.1. $F_{obs} = \frac{\frac{300 - 250}{4 - 2}}{\frac{250}{20 - 5}} = 1.50$ $F_{.05, 2, 15} = 3.682$

Q.C.2. $F_{obs} = 2.10$ $F_{.05} = 2.960$

Q.C.3. $\hat{Y} = 10.0 + 0.35(10) + 0.30(15) + 0.010(300) = 21.0$

$F_{obs} = \frac{0.75/3}{(1 - 0.75)/(24 - 4)} = 20.00$ $F_{.05, 3, 20} = 3.098$

Q.C.4. TRUE Q.C.5. TRUE Q.C.6. TRUE

Q.C.7. $F = \frac{R^2/6}{(1 - R^2)/(20 - 7)} = \frac{13}{7} \frac{R^2}{1 - R^2}$ Reject H_0 if $F \geq F_{.05, 6, 13} = 2.915$

\Rightarrow Reject H_0 if $\frac{13}{7} \left(\frac{R^2}{1 - R^2} \right) \geq 2.915 \Rightarrow \frac{R^2}{1 - R^2} \geq \frac{7(2.915)}{13} = 1.570$

$\Rightarrow \frac{1 - R^2}{R^2} \leq \frac{1}{1.570} = 0.637 \Rightarrow \frac{1}{R^2} - 1 \leq 0.637 \Rightarrow \frac{1}{R^2} \leq 1.637$

$\Rightarrow R^2 \geq \frac{1}{1.637} = 0.611$

Q.C.9. P.9.a. $F_{obs} = 53.429$ $F_{.05} \approx 2.41$ P.9.b. $t_{obs} = 5.058$ $t_{.025} = 1.97$

Q.C.10. $F = \frac{R^2/p}{(1 - R^2)/(n - p')} = \left(\frac{n - p'}{p} \right) \frac{R^2}{1 - R^2} \geq F_{.05, 3, 21} = 3.072 \Rightarrow \frac{R^2}{1 - R^2} \geq 3.072 \left(\frac{3}{21} \right) = .439$

Q.C.11. TRUE Q.C.12. $R^2 \geq .378$ Q.C.13. TRUE

Q.C.14. P.14.a.

Source	df	SS	MS	F	F(.05)
Regression	3	47.30	15.77	2.879 287.7	2.975
Residual	26	1.44	0.055		
Total	29	48.74			

$t_0 = 1.929$ $t_1 = 1.874$ $t_2 = -28.76$ $t_3 = 0.349$ $t_{.025} = 2.056$

P.14.b. $S^2 = 0.055$

P.14.c. $0.0132 \pm 2.056(.0378) = .0132 \pm .0777 = (-.0645, .0909)$ NO

P.14.d. $\hat{Y}_1 = 6.0509 + .0253(227) - .2186(20) + .0132(1) = 7.435$, $R_1 = 7.637 - 7.435 = 0.202$

Q.C. 15. $R^2 \geq 0,238$ Q.C. 16. TRUE

Q.C. 17. P.17.a. $R^2 = ,703$

P.17.b.

Source	df	SS	MS	F	F(.05)	Coefficient	STDEEM	t	t(.025)
Regression	3	24094.91	8032	27.7	≈ 2.88	INT -115.36	63.29	-1.823	≈ 2.03
Residual	35	10164.83	290.4	-	-	M 4.15	4.38	0.947	↓
Total	38	34259.74	-	-	-	P 19.99	2.76	7.243	
						A -128.86	15.37	-8.353	

P.17.c. $SSR(X_A) = 8869.33$ $SSR(X_P|X_A) = 23834.15 - 8869.33 = 14964.82$

$SSR(X_M|X_A, X_P) = 24094.91 - \frac{23834.15}{1} = 260.76$

P.17.d. $R^2_{X_P \cdot X_A} = \frac{SSR(X_P|X_A)}{TSS - SSR(X_A)} = \frac{14964.82}{34259.74 - 8869.33} = \frac{14964.82}{25390.41} = 0.589$

Q.C. 18. P.18.a. $DW = 1,96$, Accept H_0 P.18.b. $SSR(X_3, X_4, X_5|X_1, X_2) = 0.178$

P.18.c. $F_{6,27} = \frac{0.178/3}{2.860/(27-6)} = \frac{21}{3} \left(\frac{.178}{2.860} \right) = 0.436$ $F_{.05} = 3.072$

Q.C. 19 TRUE Q.C. 20. TRUE