1\. 1.1. According to law of demand, if the place of product is increased, the demand will fall accordingly. As a result, the model follows the law of demand because the price has negative effect to the consumption : $\ln C_i = 4.30 - 1.34 \ln P_i + 0.17 \ln Y_i$

1.2. So, we have to test β_2 which in the model $\ln C_i = 4.30 - \underbrace{1.34}_{\beta_2} \ln P_i + 0.17 \ln Y_i$

Test statistically significant

$H_0 : \beta_2 = 0$ $\quad t_{cal}(\beta_2) = \frac{\hat\beta_2 - \beta_2}{6\hat\beta_2}$

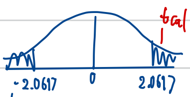
$H_a : \beta_2 \neq 0$ $\quad = \frac{-1.34 - 0}{0.32}$

$= 4.1875$

supposed that we plot $\alpha = 0.05$

$t_{lower} = -2.0617$

$t_{upper} = 2.0617$



so, we can reject H_0. we can make sure that 95 % of the times β_2 will not equal to 0

$H_0 : \beta_2 = 1$

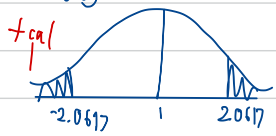
$H_a : \beta_2 \neq 1$

$t_{cal}(\beta_2) = \frac{\hat\beta_2 - \beta_2}{6\hat\beta_2} = \frac{-1.34 - 1}{0.32} = -7.3125 \sim t_{n-3}$

Supposed that we plot $\alpha = 0.05$

$t_{lower} = -2.0617$

$t_{upper} = 2.0617$



So, we can reject H_0. We can make sure that 95% of the times β_2 will not equal to 1

1.3 We tested β_3 which in this model $\beta_3 = 0.17$

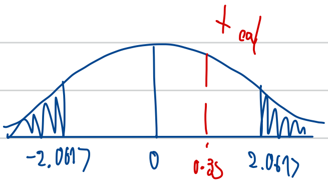
$H_0 : \beta_3 = 0$ $\quad t_{cal}(\beta_3) = \frac{\hat\beta_3 - \beta_3}{6\hat\beta_3} = \frac{0.17 - 0}{0.20} = 0.85$

$H_a : \beta_3 \neq 0$

Supposed that we plot $\alpha = 0.05$

$t_{lower} = -2.0617$

$t_{upper} = 2.0617$



So, we can reject H_0. we can make sure that 95 % of the times β_2 will equal to 0 which means it is not statistically significant.

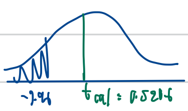
2 2.1 $H_0 : \beta_3 \geq 1$

$H_a : \beta_3 < 1$

t-test d.f. = 9275 - 3 = 9272

$t_{cal} = \frac{\hat\beta_3 - \beta_3}{6\hat\beta_3} = \frac{1.030777 - 1}{0.0591226} = 0.5206 \sim t_{9272}$

$\alpha = 0.05$; $t_{0.05, 9272} = -1.96$



∴ We cannot reject H_0.
Therefore, we can say for H. that β_3 is less than for 95 %.

2.2 f-test

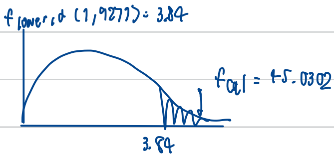
$H_0 : \beta_4 = 0$ [Aqesa has contribution to the model]

$H_a : \beta_4 \neq 0$

$f_{cal} = \frac{RSS_{new} - RSS_{old} / (\#\text{ of new regressors})}{RSS_{new} / (n - k_{new})} = \frac{31528770.7 - 31371372.3 / 1}{31371372.3 / (9275 - 4)} = 45. \ldots$

$\alpha = 0.05$

$f_{lower, 0.05}(1, 9271) = 3.84$



Therefore, we can reject H_0 because $f_{cal} > 3.84$. The additional of aqesa does increase ESS and hence R^2 value at 95 % confident. So, the estimator is significant and give more detail to the model.

3

3.1 $\hat{\beta}_1$ is 11.05 ; if $\ln(NOX_i) = 0$, $\ln(DIST_i) = 0$, and $STRAT_i = 0$, on average, the median house price $= e^{11.05}$ $= 64,860.88349$ dollars. $\hat{\beta}_2$ is -0.9535, so if level of nitrous oxide in the air of community increase 1 unit, median house price decrease by 0.9535 units on average, keeping other variables constant. $\hat{\beta}_3$ is -0.1393, so if the weighted distance of community increase 1 unit, median house price decrease by 0.1393 units on average keeping other variables constant $\hat{\beta}_4$ is 0.2845, so if average number of rooms per house increase 1 unit, median house price increase by 0.2845 unit on average, keeping other variable constant. $\hat{\beta}_5 = 0.0525$, so if average student teacher ratio of schools in community increase by 1 unit, median house price decrease by 0.0525 units on average, keeping other variable constant.

3.2 $\ln(NOX_i)$

$H_0 : \beta_2 = 0$

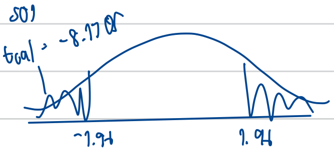
$H_a : \beta_2 \neq 0$

$t_{cal} = \frac{-0.9535 - 0}{0.1067} = -8.9705 \sim t_{506-5}$

$\alpha = 0.05$, d.f. $= 501$

$t_{upper} = 1.96$

$t_{lower} = -1.96$



$\therefore$ we can reject H_0 and say that β_2 is not zero with 95 % confident and β_2 is significant

$ROOM_i$

$H_0 : \beta_5 = 0$

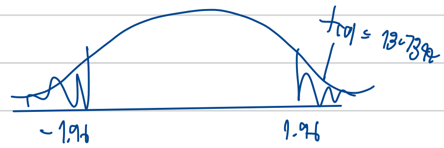
$H_a : \beta_5 \neq 0$

$t_{cal} = \frac{0.2845 - 0}{0.06853} = 13.7344 \sim t_{506-5}$

let $\alpha = 0.05$, d.f $= 501$

$t_{upper} = 1.96$

$t_{lower} = -1.96$



$\therefore$ we can reject H_0 and say that β_5 is not zero with 95 % confident and β_5 is significant