$f(t)$

t

$$\frac{df(t)}{dt} > 0.$$

$$f(0) = 1/2.$$

$f(t)$

$\longrightarrow$

0, and

$$\frac{df(t)}{dt}$$

$\propto$

$f(t),$

as t

$-\infty.$

1, and

$1 - f(t),$

∞.

$$\frac{df(t)}{dt} \propto f(t)[1 - f(t)].$$

$$\frac{df(t)}{dt} = f(t)[1 - f(t)].$$

$$f(x)$$

$$\left[\frac{1}{f(t)} + \frac{1}{1 - f(t)}\right] df(t)/dt$$

$=$

1,

$$\frac{d}{dt}\{\log f(t) - \log[1 - f(t)]\}$$

$$\log f(t) - \log[1 - f(t)]$$

$t,$

$$\log\left[\frac{f(t)}{1-f(t)}\right]$$

t, and

$$\frac{f(t)}{1 - f(t)}$$

$\exp(t)$.

$$f(t) = \frac{\exp(t)}{1 + \exp(t)} = \frac{1}{1 + \exp(-t)}.$$

$$1 - f(t) = 1/[1 + \exp(t)]$$

$f(-t);$

$$f(t) + f(-t)$$

1.

$$df(t)/dt$$

$$\frac{\exp(-t)}{[1+\exp(-t)]^2} = \frac{1}{[\exp(t/2)+\exp(-t/2)]^2},$$

$$\frac{df(0)}{dt}$$

$$1/4, \text{ and } \frac{df(\pm\infty)}{dt} = 0.$$

$$t \equiv r(\tau - \bar{\tau}),$$

$\mathcal{T}$

r

$\bar{\tau}$

$$f(t) \equiv Q(\tau)/k,$$

$$Q(\tau)$$

k

$$Q(\bar{\tau}) \equiv k/2.$$

$$\frac{dQ(\tau)}{d\tau}$$

$r[1 - Q(\tau)/k]Q(\tau);$

$$\frac{dQ(\tau)}{d\tau}/Q(\tau)$$

$$r - (r/k)Q(\tau).$$

r/k

$$Q(-\infty) = 0$$

$$Q(\infty) = k$$

$$dQ(\tau)/d\tau$$

$$Q(\tau) = \frac{k}{1 + \exp[-r(\tau - \bar{\tau})]}.$$

$$P(\tau)$$

$$P(\tau) \equiv \frac{dQ(\tau)}{d\tau} = \frac{kr}{\{\exp[r(\tau - \bar{\tau})/2] + \exp[-r(\tau - \bar{\tau})/2]\}^2}.$$

$$P(\bar{\tau}) = kr/4$$

$$\{P^i, \tau^i\}$$

i

$$\min_{k,r,\bar{\tau}} \sum_i \left\{ P^i \ \log[P^i \ / \ P(\tau^i)] \right\} .$$

$(k, r, \bar{\tau})$

P^i

τ^i

p

$$1 - p$$

x

$p(x)$

$$\text{logit}(p) \equiv \log\left(\frac{p}{1-p}\right).$$

logit

$$\log\left[\frac{p(x)}{1-p(x)}\right]$$

$$\beta_0 + \beta_1 x.$$

β_0

β_1

$$t \equiv \beta_0 + \beta_1 x$$

H

$$H(p) \equiv -p \log p - (1-p) \log(1-p).$$

$$\log(2)$$

$$p = \frac{1}{2}$$

$$\frac{dH(p)}{dp} = -\text{logit}(p).$$