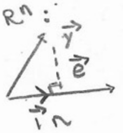
Math 3104
lecture 16 2/21

R^n :



$\vec{\bar{y}} = \bar{y} \cdot \vec{1}_n$

$\vec{\hat{y}} = \bar{y}\,\vec{1}_n = \underset{\text{projection matrix}}{H}\vec{y}$

$H\vec{x} = \lambda\vec{x}$!

$H = X(X^TX)^{-1}X^T$
$\vec{1}(\vec{1}^T\vec{1})^{-1}\vec{1}^T$
$\vec{1}\; n^{-1}\; \vec{1}^T$
n^{-1}
$= \frac{1}{n}$ matrix of all values $\frac{1}{n}$

rank = 1

$$\begin{bmatrix} \frac{1}{n} & \frac{1}{n} & \cdots & \frac{1}{n} \\ \frac{1}{n} & \frac{1}{n} & & \vdots \\ \vdots & & \ddots & \\ \frac{1}{n} & \cdots & & \frac{1}{n} \end{bmatrix}$$

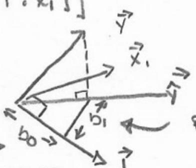
R^n = colsp(X) + colsp($X_\perp$)

$\underbrace{\text{Anova (factor variables)} \quad \text{Ancova (factor \& continuous)}}_{\text{both OLS}}$

$\text{proj}_X(\vec{y}) \approx \text{proj}_{\vec{1}}(\vec{y}) \approx \text{proj}_{\vec{x}_1}(\vec{y})$

colsp$[[\vec{1} : \vec{x}_1]]$

$\hat{y} \in$



b_1: parallel to $\vec{x}_1$

$\text{proj}_{\vec{1}}(\vec{y})$

$\text{proj}_{\vec{x}_1}(y)$

trouble in paradise

$V = [v_1 | v_2]$

$U = \text{span}[\{\vec{v}_1, \vec{v}_2\}] = \text{colsp}(V)$

$\text{proj}_V(\vec{a}) \overset{?}{=} \text{proj}_{\vec{v}_1}(\vec{m}) + \text{proj}_{\vec{v}_2}(\vec{a}) \Leftarrow$ equal when $v_1 \perp v_2$
otherwise <u>NO</u>.

$H\vec{a} = H_1\vec{a} + H_2\vec{a}$

$H\vec{a} = c_1\vec{v}_1 + c_2\vec{v}_2$