

Stat3032_homework4

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Answer for 6.1

```
m61n <- lm(lifeExpF ~ 1, data = UN11)
m61a <- lm(lifeExpF ~ group, data = UN11)
anova(m61n, m61a)
```

```
## Analysis of Variance Table
##
## Model 1: lifeExpF ~ 1
## Model 2: lifeExpF ~ group
##   Res.Df    RSS Df Sum of Sq    F    Pr(>F)
## 1     198 20293.2
## 2     196  7730.2   2    12563 159.27 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Answer for 6.3

```
m63n <- lm(lifeExpF ~ group, data = UN11)
m63a <- lm(lifeExpF ~ group + log(ppgdp), data = UN11)
anova(m63n, m63a)
```

```
## Analysis of Variance Table
##
## Model 1: lifeExpF ~ group
## Model 2: lifeExpF ~ group + log(ppgdp)
##   Res.Df    RSS Df Sum of Sq    F    Pr(>F)
## 1     196  7730.2
## 2     195  5090.4   1    2639.8 101.12 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Answer for 6.4

Answer for 6.4.1

NH model means lifeExpF is dependent on $\log(\text{ppgdp})$ and the interaction term of group and $\log(\text{ppgdp})$. in other words, $E(\text{lifeExpF} \mid \log(\text{ppgdp}), \text{group}) = b_0 + b_1 \times \log(\text{ppgdp}) + b_2 \times \log(\text{ppgdp}) \times \text{group}$

Answer for 6.4.2

```
m64n <- lm(lifeExpF ~ log(ppgdp) + group:log(ppgdp), data = UN11)
m64a <- lm(lifeExpF ~ group + log(ppgdp) + group:log(ppgdp), data = UN11)
anova(m64n, m64a)
```

```
## Analysis of Variance Table
##
## Model 1: lifeExpF ~ log(ppgdp) + group:log(ppgdp)
## Model 2: lifeExpF ~ group + log(ppgdp) + group:log(ppgdp)
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1     195 5232.0
## 2     193 5077.7  2     154.31 2.9326 0.05564 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Answer for 6.5

Answer for 6.5.1

```
u651 <- lm(lifeExpF ~ group + log(ppgdp) + group:log(ppgdp), UN11)
summary(u651)$coef
```

	Estimate	Std. Error	t value	Pr(> t)
## (Intercept)	59.2136614	15.220345	3.8904284	0.0001376669
## groupother	-11.1731029	15.594836	-0.7164617	0.4745723433
## groupafrica	-22.9848394	15.783786	-1.4562310	0.1469536042
## log(ppgdp)	2.2425354	1.466444	1.5292337	0.1278438256
## groupother:log(ppgdp)	0.9294372	1.517667	0.6124117	0.5409862449
## groupafrica:log(ppgdp)	1.0949810	1.578460	0.6937019	0.4887032151

Based on the table, the p-value are all greater than 0.05(except the intercept). Therefore, there are no difference between oecd and other level.

Answer for 6.5.2

```
UN11$group1 <- relevel(UN11$group, "other")
u652 <- lm(lifeExpF ~ group + log(ppgdp) + log(ppgdp):group1, data = UN11)
summary(u652)$coef
```

##	Estimate	Std. Error	t value	Pr(> t)
## (Intercept)	59.2136614	15.2203448	3.8904284	1.376669e-04
## groupother	-11.1731029	15.5948356	-0.7164617	4.745723e-01
## groupafrica	-22.9848394	15.7837862	-1.4562310	1.469536e-01
## log(ppgdp)	3.1719725	0.3909682	8.1131211	5.638388e-14
## log(ppgdp):grouploecd	-0.9294372	1.5176672	-0.6124117	5.409862e-01
## log(ppgdp):grouplafrica	0.1655438	0.7028055	0.2355471	8.140339e-01

Based on the table, the p-value are all less than 0.05. Therefore, group other is not equal to group africa.