6304641662_Film

1.a) $narr86_i = \beta_1 + \beta_2 pcnv_i + \beta_3 avgsen_i + \beta_4 tottime_i + \beta_5 ptime86_i + \beta_6 qemp86_i + u_i$

$narr86_i = 0.7061 - 0.1512\, pcnv_i - 0.0070\, avgsen_i + 0.0121\, tottime_i - 0.0393\, ptime86_i - 0.1031\, qemp86_i$

step1 $H_0 : \beta_3 = 0$ - Null Hypothesis
$H_A : \beta_3 \neq 0$ - Alternative hypothesis

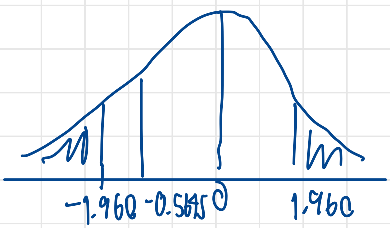
step2 $\alpha = 0.05$

step3 β_3 $t_{cal} = \dfrac{\hat{\beta}_3 - \beta_3}{se_3}$

$t_{cal} = \dfrac{-0.0070}{0.0124} = -0.5645$

step4 $t_{lower} = -1.960$

$t_{upper} = 1.960$



step5 At confidental 95 percent, the average sentance served from prior conviction (in months) is not equal to zero.

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1.b) Model (1.1)

step1 $H_0 : \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$

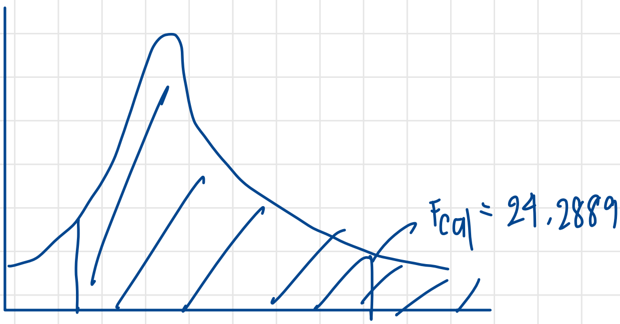
H_A : Otherwise

step2 $F_{cal} = \frac{ESS/df}{RSS/df} = \frac{ESS/(k-1)}{RSS/(n-k)} = \frac{85.9532/(6-1)}{1924.3939/(2,725-6)} = 24.2889$

step3 $\alpha = 0.01$

$F_{upper,\alpha}(5, 2719) = 3.02$

step4



$F_{cri} = F_{0.01}(5, 2719) = 3.02$

$\therefore$ We can make sure that $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are not simultaneously equal to zero, 99 times out of 100.

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1.b) Model (1.2)

step1 $H_0: \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$

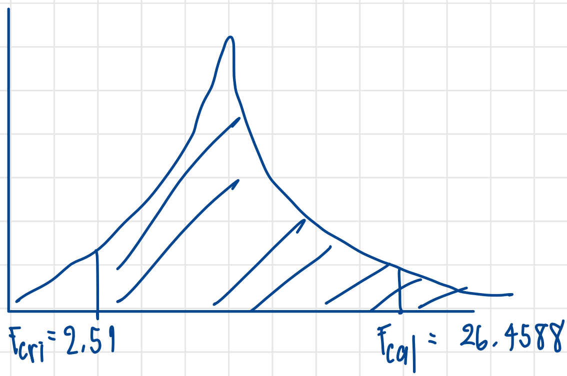
H_A = otherwise

step2 $F_{cal} = \dfrac{R^2/(k-1)}{1-R^2/(n-k)} = \dfrac{0.0723/(9-1)}{1-0.0723/(2,725-9)} = 26.4588$

step3 $\alpha = 0.01$

$F_{upper,\alpha}(8, 2716) = 2.51$

step4



∴ We can make sure that $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ and β_9 are not simultaneously equal to zero, 99 times out of 100.

63046416_Film

1.C) Step1 H_0 : ethnic background and legal income has no marginal contribution to the model.
H_a : otherwise

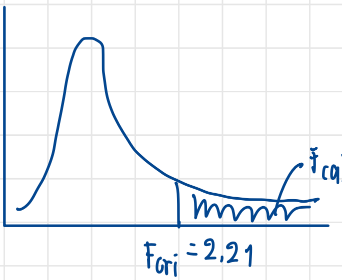
step2 $F_{cal} = \dfrac{ESS_{new} - ESS_{old} / (\text{number of new regressors})}{RSS_{new} / (n - k_{new})}$

$F_{cal} = \dfrac{145.3901 - 85.9532 / 3}{1864.9571 / (2725 - 9)} = 28.8533$

step3 $\alpha = 0.05$

$F_{upper, \alpha}(5, 2716) = 2.21$

step4



∴ We can make sure that ethnic background and legal income has marginal contribution to the model, 95 times out of 100.

2.9 Assume $\alpha = 0.05$

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<u>Step1</u> $H_0 : \beta_1 = 0$

$H_A : \beta_1 \neq 0$

<u>Step2</u>

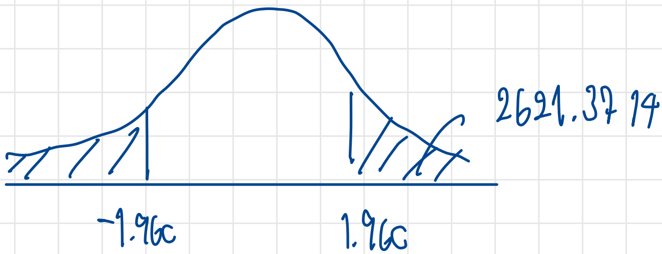
$$t_{cal}(\beta_1) = \frac{\hat{\beta}_1 - \beta_1}{se\,\beta_1}$$

$$t_{cal}(\beta_1) = \frac{9.1748 - 0}{0.0035} = 2621.3714$$

<u>step3</u> $t_{upper} = 1.960$ $n = 97{,}873$

$n-k = 97{,}870$ $\alpha = 0.05$

$t_{lower} = -1.960$



<u>step4</u> From 95 of 100 times, β_1 is reject H_0 or β_1 is not equal to 0.

(2.9) Film_ 6304641662

Step1 $H_0: \beta_2 = 0$

$H_A: \beta_2 \neq 0$

Step2

$$t_{cal}(\beta_2) = \frac{\hat{\beta}_2 - \beta_2}{se\,\beta_2}$$

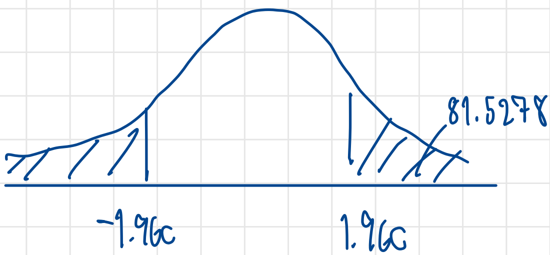
$$t_{cal}(\beta_2) = \frac{0.587 - 0}{0.0072} = 81.5278$$

step3 $t_{upper} = 1.960$

$n = 97,873$

$n-k = 97,870$ $\alpha = 0.05$

$t_{lower} = -1.960$



step4 From 95 of 100 times, β_2 is reject H_0 or β_2 is not equal to 0.

Film_ 6304641662

2.9

Step1 $H_0 : \beta_3 = 0$

$H_A : \beta_3 \neq 0$

Step2

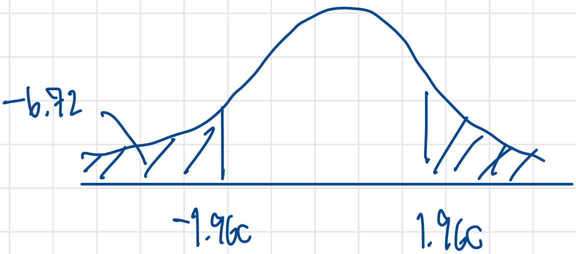
$$t_{cal}(\beta_3) = \frac{\hat{\beta}_3 - \beta_3}{se\beta_3}$$

$$t_{cal}(\beta_3) = \frac{-0.0336 - 0}{0.005} = -6.72$$

step3 $t_{upper} = 1.960$ $n = 97,873$

$n-k = 97,870$ $\alpha = 0.05$

$t_{lower} = -1.960$



step4 From 95 of 100 times, β_3 is reject H_0 or β_3 is not equal to 0.

Film_ 6304641662

2.9 Step1 $H_0: \beta_4 = 0$

$H_A: \beta_4 \neq 0$

Step2

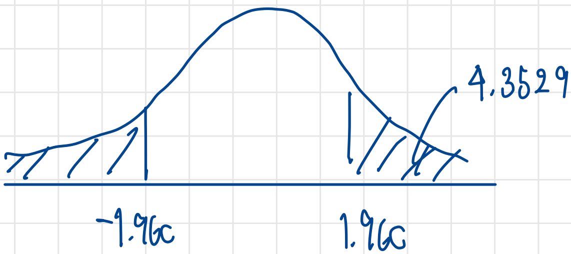
$$t_{cal}(\beta_4) = \frac{\hat{\beta}_4 - \beta_4}{se\,\beta_4}$$

$$t_{cal}(\beta_4) = \frac{0.0444 - 0}{0.0102} = 4.3529$$

step3 $t_{upper} = 1.960$ $n = 97,873$

$n-k = 97,870$ $\alpha = 0.05$

$t_{lower} = -1.960$



step4 From 95 of 100 times, β_4 is reject H_0 or β_4 is not equal to 0.

All in all, at level significant = 0.05, $\beta_1, \beta_2, \beta_3, \beta_4 \neq 0$

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2.b $\ln wage_i = 9.1748 + 0.587\ civil_i - 0.0336\ year_i + 0.0444\ civil_i \cdot year_i + u_i$

$$wage_i = e^{9.1748 + 0.587\ civil_i - 0.0336\ year_i + 0.0444\ civil_i \cdot year_i + u_i}$$

percentage of civil servant stage and state emplyee wage without pendemic $= (e^{\hat{\beta}_2} - 1) \times 100$

$$= (e^{0.587} - 1) \times 100$$

$$= 79.8585\ \%$$

It can be said that civil servant stage and state emplyee gain wage more than athers by 79.8585%.

2.c percentage of wage due to pandemic $= (e^{\hat{\beta}_3} - 1) \times 100$

$$= (e^{-0.0336} - 1) \times 100$$

$$= -3,3042\ \%$$

It can be seen that in 2020 with pendemic year overall wage drap by 3.3042%.

2.d

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$$\widehat{\ln wage_i} = \beta_1 + \beta_2 civil_i + \beta_3 year + \beta_4 civil_i \cdot year_i + u_i$$

$$\widehat{wage_i} = e^{\beta_1 + \beta_2 civil_i + \beta_3 year + \beta_4 civil_i \cdot year_i + u_i}$$

$$\widehat{\ln wage_i} = 9.1748 + 0.587\ civil_i - 0.0336\ year_i + 0.0444\ civil_i \cdot year_i + u_i$$

$$\widehat{wage_i} = e^{9.1748 + 0.587\ civil_i - 0.0336\ year_i + 0.0444\ civil_i \cdot year_i + u_i}$$

$$E[\widehat{wage_i} \mid civil_i = 0,\ year = 1,\ civil \cdot year = 0] = e^{9.1748 - 0.0336} = 9{,}331.9568$$

$$E[\widehat{wage_i} \mid civil_i = 0,\ year = 0,\ civil \cdot year = 0] = e^{9.1748} = 9{,}650.8377$$

$$E[\widehat{wage_i} \mid civil_i = 1,\ year = 1,\ civil \cdot year = 1] = e^{9.1748 + 0.587 - 0.0336 + 0.0444} = 17{,}546.3284$$

$$E[\widehat{wage_i} \mid civil_i = 1,\ year = 0,\ civil \cdot year = 0] = e^{9.1748 + 0.587} = 17{,}357.8477$$

It can be concluded that the civil servant (control group) is better-off during 2020 by 188.480702 or 1.0859 % of their wage. while the others are worse-off by 318.8809 or − 3.3042 of the wage.

This makes economic sense because civil servants' wage is fixed and did not decrease during pandemic but the others group had an effect from pandemic because of government policy such as lock-down, social distancing, and time limitation to sell.

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(3.9) In Klein's rule of thumb suggests that multicollinearity is troublesome if the R_i^2 is greater than R^2 from another model that we regress Y on there X_i and other X.
Moreover, VIF should not exceed 10, while TOL should be closer to 1 rather than 0.

$\alpha = 0.05$

Step1 $H_0 : \beta_1 = 0$

$H_A : \beta_1 \neq 0$

Step2

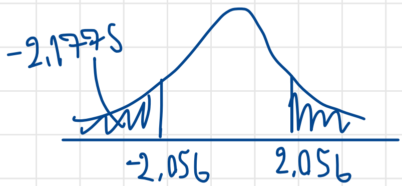
$$t_{cal}(\beta_1) = \frac{\hat{\beta}_1 - \beta_1}{se\beta_1} = \frac{-34.1349 - 0}{15.6763} = -2.1775$$

Step3

$\alpha = 0.05$ $t_{upper} = 2.056$

df $n-k = 30-4 = 26$ $t_{lower} = -2.056$

Step4



From 95 out of 100 times, β_1 is reject H_0 or not equal to 0.

(3.9) Step1 $H_0 : \beta_2 = 0$ Film_ 6304641662

$H_A : \beta_2 \neq 0$

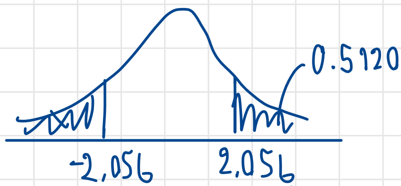
Step2

$$t_{cal}(\beta_2) = \frac{\hat{\beta}_2 - \beta_2}{se\beta_2} = \frac{1.5386 - 0}{3.005} = 0.5120$$

step3 $\alpha = 0.05$ $t_{upper} = 2.056$

df $n-k = 30-4 = 26$ $t_{lower} = -2.056$

Step4



From 95 out of 100 times, β_2 is reject H_0 or not equal to 0.

Step1 $H_0 : \beta_3 = 0$

$H_A : \beta_3 \neq 0$

Step2

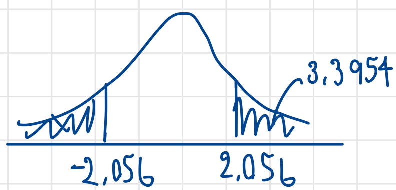
$$t_{cal}(\beta_3) = \frac{\hat{\beta}_3 - \beta_3}{se\beta_3} = \frac{3.9152 - 0}{1.1531} = 3.3954$$

step3

$\alpha = 0.05$ $t_{upper} = 2.056$

df $n-k = 30-4 = 26$ $t_{lower} = -2.056$

Step4



From 95 out of 100 times, β_3 is reject H_0 or not equal to 0.

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3.a Step1 $H_0: \beta_4 = 0$

$H_A: \beta_4 \neq 0$

Step2

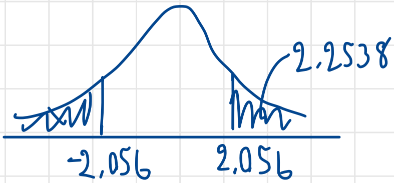
$$t_{cal}(\beta_4) = \frac{\hat{\beta}_4 - \beta_4}{se\,\beta_4} = \frac{18.8023 - 0}{8.3426} = 2.2538$$

step3

$\alpha = 0.05$ $\qquad$ $t_{upper} = 2.056$

df $n-k = 30-4 = 26$ $\qquad$ $t_{lower} = -2.056$

Step4



From 95 out of 100 times, β_4 is reject H_0 or not equal to 0.

All in all It is clear that there are no multicollinearity in this modle because $R^2 = 0.6552$ and all of the paremeters are different from zero.

3.b BLUE (Best Linear Unbiased Estimator) is the estimators that show the best variance or the lowest variance as possible. They are unbiased because when there are more samples, probability limit of the estimators tend toward true parameters. BLUE cannot use in multicollinearity. In multicollinearity causes misleading conclusion of hypothesis test.

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(4.a) $Inf_t = \beta_1 + \beta_2 \, unem_t + u_t$

$Inf_t = 1.0108 + 0.5055 \, unem_t + u_t$

β_1 is the intercept which equal to 1.0108. It implies that when Unemployment rate is 0, the inflation rate is 1.0108 % on average

β_2 is the slope which is 0.5055. It means when unemployment increase by 1%, the inflation rate will increase by 0.5055 % on average.

(4.b) White's test

step1 : $H_0 =$ (Homoskedasticity)
$H_A =$ (Unrestricted heterasokedasticty)

step2 $\hat{R}^2_{\hat{u}^2_3} = 0.0633$

step3 $LM_{cal} = n \cdot R^2_{\hat{u}^2_1} = 59 \times 0.0633 = 3.7347$

The critical value $(\chi^2_{k-1}) = \chi^2_1 \quad \alpha = 0.05 = 3.841426$

step4 We reject the null hypothesis $LM_{cal} > \chi^2_{k-1}$.
at significant level = 0.05, heteroscedasticity is present on this model.

(4.c) The OLS estimators still ratain than BLUE because from (4.b) this modle is heterosocedasticity. Therefore, BLUE property is not violated