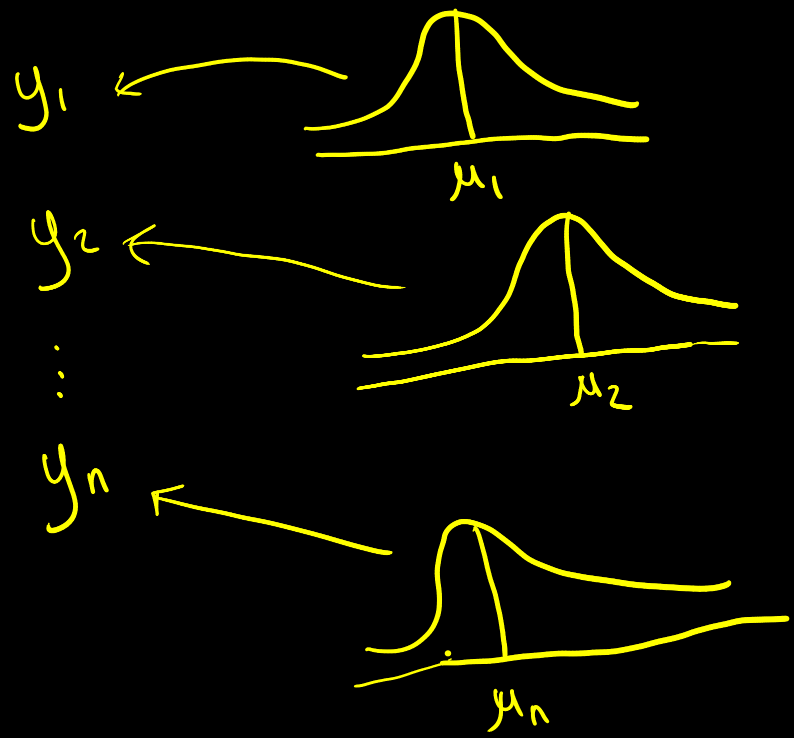

y_1
y_2
$\vdots$
y_n
μ_1
μ_2
μ_n

Normal linear

$$y_i \sim N(\mu_i, \sigma^2)$$

$$\mu_i = \underbrace{\beta_0 + \sum_{k=1}^{K} \beta_k x_{ki}}$$

binary logistic

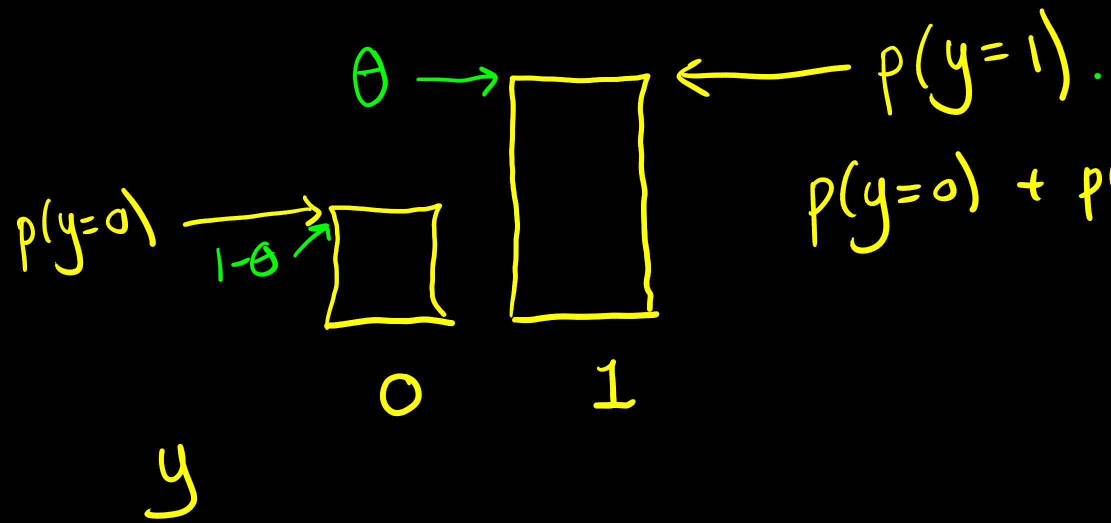
$$y_i \sim \text{bernoulli}(\theta_i)$$

$$\underline{\text{logit}(\theta_i)} = \underbrace{\beta_0 + \sum_{k=1}^{K} \beta_k x_{ki}}$$

<u>link function</u>

Bernoulli

prob distribution over $\{0, 1\}$



$$p(y=0) + p(y=1) = 1$$

$2^3 = 2 \times 2 \times 2 = 8$

$\log_2(8) = 3$

10^6

$\log_{10}(1000\,000) = 6$

$\log_e(1000\,000) =$

$e \approx 2.71\ldots\ldots$

$\log_e\left(\frac{p}{1-p}\right)$

log odds of prob of affairs

is linear function of years married

$\beta_0 + \beta_1 \times$ number of years married

$-1.6 + 0.05 \times 10$

β

e^{β} = odds ratio for a unit change in predictor

= factor by which the odds increases for a unit change in predictor

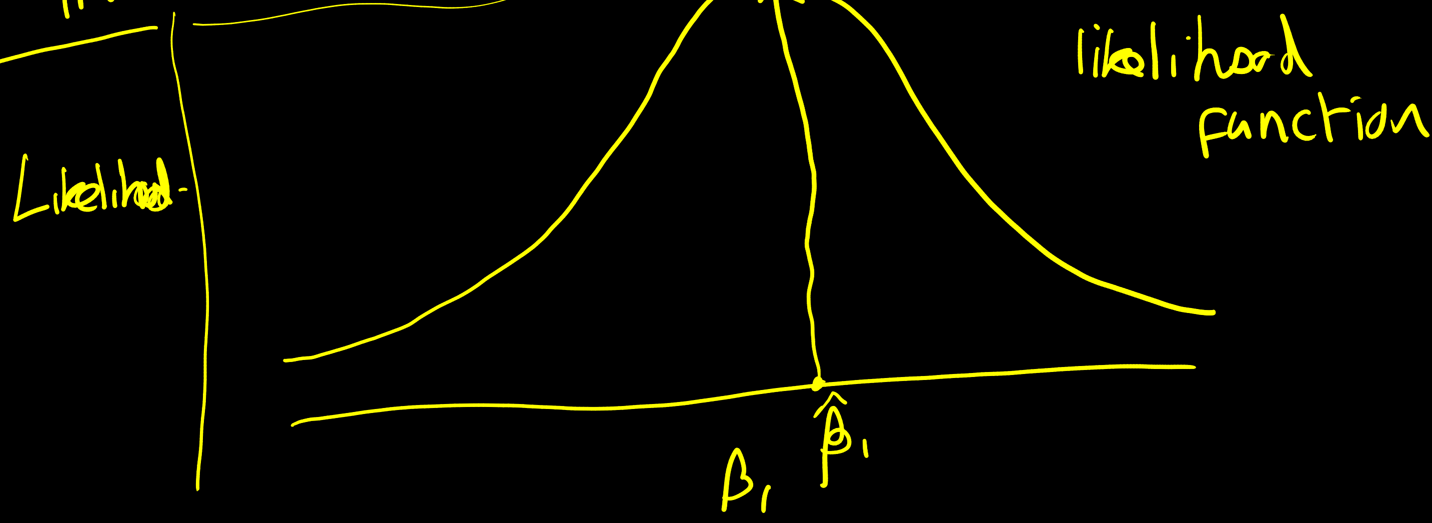
= $\underline{\underline{1.06}}$

$\beta_0 \quad \beta_1$

Deviance $= -2 \log L$

maximum likelihood estimation

L



M_1 : yearsmarried
age
gender

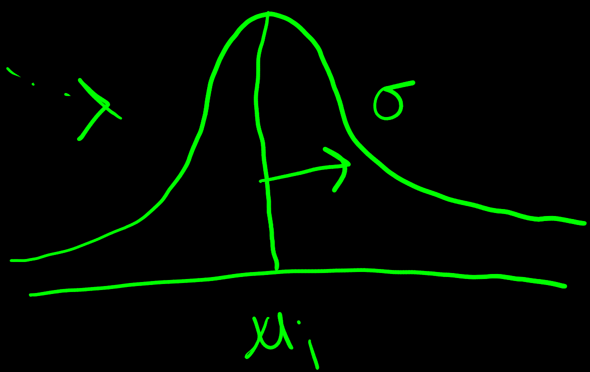
M_0 : yearsmarried

null hypothesis : M_0 is as good as M_1 at predicting affairs

$$D_0 - D_1 \sim \chi^2_{[k-k']}$$

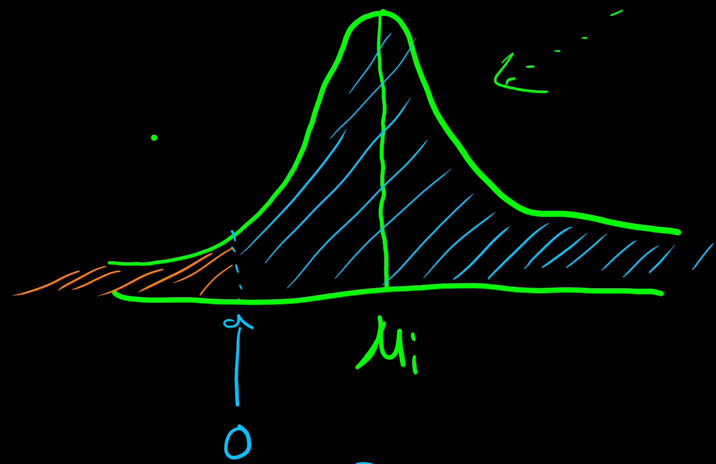
$$y_i \sim N(\mu_i, \sigma^2)$$

$$\mu_i = \beta_0 + \sum_{k=1}^{K} \beta_k x_{ki}$$

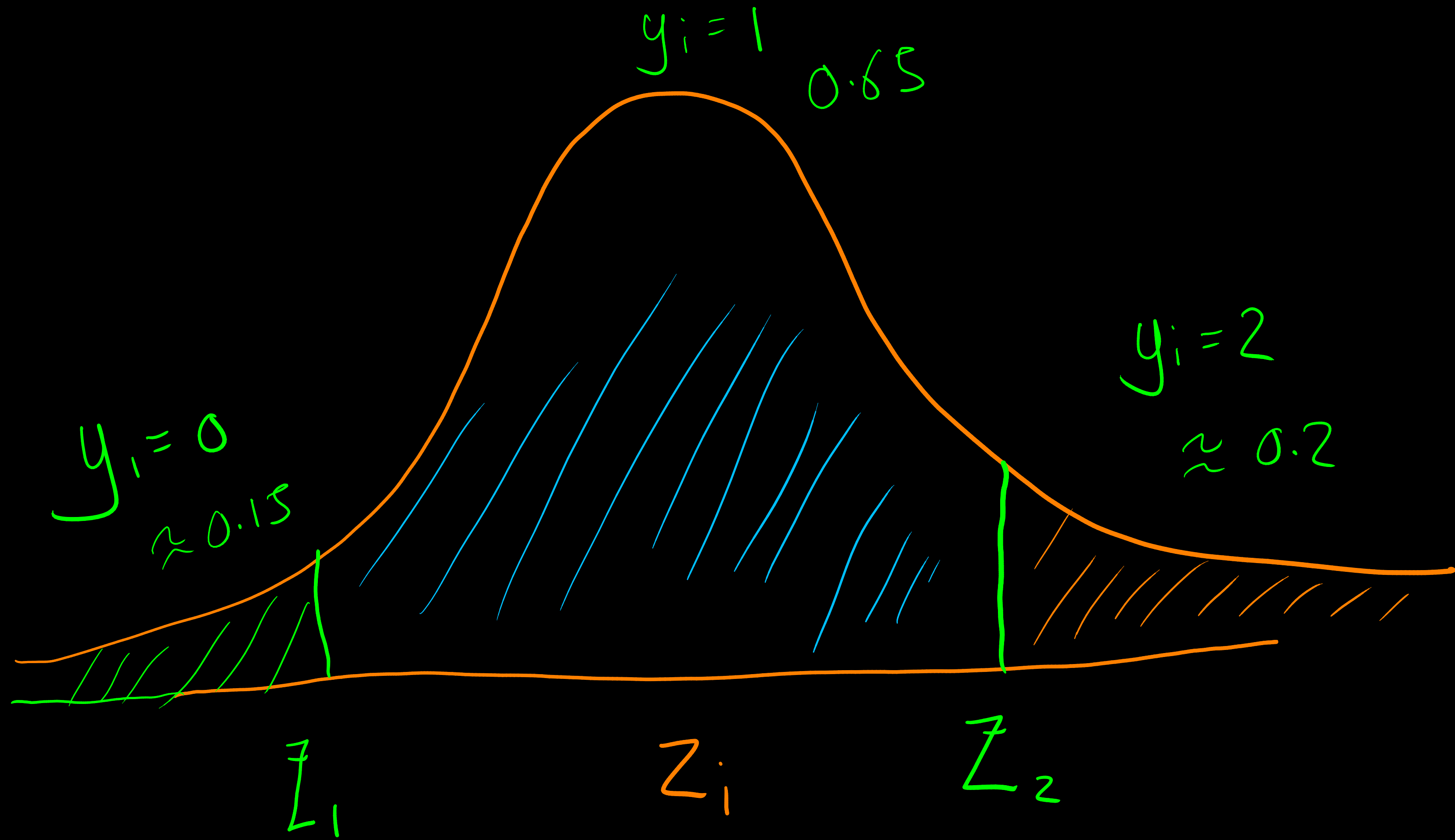


$$z_i \sim \mathrm{dlogis}(\mu_i)$$

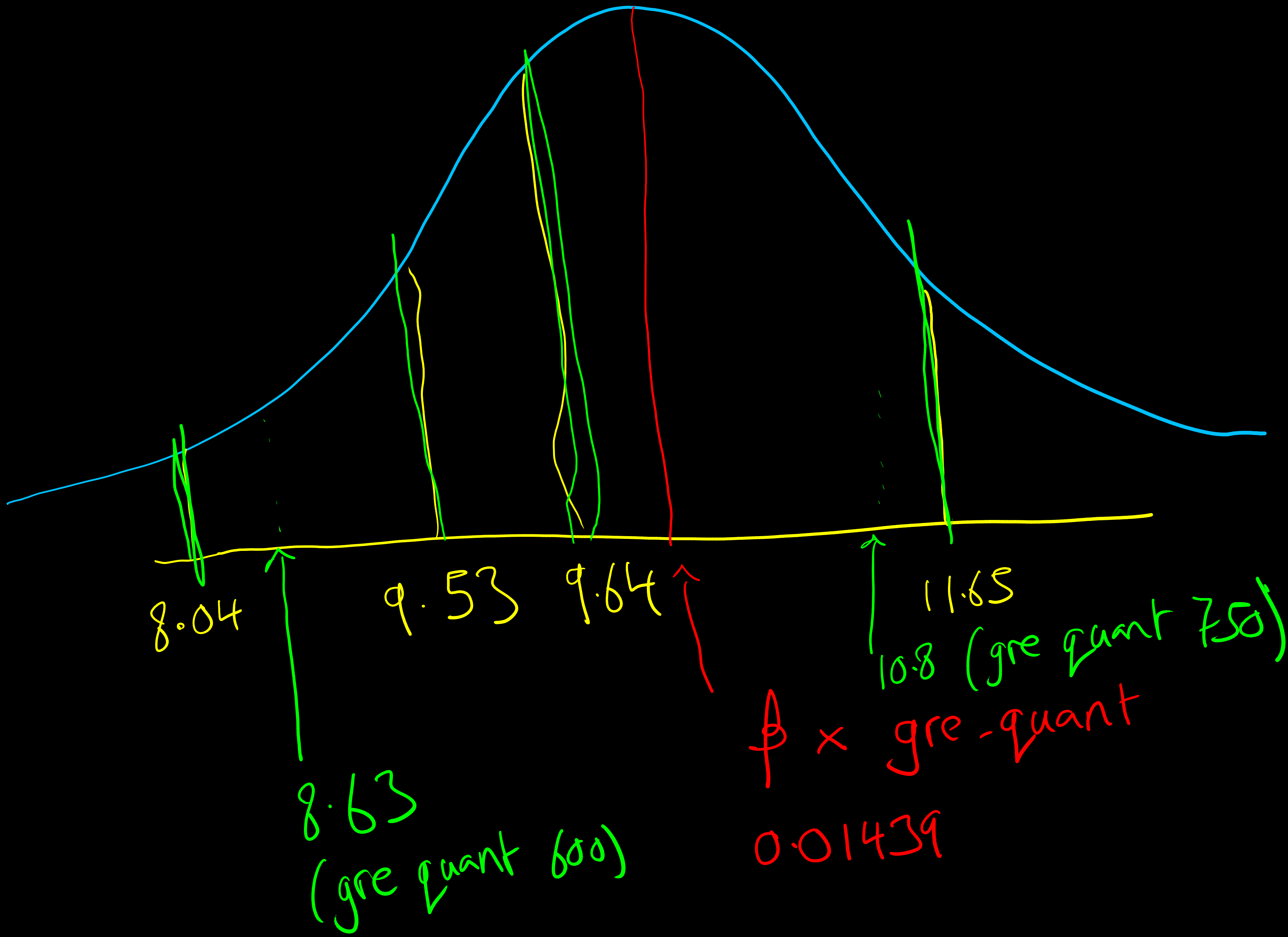
$$\mu_i = \beta_0 + \sum_{k=1}^{K} \beta_k x_{ki}$$



$$y_i = \begin{cases} 1 & \text{if } z_i \geq 0 \\ 0 & \text{if } z_i < 0 \end{cases}$$



$y_i = 1$
0.65
$y_i = 0$
≈ 0.15
$y_i = 2$
≈ 0.2
z_1
z_i
z_2


8.04
9.53
9.64
11.65
8.63
(gre quant 600)
10.8 (gre quant 750)
β × gre-quant
0.01439

$y_i \in \{$ French, Indian, Canadian$)$

categorical logistic

multinomial logistic

$$\overset{1}{} \quad \overset{2}{} \quad \overset{3}{}$$

$$\log\left(\frac{P(y=2)}{P(y=1)}\right) = \beta_0^2 + \sum_{k=1}^{K} \beta_k^2 x_{ki}$$

$y_1 \quad y_2 \quad y_3 \quad \ldots\ldots \quad y_n \quad \in \{1, 2 \ldots L\}$

$\vec{x}_1 \quad \vec{x}_2 \quad \vec{x}_3 \quad \ldots\ldots \quad \vec{x}_n$

$\vec{z}_1 \quad \vec{z}_2 \quad \vec{z}_3$

if $L = 5$

e.g

$$\vec{z} = [1, \ldots, \ldots, \ldots, \ldots]$$

$$\frac{e^{\vec{z}_i}}{1 + \sum e^{z_i}} = [\quad]$$