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# Empirical Dist. Function "Li & Racine"

$$\hat{F}_n(t) = \frac{\text{≤t 的样本数}}{\text{总样本}} = \frac{1}{n} \sum_{i=1}^N 1(x_i \leq t)$$

$$F(t) = P_r(X \leq t)$$

$$f(t) = \lim_{h \rightarrow 0} \frac{F(t+h) - F(t-h)}{2h}$$

用 EDF 代替 F:

$$\begin{aligned} f(t) &= \frac{1}{2h} \frac{\# x_i \in [t-h, t+h]}{n} \\ &= \frac{1}{nh} \sum_{i=1}^n \left[ \frac{1}{2} 1\left(\frac{|t-x_i|}{h} \leq 1\right) \right] \end{aligned}$$

$$\frac{1}{2} 1(|t| \leq 1) \equiv K(t) \leftarrow \text{直方图}$$

$$f(t) = \frac{1}{nh} \sum_{i=1}^n K\left(\frac{t-x_i}{h}\right) \quad f(t) = \frac{1}{nh} \sum_{i=1}^n \phi\left(\frac{t-x_i}{h}\right)$$

$$\int_{-\infty}^{\infty} f(t) dt = 1, \quad \frac{1}{nh} \sum_{i=1}^n \int_{-\infty}^{\infty} K\left(\frac{t-x_i}{h}\right) dt$$

$$\text{令 } \frac{t}{h} = x, \quad = \frac{1}{n} \sum_{i=1}^n \int_{-1}^1 \frac{1}{2} dx = 1$$