ECOM20001 Econometrics 1

Tutorial 8 (Week 8 - Thursday)

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Question 5

This slides helps us to develop a transformed regression that allows us to use an individual hypothesis test to represent joint hypothesis test.

The null hypothesis: the sum of the coefficients on alcohol and unmarried equals the coefficient on smoker against the alternative that the equality does not hold.

Question 5

Given the initial regression:

$$\text{Birthweight}_i = \beta_0 + \beta_1 \text{ Smoker}_i + \beta_2 \text{ Alcohol}_i + \beta_3 \text{ Unmarried}_i + X_i + u_i$$

where X_i includes all other non-listed regressor.

We are trying to test:

$$\text{H}_0 : \ \beta_1 = \beta_2 + \beta_3$$
$$\text{H}_1 : \ \beta_1 \neq \beta_2 + \beta_3$$

Question 5

$$\text{Birthweight}_i = \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i$$

Question 5

$$\begin{aligned}\text{Birthweight}_i &= \beta_0 + \beta_1\text{Smoker}_i + \beta_2\text{Alcohol}_i + \beta_3\text{Unmarried}_i + X_i + u_i \\ &= \beta_0 + \beta_1\text{Smoker}_i + \beta_2\text{Alcohol}_i + \beta_3\text{Unmarried}_i + X_i + u_i\end{aligned}$$

Question 5

$$\begin{aligned}
\text{Birthweight}_i &= \beta_0 + \beta_1\text{Smoker}_i + \beta_2\text{Alcohol}_i + \beta_3\text{Unmarried}_i + X_i + u_i \\
&= \beta_0 + \beta_1\text{Smoker}_i + \beta_2\text{Alcohol}_i + \beta_3\text{Unmarried}_i + X_i + u_i \\
&\quad + \beta_2\text{Smoker}_i - \beta_2\text{Smoker}_i + \beta_3\text{Smoker}_i - \beta_3\text{Smoker}_i
\end{aligned}$$

Question 5

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\begin{aligned}
\text{Birthweight}_i &= \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i \\
&= \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i \\
&\quad + \beta_2 \text{Smoker}_i - \beta_2 \text{Smoker}_i + \beta_3 \text{Smoker}_i - \beta_3 \text{Smoker}_i \\
&= \beta_0 + (\beta_1 - \beta_2 - \beta_3)\text{Smoker}_i + \beta_2(\text{Alcohol}_i + \text{Smoker}_i)
\end{aligned}
$$

Question 5

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\begin{aligned}
\text{Birthweight}_i &= \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i \\
&= \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i \\
&\quad + \beta_2 \text{Smoker}_i - \beta_2 \text{Smoker}_i + \beta_3 \text{Smoker}_i - \beta_3 \text{Smoker}_i \\
&= \beta_0 + (\beta_1 - \beta_2 - \beta_3) \text{Smoker}_i + \beta_2 (\text{Alcohol}_i + \text{Smoker}_i) \\
&\quad + \beta_3 (\text{Unmarried}_i + \text{Smoker}_i) + X_i + u_i
\end{aligned}
$$

Question 5

$$\begin{aligned}
\text{Birthweight}_i &= \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i \\
&= \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i \\
&\quad + \beta_2 \text{Smoker}_i - \beta_2 \text{Smoker}_i + \beta_3 \text{Smoker}_i - \beta_3 \text{Smoker}_i \\
&= \beta_0 + (\beta_1 - \beta_2 - \beta_3) \text{Smoker}_i + \beta_2 (\text{Alcohol}_i + \text{Smoker}_i) \\
&\quad + \beta_3 (\text{Unmarried}_i + \text{Smoker}_i) + X_i + u_i \\
&= \beta_0 + (\beta_1 - \beta_2 - \beta_3) \text{Smoker}_i + \beta_2 (W_i) + \beta_3 (Z_i) + X_i + u_i
\end{aligned}$$

Question 5

$$
\begin{aligned}
\text{Birthweight}_i &= \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i \\
&= \beta_0 + \beta_1 \text{Smoker}_i + \beta_2 \text{Alcohol}_i + \beta_3 \text{Unmarried}_i + X_i + u_i \\
&\quad + \beta_2 \text{Smoker}_i - \beta_2 \text{Smoker}_i + \beta_3 \text{Smoker}_i - \beta_3 \text{Smoker}_i \\
&= \beta_0 + (\beta_1 - \beta_2 - \beta_3)\text{Smoker}_i + \beta_2(\text{Alcohol}_i + \text{Smoker}_i) \\
&\quad + \beta_3(\text{Unmarried}_i + \text{Smoker}_i) + X_i + u_i \\
&= \beta_0 + (\beta_1 - \beta_2 - \beta_3)\text{Smoker}_i + \beta_2(W_i) + \beta_3(Z_i) + X_i + u_i \\
&= \beta_0 + \gamma \text{Smoker}_i + \beta_2(W_i) + \beta_3(Z_i) + X_i + u_i
\end{aligned}
$$