Economics 312 — Spring 2020
Daily Problem #6 — February 6

Today's problem paves the way for us to analyze the linear regression model using matrices and vectors. Suppose that we have n observations indexed by $i = 1, 2, \ldots, n$. For each observation, $y_i = \beta_0 + \beta_1 x_i + u_i$. Thus, we have a set of n equations corresponding to the values of i. Show that each of these equations corresponds to one row of the matrix equation: $\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{u}$, where

$$\mathbf{y} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}, \quad \mathbf{X} = \begin{bmatrix} 1 & x_1 \\ 1 & x_2 \\ \vdots & \vdots \\ 1 & x_n \end{bmatrix}, \quad \boldsymbol{\beta} = \begin{bmatrix} \beta_0 \\ \beta_1 \end{bmatrix}, \quad \mathbf{u} = \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_n \end{bmatrix}.$$