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1.

1.1) Yes because the cigarette consumption (C_i) decreases by -1.34 when the real price per pack (P_i) increases for \$1. Also, C_i increases by 0.17 when real disposible income per capita increases for \$1.

1.2) price elasticity = -1.34

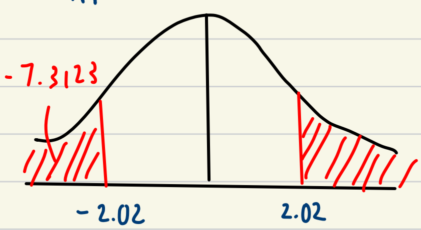
H_0 : $\beta_2 = 1$

H_a : $\beta_2 \neq 1$

$$t_{cal} = \frac{-1.34-1}{0.32} = -7.3123 \sim t_{46-3}$$

t_{lower} = -2.02 Note : $\alpha = 0.05$

t_{upper} = 2.02 d.f. = 43



∴ we can reject H_0, with 95% of confidence interval, it is statistically significant. ✱

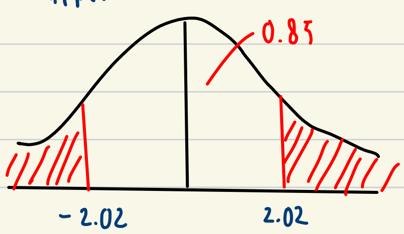
1.3) H_0 : $\beta_3 = 0$

H_a : $\beta_3 \neq 0$

$$t_{cal} = \frac{0.17-0}{0.2} = 0.85 \sim t_{46-3}$$

t_{lower} = -2.02 Note : $\alpha = 0.05$

t_{upper} = 2.02 d.f = 43



∴ we can't reject H_0, with 95% of confidence interval, it is not statistically significant. ✱

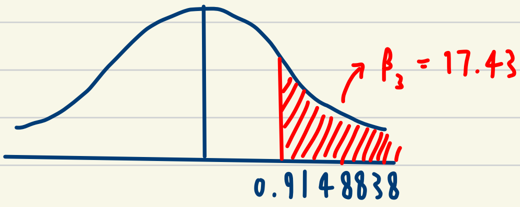
2.

2.1) $H_0 : \beta_3 < 1$
$H_a : \beta_3 \geq 1$

$$t_{cal}(\beta_3) = \frac{\hat{\beta}_3 - \beta_3}{\sigma_{\hat{\beta}_3}} = 17.43 \sim t_{9,272}$$

$\alpha = 0.005$

$t_{upper} = 0.9148838$



- β_3 is significant
- reject H_0
- β_3 is ≥ 1.

2.2) $nettfa_i = \beta_1 + \beta_2 inc_i + \beta_3 age_i + u_i$ (restricted)
$nettfa_i = \beta_1 + \beta_2 inc_i + \beta_3 age_i + \beta_4 age_i^2 + u_i$ (unrestricted)
$H_0 : \beta_4 = 0$: shouldn't add
$H_a : \beta_4 \neq 0$: should add
Note: $\alpha = 0.05$, $m = k - r = 4 - 3 = 1$

$$F_{cal} = \frac{RSS_R - RSS_{UR} / m}{RSS_{UR} / n-k}$$

$$= \frac{(315280770.7 - 31376372.3) / 1}{31376372.3 / 9275-4}$$

$$= 45.03024$$

critical value

$F_{0.05,(1,9271)} = 3.84$

$\therefore$ we reject H_0 since we cannot make sure that, 95% of the time, $\beta_4 = 0$. Thus, we have enough evidence to say that we should add age^2 to the model.

3.

3.1) $\hat{\beta}_1 = 11.05$

$\hat{\beta}_2 = -0.95$

$\hat{\beta}_3 = -0.13$

$\hat{\beta}_4 = 0.25$

$\hat{\beta}_5 = 0.05$

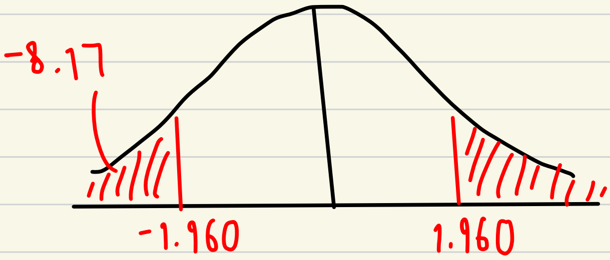
3.2) $\ln(NOX_i)$

$H_0 : \beta_2 = 0$

$H_a : \beta_2 \neq 0$

$$t_{cal}(\beta_2) = \frac{0.4535 - 0}{0.1167} = -8.17$$

Note : $\alpha = 0.05$



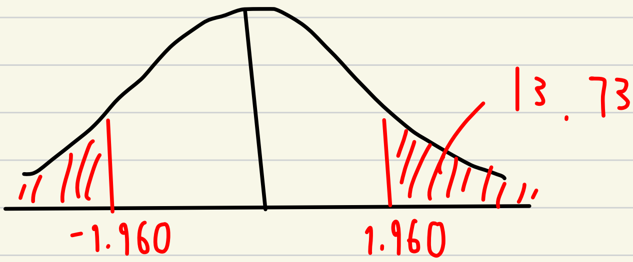
$\therefore$ β_2 is significant #

$Room_i$

$H_0 : \beta_5 = 0$

$H_a : \beta_5 \neq 0$

$$t_{cal}(\beta_5) = \frac{0.2545 - 0}{0.01853} = 13.73$$



$\therefore$ β_4 is significant. #

3.3) $ESS = TSS - RSS = 84.58 - 35.18 = 49.4$

$R^2 = \frac{ESS}{TSS} = \frac{84.58}{49.40} = 1.71$

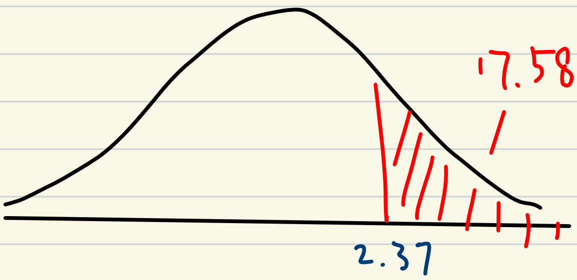
adjust R^2:

$\frac{1 - RSS / n \cdot k}{TSS / n \cdot 1} = \frac{-0.07}{0.17} = -0.4$

$H_0 : \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ Note. $\alpha = 0.05$

H_a : not all coefficients are equal to 0.

$F_{cal} = \frac{ESS / k-1}{RSS / n-k} = \frac{49.40 / 4}{35.18 / 5} = 175.84$



∴ we can reject H_0, with 95% of the time, at least one coefficient is not equal to 0.*

4 4.1) model 1 . $\ln \hat{Y}_t = 18.27 + 0.536 \ln_{Lt} + 0.024 \ln K_t$

$\varepsilon^y_x = \frac{\% \Delta y}{\% \Delta x}$

$\hat{\beta}_1 = 18.27$

$\hat{\beta}_2 = 0.54$

$\hat{\beta}_3 = 0.10$

4.2) model 1 : $\ln Y_t = \beta_1 + \beta_2 \ln L_t + \beta_3 \ln K_t + V_t$ (unrestricted)

model 2 : $\ln Y_t = \beta_1 + \beta_2 \ln (\frac{K}{L}) + V_t$ (restricted)

H_0 $\beta_2 + \beta_3 = 1$ Note : $\alpha = 0.05$

H_a : $\beta_2 + \beta_3 \neq 1$

$F = \frac{(R^2_{uR} - R^2_R) / m}{(1 - R^2_{uR}) / (n - K_{uR})} = \frac{(0.9389 - 0.8087) / 1}{(1 - 0.9389) / 27} = 57.535$

critical value :

$f_{0.05, 1.26} = 4.23$

∴ we can reject H_0

4.3) we can't compare the R^2 value between the two regression model.