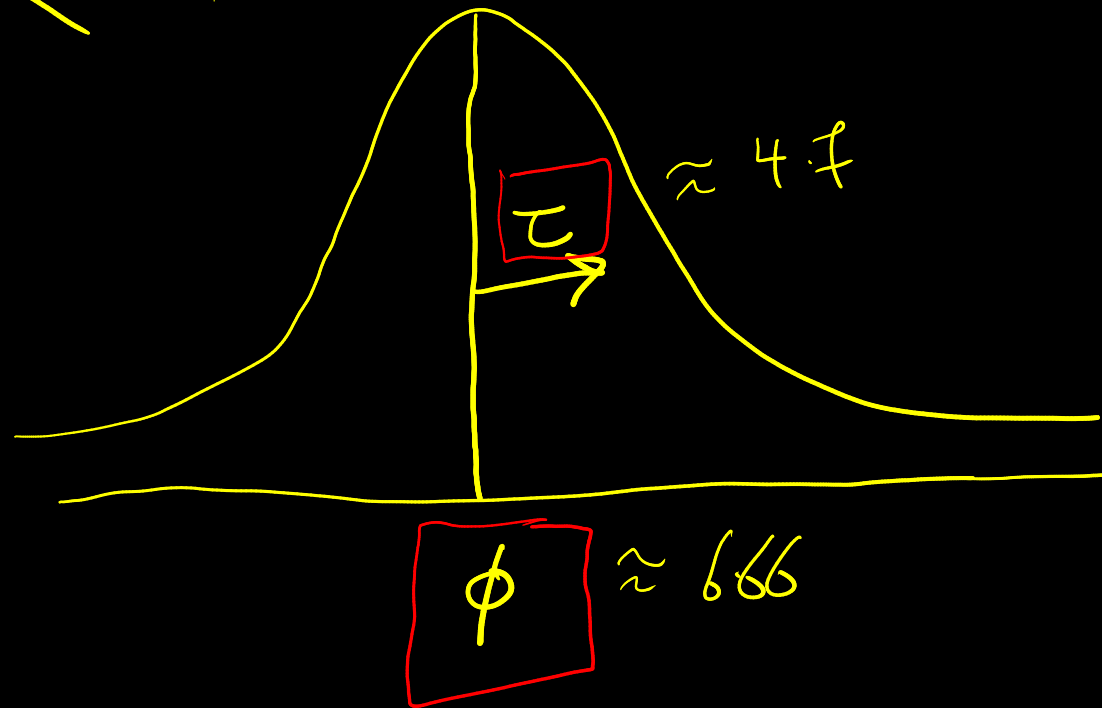
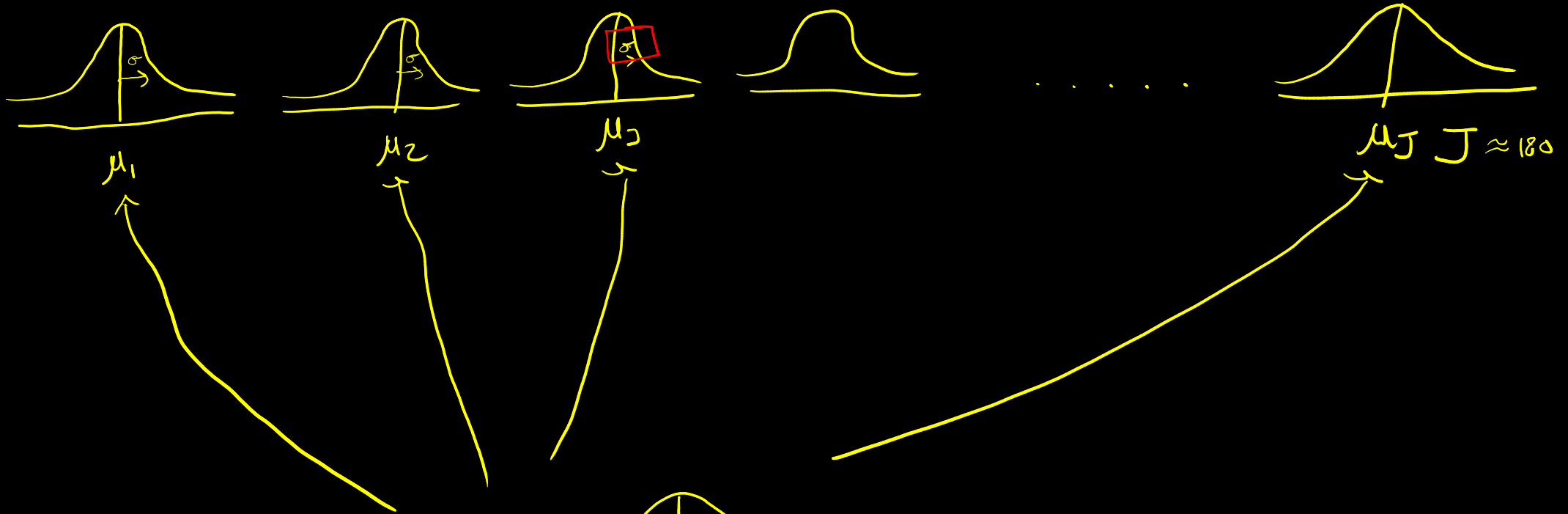


$$b = -1.94$$
$$\Rightarrow p \approx 12.5\%$$



for d in $0 \dots q$

$$y_d \sim N(\mu_d, \sigma^2)$$

$$\mu_d = \beta_0 + \beta_1 x_d$$

.

||

$$y_d = \underline{\beta_0} + \underline{\beta_1} x_d + \epsilon_d$$

$$\epsilon_d \sim N(0, \underline{\sigma^2})$$

$$\vec{\beta} = \begin{bmatrix} \beta_0 \\ \beta_1 \end{bmatrix}$$

$$x \sim N(\mu, \sigma^2)$$

$$\rightarrow x = \mu + \epsilon, \epsilon \sim N(0, \sigma^2)$$

for j in $1 \dots J$
 for d in $0 \dots q$

$$y_{jd} \sim N(\mu_{jd}, \sigma^2)$$

$$\mu_{jd} = \beta_0^j + \beta_1^j x_{jd}$$

$$\beta_0^j + \beta_1^j x_{jd}$$

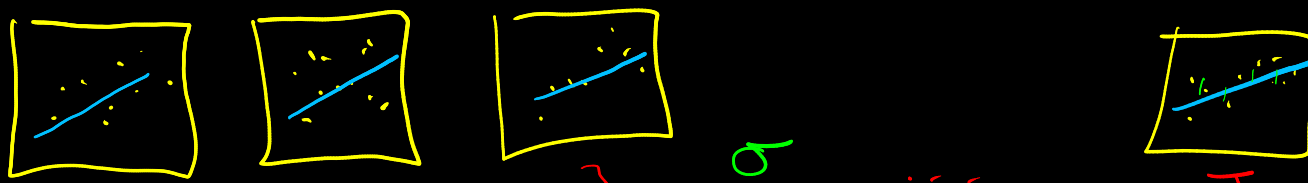
$$[b_0 + \bar{z}_0^j] + [b_1 + \bar{z}_1^j] x_{jd}$$

$$\underbrace{b_0 + b_1 x_{jd}}_{\text{fixed}} + \underbrace{\bar{z}_0^j + \bar{z}_1^j x_{jd}}_{\text{random effects}}$$

$$\vec{\beta}_j \triangleq \begin{bmatrix} \beta_0^j \\ \beta_1^j \end{bmatrix}$$

$$\vec{\beta}_j \sim N(\vec{b}, \Sigma)$$

$$\vec{\beta}_j = \begin{bmatrix} \vec{b} \\ \vec{z}_j \end{bmatrix} \quad \vec{z}_j \sim N(0, \Sigma)$$

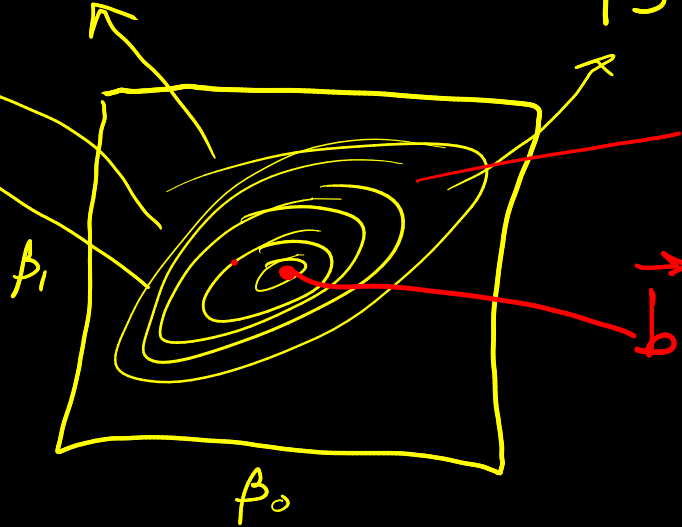


1
 $\vec{\beta}_1$

2
 $\vec{\beta}_2$

3
 $\vec{\beta}_3$

J
 $\vec{\beta}_J$



$$\beta_0^j \sim \mathcal{N}(b_0, \tau_0^2)$$

$$\beta_1^j \sim \mathcal{N}(b_1, \tau_1^2)$$

$$\Sigma = \begin{bmatrix} \tau_0^2 & \tau_0 \tau_1 \rho \\ \tau_0 \tau_1 \rho & \tau_1^2 \end{bmatrix}$$

$$p(\beta_0, \beta_1)$$

$$= p(\beta_0) p(\beta_1)$$