

$$1] RR = \frac{\pi_1}{\pi_2} = \frac{\frac{\pi_1}{1-\pi_1}}{\frac{\pi_2}{1-\pi_2}}$$

$$OR = \frac{\pi_1(1-\pi_2)}{\pi_2(1-\pi_1)}$$

$$= RR \cdot \left( \frac{1-\pi_2}{1-\pi_1} \right)$$

$$\left[ RR \cdot \frac{1-\pi_1}{1-\pi_2} \right]$$

$$P.D = \frac{2}{\lambda(1+\lambda)} \sum_i n_i \left[ \left( \frac{n_i}{\hat{\mu}_i} \right)^\lambda - 1 \right]$$

When  $\lambda = 1 = \chi^2$  ,  $-\infty < \lambda < \infty$

Putting  $\lambda = 1$ ,

$$= \frac{2}{1 \cdot (1+1)} \cdot \sum_i n_i \left[ \left( \frac{n_i}{\hat{\mu}_i} \right) - 1 \right]$$

$$= \sum_i n_i \left( \frac{n_i - \hat{\mu}_i}{\hat{\mu}_i} \right)$$


$\left[ \sum_i (n_i - \hat{\mu}_i) = 0 \right]$

$$\begin{aligned}
&= \sum_i \frac{n_i^2 - n_i \hat{\mu}_i}{\hat{\mu}_i} \\
&= \sum_i \frac{n_i^2 - n_i \hat{\mu}_i}{\hat{\mu}_i} - \sum_i (n_i - \hat{\mu}_i) \\
&= \sum_i \left( \frac{n_i^2 - n_i \hat{\mu}_i - n_i \hat{\mu}_i + \hat{\mu}_i^2}{\hat{\mu}_i} \right) \\
&= \sum_i \frac{(n_i - \hat{\mu}_i)^2}{\hat{\mu}_i} = \chi^2
\end{aligned}$$

$$G^2 = 2 \sum_{i=1}^k n_i \log_e \left( \frac{n_i}{m_i} \right)$$

Let  $n = \sum_i n_i$  &

$$p_i = \frac{n_i}{n} \Rightarrow n_i = n \cdot p_i$$

$$\begin{aligned} \therefore G^2 &= 2n \sum_i p_i \ln \left( \frac{n_i}{m_i} \right) \\ &= -2n \sum_i p_i \ln \left( \frac{m_i}{n_i} \right) \end{aligned}$$


Let  $X$  be a r.v taking value  $\frac{m_i}{n_i}$  w.p  $p_i$   $[0, 0.0]$   $\leftarrow \begin{matrix} (0, 1) \\ 0 \end{matrix}$

$$\begin{aligned} \therefore E(X) &= \sum_i p_i \cdot \frac{m_i}{n_i} \\ &= \sum_i \frac{n_i}{n} \cdot \frac{m_i}{n_i} = \sum_i \frac{m_i}{n} = 1 \end{aligned}$$

$$\& E[\log X] = \sum_i p_i \cdot \log_e \left( \frac{m_i}{n_i} \right)$$

$\therefore \log_e X$  is concave

$$E[f(x)] \quad f[E(x)]$$

$$\rightarrow E[\log X] \leq \log[E(x)]$$

Concave



Convex



$f = \log$

$$\begin{aligned} \therefore G^2 &= -2n \sum_i p_i \ln \left( \frac{n_i}{n} \right) = \log(1) = 0 \\ &= -2n E(\log X) \geq 0 \end{aligned}$$

*(Note: Red arrows in the original image point from the sum term to  $E(\log X)$  and from the result  $\geq 0$  to  $G^2 \leq 0$ )*