

Consider the following regression model

$$Y = \gamma_0 + Z\gamma_1 + v \quad (*)$$

where  $Y$  and  $Z$  are observable random variables,  $v$  is the unobservable regression error term and  $E[v | Z] = 0$  [note that this implies that  $\text{cov}(v, Z) = 0$ ]. Suppose we draw a sample from the joint distribution of  $[Y \ Z]$  and apply the ordinary least squares (OLS) method to (\*).

- a) Will the OLS estimates of  $\gamma_0$  and  $\gamma_1$  be unbiased?
- b) Would you describe  $Z$  as an exogenous (i.e. non-endogenous) variable in (\*)?
- c) Can the OLS estimated version of (\*) be used to analyze the causal effect of  $Z$  on  $Y$ ?

Explain your answers.