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1. 1.1) Assume we insert 1 and 2 to compare the result

$4.36 - 1.34 \ln(1) + 0.17 \ln(2) = 4.1873$ ∴ Estimation results follow law of demand since an increase

$4.30 - 1.34 \ln(2) + 0.1127 = 3.4837$ in P causes consumption to reduce.

1.2) $- \dfrac{\partial \ln C}{\partial \ln P} = -1.34 \dfrac{\partial \ln P}{\partial \ln P} \Rightarrow \dfrac{\partial C}{\partial P} \cdot \dfrac{P}{C} = |-1.34| = 1.34 \rightarrow \varepsilon_p^c$

–

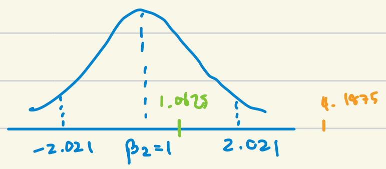
– Test

1) $H_0 : \varepsilon_p^c = 0$
$H_a : \varepsilon_p^c \neq 0$

2) $t_{cal_1} = \dfrac{1.34 - 0}{0.32} = 4.1875 \sim t_{43}$

3) $t_{\frac{\alpha}{2}} = 2.021$ $t_{-\frac{2}{2}} = -2.201$

4)



Conclude → We reject null hypothesis so β_2 is statistically different from 0

– Test

1) $H_0 : \varepsilon_p^c = 1$
$H_a : \varepsilon_p^c \neq 1$

2) $t_{cal_2} = \dfrac{1.34 - 1}{0.32} = 1.0625 \sim t_{43}$

3) $t_{\frac{\alpha}{2}} = 2.021$ $t_{-\frac{\alpha}{2}} = -2.021$

4) We fail to reject null hypothesis so β_2 is not statistically different from 1

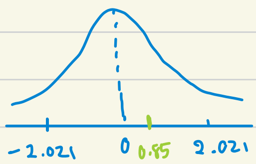
1.3) Test

1) $H_0 : \varepsilon_y^c = 0$
$H_a : \varepsilon_y^c \neq 0$

3) $t_{\frac{\alpha}{2}} = 2.021$ $t_{-\frac{\alpha}{2}} = -2.021$

2) $t_{cal} = \dfrac{0.17 - 0}{0.2} = 0.85$

4)



∴ We fail to reject null hypothesis. ε_y^c or β_3 is not statistically significant because sampling process might not be efficient and might be because it is real disposable income so the constraint is that real price and real income might be correlated.

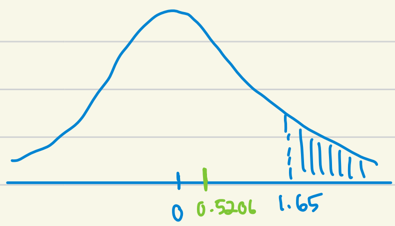
2. 2.1) Test

1) $H_0 : \beta < 1$
$H_0 : \beta \nless 1$

2) $t_{cal} = \dfrac{1.03077 - 1}{0.0591} = 0.5206 \sim t_{9272}$

3) $t_{0.05, 9272} = 1.65$

4)



β_3 is less than 1 as t_{cal} falls in region of acceptance.

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2.2) T-Test

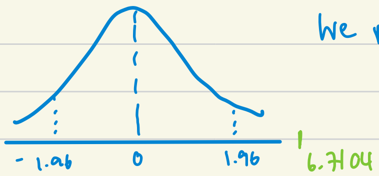
1) $H_0 : \beta_4 = 0$

$H_a : \beta_4 \neq 0$

2) $t_{cal} : \dfrac{0.0377221 - 0}{0.0056214} = 6.7104$

3) $t_{\frac{0.05}{2}, 9271} = 1.96$ $\quad t_{\frac{\alpha}{2}} = -1.96$

4)



We reject null hypothesis

F-test

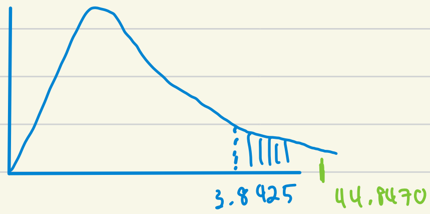
1) H_0 : β_4 has a contribution to model

H_a : otherwise

2) $F_{cal} = \dfrac{(0.1731 - 0.1691)/1}{1 - 0.1731/9271} = 44.8470$

3) $F(1, 9271) = 3.8425$

4) Since Fcal falls in critical region we conclude that β_4 has no contribution to model.



If we square age, It becomes a quadratic equation which instead of making the curve a straight line It makes the curve U shape instead and squared age does not help explaining more about the model meaning It does not help increasing ESS.

3)

3.1)
- 11.08 = constant value
- $-0.9535 \ln(Nox)$ = Nox increases by 1%, P decreases by 0.9535 %.
- $-0.1343 \ln(DIST_i)$ = DIST increases by 1%, P decreases by 0.1343 %.
- -0.2545 ROOMi = ROOM increases by 1 unit, P increases by 0.2545 %.
- -0.05245 STRAT : STRAT increases by 1 unit, P decreases by 0.05245 %.

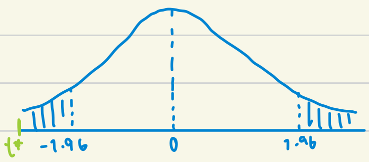
3.2) Test the slope coefficient for ln (Nox)

1) $H_0 : \beta_2 = 0$
$H_a : \beta_2 \neq 0$

2) $t_{cal} = \dfrac{-0.9535 - 0}{0.1167} = -8.171 \sim t_{506-5} \sim t_{501}$

3) $t_{\frac{0.05}{2}} = 1.9647 \quad t_{-\frac{0.05}{2}} = -1.9647$

4)



∴ We reject null hypothesis so slope coefficient of ln (Nox) is statistically significant from 0

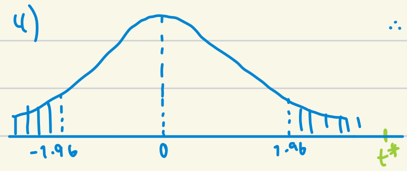
Test the slope coefficient for Room;

1) $H_0 : \beta_5 = 0$
$H_a : \beta_5 \neq 0$

2) $t_{cal} = \dfrac{0.2545 - 0}{0.01853} = 13.73 \sim t_{501}$

3) $t_{\frac{0.05}{2}} = 1.9647 \quad t_{-\frac{0.05}{2}} = -1.9647$

4)



∴ We reject null hypothesis so slope coefficient of Roomi is statistically significant from 0

3.3) $R^2 = 1 - \dfrac{RSS}{TSS} = 1 - \dfrac{35.1835}{84.5822} = 0.5840$

Adjusted $R^2 / \bar{R}^2 = 1 - (1 - R^2)\dfrac{n-1}{n-k} = 1 - \left[(1 - 0.5840)\dfrac{505}{501}\right] \Rightarrow 0.5807$

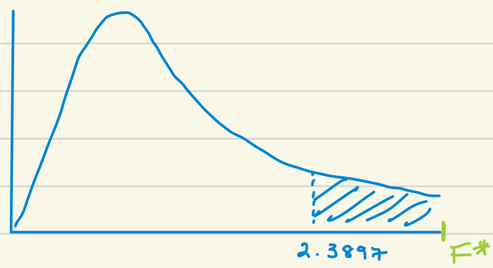
Test joint significance of all the slope

1) $H_0 : \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$
H_a : Not all slope coefficients are simultaneously zero

2) $F_{cal} = \dfrac{ESS/(k-1)}{RSS/(n-k)} = \dfrac{(49.3987)/4}{35.1835/501} = 175.8$

3) $F_{0.05}(4, 501) = 2.3897$

4)



∴ - Fcal > F table (3, 501)
- Reject null hypothesis and that not all slope are simultaneously zero

3.4) $H_0 : \beta_2 = \beta_3 \;/\; \beta \ln(Nox) - \beta \ln(DIST) = 0$
$H_a : \beta_2 \neq \beta_3$

Unrestricted model = $\ln(P_i) = 11.08 - 0.9535 \ln(Nox) - 0.1343 \ln(DIST) + 0.2545$ Room $- 0.05245$ STRAT

Restricted model = $\ln(P_i) = 11.08 - 0.1343 \ln(Nox \cdot DIST) + 0.2545$ Roomi $- 0.0525$ STRAT

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1) H_0 : $\beta_2 = \beta_3$ / $\beta_2 - \beta_3 = 0$ or the restriction is valid

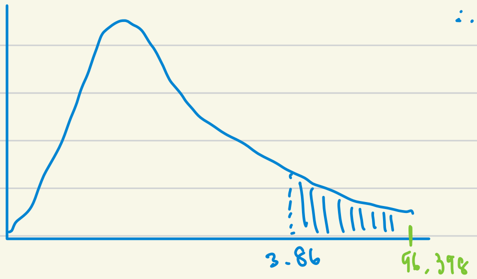
H_a : $\beta_2 \neq \beta_3$ or the restriction is not valid

2) $F_{cal} = \frac{RSS_R - RSS_{UR} / m}{RSS_{UR} / (n - k_{UR})} = \frac{41.9532 - 35.1835 / 1}{35.1835 / (506 - 5)} = 96.398$

3) $\alpha = 0.05$

$F(1, 501) = 3.8600$

4)



$\therefore$ $F_{cal} > F_{table}$

We reject null hypothesis → The restriction imposed is not valid meaning β_2 is not equal to β_3

4. 4.1) Model 1 : $0.536 \ln L$ → L increases by 1%, y increases by 0.536%.

$0.024 \ln k$ → K increases by 1%, y increases by 0.024%.

Model 2 : $1.12 \ln \left(\frac{K}{L}\right)_t$ → capital per labor increases by 1%, output per labour increases by 1.12%.

4.2) Test

1) H_0 : $\beta_K + \beta_L = 1$

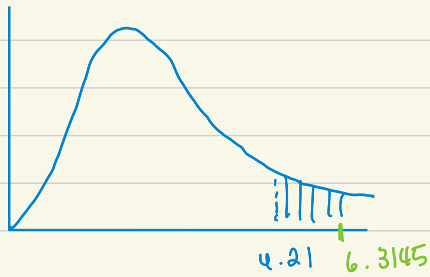
H_a : $\beta_K + \beta_L \neq 1$

2) $F_{cal} = \frac{RSS_R - RSS_{UR} / m}{RSS_{UR} (n - k_{UR})}$

$= \frac{0.0153 - 0.0124 / 1}{0.0124 (30 - 3)} = 6.3145$

3) F table $= 0.05 (1, 27) = 4.21$

4)



$\therefore$ We reject H_0 therefore the production function is not constant return to scale.

4.3) We cannot compare R^2 because left side of the two models are not equal.