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a.) log(salary) = 4.58101 + 0.2571997 log(sales)

Positive of log(sale) [β_1], mean that when β_1 increase by 1% log(salary) will increase by 0.2571997%.

b.) $H_0 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$, H_1 = Not all slope coefficient, are simultaneously zero

$$F_{cal} = \frac{\frac{ESS}{K-1}}{\frac{RSS}{n-K}} = \frac{MS(E)}{MS(R)} = \frac{4.76219897}{0.211385068} = 22.52854904$$ at $\alpha = 0.05$ $F_{upper}(5,203) = 2.21$

$F_{cal} > F_{cri}(5,203)$ we can reject H_0 and we can make sure that $\beta_2, \beta_3, \beta_4$ and $\beta_5 \neq 0$

$\alpha = 0.05$, d.f = 203, $t_{cri}(Lower) = -1.96$, $t_{cri}(upper) = 1.96$

sales (8.03) → Reject Ho, significant
roe (2.59) → Reject Ho, significant
finance (1.77) → Accept Ho, not significant
consprod (2.13) → Reject Ho, significant
utility (-2.85) → Reject Ho, significant
cons (15.55) → Reject Ho, significant

c.) Utility → log(salary) : $\beta_n = 1$ $= \beta_0 + \beta_3$ finance $+ \beta_4$ consprod $+ \beta_5$ utility
$= 4.588101 + 0.1579564 + 0.1908917 + 0.2830015 = 4.643948$

Transport sector → log(salary) : $\beta_n = 0$ = 4.588101

$$\Delta\% = \frac{4.588101 - 4.64395}{4.64395} \times 100 = -1.203\%$$

D.) A case of perfect collinearity will occurs, Because each variable will have exact linear relationship
In stata, it will automatically reject or omit one dummy variable. Because it cannot be estimated

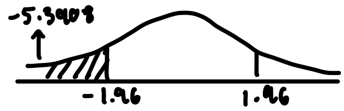
e.) E(log(salary | finance = 1) = $(\beta_0 + \beta_3) + \beta_1$ log(sales) + $(\beta_2 + \beta_6)(ROE_i) + \beta_4$ consprod$_i$ + β_5 utility + β_7(ROE*consprod) + β_8(ROE*utility) + u_i

E(log(salary | consprod = 1) = $(\beta_0 + \beta_4) + \beta_1$ log(sales) + $(\beta_2 + \beta_7)(ROE_i) + \beta_3$ consprod$_i$ + β_5 utility + β_6(ROE*consprod) + β_8(ROE*utility) + u_i

E(log(salary | utility = 1) = $(\beta_0 + \beta_5) + \beta_1$ log(sales) + $(\beta_2 + \beta_8)(ROE_i) + \beta_3$ consprod$_i$ + β_4 utility + β_6(ROE*consprod) + β_7(ROE*utility) + u_i

A.) $\alpha = 0.05$ $H_0: \beta_1 = 0$, $H_1: \beta_1 \neq 0$

T-test $t_{cal} = \frac{\hat{\beta}_1 - \beta_1}{se\,\hat{\beta}_1} = \frac{-0.5876995}{0.1090181} = -5.3908$ $d.f = n-3 = 1188$ $t_{lower} = -1.96$ $t_{upper} = 1.96$



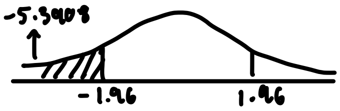
reject H_0. We can make sure that $\beta_1 \neq 0$, smoking impact on birth weight

B.) $\hat{\beta}_2 \pm t_{\frac{\alpha}{2}, n-3} \cdot \sigma(\hat{\beta}_2)$, $t_{\frac{0.01}{2}, 1188} = 2.576$ $= 0.624694 \pm 2.576\,(0.324438)$ lower $= -0.2111$ upper $= 1.4604$

Coffidence interval for $\hat{\beta}_2$ is $Pr(-0.211 < \hat{\beta}_2 < 1.4604) = 0.99$, 99 out of 100 cases this interval will contain true $\hat{\beta}_2$

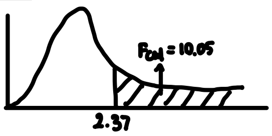
C.) $\alpha = 0.05$ $H_0: \beta_1 = 0$ $H_1: \beta_1 \neq 0$

T-test $t_{cal} = \frac{\hat{\beta}_1 - \beta_1}{se\,\hat{\beta}_1} = \frac{-0.5894954}{0.1106172} = -5.329$ $d.f = n-5 = 1186$ $t_{lower} = -1.96$, $t_{upper} = 1.96$



reject H_0. We can make sure that $\beta_1 \neq 0$, smoking impact on birth weight

D.) **F-test** $H_0: \beta_2 = \beta_3 = \beta_4 = 0$; $\alpha = 0.05$ H_1: not all slope coefficient are $= 0$ stata $F_{cal\,(4,1186)} = 10.05$ $F_{cri(4,1186)} = 2.37$ $F_{cal} > F_{cri(4,1186)}$



reject H_0. We can make sure that β_2, β_3 and $\beta_4 \neq 0$

T-test $\alpha = 0.05$, $t_{lower} = -1.96$ $t_{upper} = 1.96$

$H_0: \beta_0 = 0$
$H_1: \beta_0 \neq 0$ $t_{cal} = \frac{\hat{\beta}_0 - \beta_0}{se\hat{\beta}_0} = \frac{118.0741}{3.500291} = 33.7326$ Reject H_0, signficant

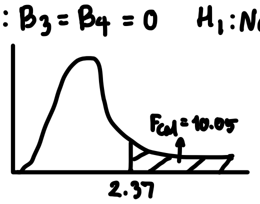
$H_0: \beta_1 = 0$
$H_1: \beta_1 \neq 0$ $t_{cal} = \frac{\hat{\beta}_1 - \beta_1}{se\hat{\beta}_1} = \frac{-0.5894954}{0.1106172} = -5.329$ Reject H_0, signficant

$H_0: \beta_2 = 0$
$H_1: \beta_2 \neq 0$ $t_{cal} = \frac{\hat{\beta}_2 - \beta_2}{se\hat{\beta}_2} = \frac{0.538254}{0.366502} = 1.4686$ Accept H_0, not signficant

$H_0: \beta_3 = 0$
$H_1: \beta_3 \neq 0$ $t_{cal} = \frac{\hat{\beta}_3 - \beta_3}{se\hat{\beta}_3} = \frac{0.4936695}{0.2832896} = 1.7426$ Accept H_0, not signficant

$H_0: \beta_4 = 0$
$H_1: \beta_4 \neq 0$ $t_{cal} = \frac{\hat{\beta}_4 - \beta_4}{se\hat{\beta}_4} = \frac{-0.4379234}{0.3197377} = -1.3696$ Accept H_0, not signficant

E.) $H_0: \beta_3 = \beta_4 = 0$ H_1: Not all slope coefficients $= 0$ $\alpha = 0.05$ $d.f. = 4$, $n = 1186$



$F_{cal} = \frac{MS(E)}{MS(R)} = \frac{3956.91482}{393.69227} = 10.05$ $F_{cri(4,1186)} = 2.37$

$F_{cal} > F_{cri(4,1186)}$ we can reject H_0, both β_3 and β_4 has an impact on birth weight

A.) d.f : ESS = 6 , RSS = 421 , TSS = 427

B.) $R^2 = \frac{ESS}{TSS}$ $\quad 0.1582 = \frac{ESS}{223.327441}$ $\quad ESS = 35.3304012$ $\quad RSS = TSS - ESS = 187.99704$

C.) $\bar{R}^2 = 1 - (1 - R^2)\frac{n-1}{n-k} = \bar{R}^2 = 1 - (1 - 0.1582)\frac{427}{421}$ $\quad \bar{R}^2 = 0.1462$

D.) $$F_{(1,421)} = \frac{\frac{R^2_{3.1} - R^2_{3.2}}{(\text{number of New})}}{\frac{1 - R^2_{3.1}}{(n - k_{3.2})}} = \frac{\frac{0.1582 - R^2_{3.2}}{1}}{\frac{1 - 0.1582}{(428 - 7)}} = 3.89$$

$$R^2_{3.2} = 0.1505$$

E.) No, because in reality age is one of factor that will determines wage and age variable is insignificance in this model because this term may have multicolinearity with other terms. therefore, age variable will be omitted