6. a) $\{ \hat{\beta} \pm Z_{0,975} \cdot se(\hat{\beta}) \}$

$$\hat{\beta} = -0{,}078 \qquad Z_{0,975} = 1{,}96 \qquad se(\hat{\beta}) = 0{,}009$$

$$\approx (-0{,}096 \; ; -0{,}06) \not\ni 0$$

b) (a) **(6 marks)** The following OLS regression results were obtained

$$\widehat{smoker} = \underset{(0.007)}{0.290} - \underset{(0.009)}{0.078}\, smkban \qquad (6.1)$$

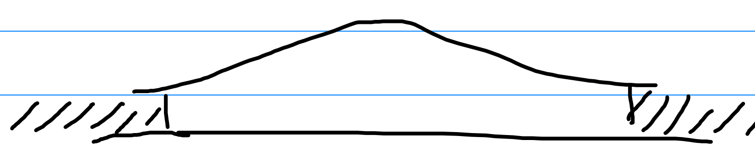
$$n = 10000,\ R^2 = 0.0078,\ RSS = 1821.59$$

$$\widehat{smoker} = \underset{(0.019)}{0.201} - \underset{(0.009)}{0.045}\, smkban - \underset{(.009)}{0.033}\, female - \underset{(.0003)}{0.001}\, age - \underset{(.016)}{0.027}\, black \qquad (6.2)$$

$$-\underset{(.014)}{0.104}\, hispanic + \underset{(.019)}{0.310}\, E1 + \underset{(.012)}{0.224}\, E2 + \underset{(.012)}{0.156}\, E3 + \underset{(.012)}{0.042}\, E4$$

$$n = 10000,\ R^2 = 0.0526,\ RSS = 1736.81$$

OVB



t^{obs}

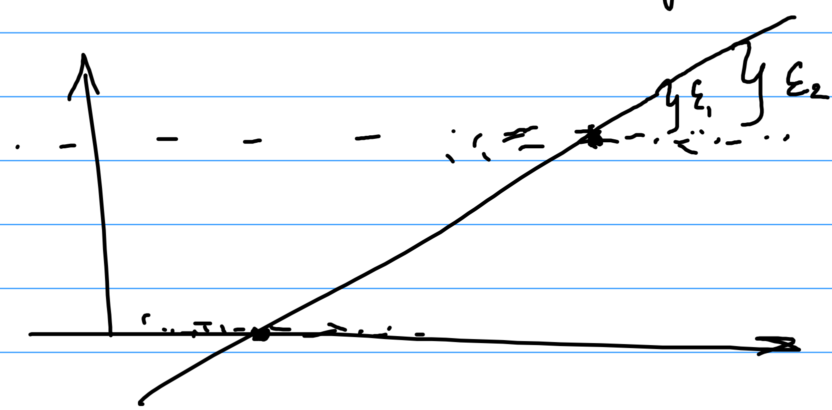
c) $t = \dfrac{0{,}224}{0{,}012} = 18{,}667 \sim N(0,1)$

p-value $= 2 \min\{ \mathbb{P}\{ t \leq t_{obs} \}, \mathbb{P}\{ t \geq t_{obs} \} \} =$

$= 2 \cdot P\{t \geq 18,667\} = 2 \cdot (1 - \Phi(18,667))$

p-value $< \alpha \Rightarrow H_0$ is rejected

d) LPM suffer from



$Var(y|X) = p(X)(1-p(X)) \equiv Var(u|X)$

- robust se
- WLS (GLS)

7. a) Drawbacks Probit:

- for cont. variables no simple interpretation as in LPM (only ME)

- computationally more expensive

b) from sem. 20.04

c) $\Delta = \hat{p}(y=1 \mid age=50, b=h=0, EU=1,$
$dem=0, \underline{smb=1}) - \hat{p}(y=1 \mid \ldots,$
$smb=0) =$
$\Phi(\hat{z}_{smb=1}) - \Phi(\hat{z}_{smb=0})$

d) $LR = 2(\log L^{UR} - \log L^{R}) \sim \chi^2_8$

$LR > \chi^2_{0{,}95,8} \Rightarrow H_0$ is rejected
restrictions not valid

8. a) $L \uparrow 1\%$ $\quad y \uparrow \beta_L \%$

β_L, β_K - unit-free

$$L_i^* = c \cdot L_i$$

$$\ln L_i^* = \ln c + \ln L_i$$

$$\Rightarrow \beta_L \ln L_i^* = \underbrace{\beta_L \ln c}_{\text{shift in const.}} + \beta_L \ln L_i^*$$

b) OVB $\Rightarrow$ endogeneity $\Rightarrow$ inconsistent est. of β_L

β_L will be biased downwards

$$\text{bias} \sim \overset{>0}{\beta_P} \cdot \overset{<0}{\text{cov}(L, P)} \Rightarrow \text{bias} \downarrow$$

c) 1 step: $\widehat{\ln L_i} = \hat{\psi}_1 + \hat{\psi}_2 \cdot W_i + \hat{\psi}_3 K_i$

2 step: $\ln Y_i = \beta_0 + \beta_L \widehat{\ln L_i} + \beta_K K_i + u_i$

1) instrument

exogenous: $cov(w_i, u_i) = 0$

relevance : $cov(w_i, \ln L_i) \neq 0$

2) $\ln K_i$ – exogenous :

$cov(\ln K_i, u_i) = 0$

d) $Var(w_i) \downarrow \Rightarrow \widehat{cov}(w_i, \ln L_i) \downarrow \Rightarrow$

$se_{TSLS} \uparrow$

Weak instrument