$Y = h(X)$: $F_Y(y) = P[Y \le y] = P[h(X) \le y] = P[X \le h^{-1}(y)]$

$= F_X(h^{-1}(y))$ / $\frac{d}{dy}$

TRANSFORMACE HUSTOT

$$F_Y(y) = \int_{-\infty}^{z} f_Y(z)\,dz = \left|\right.$$

Příklad: transformace hustot

SLIDE 16: FUNKCE NÁH. VEL.

$Y = a + bX = h(X)$ $\quad f_X(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$

$X = \frac{Y-a}{b} = h^{-1}(y)$

$$f_Y(y) = f_X\left(\frac{y-a}{b}\right) \cdot \left|\frac{dh^{-1}(y)}{dy}\right| = \frac{1}{\sqrt{2\pi b^2}} \cdot e^{-\frac{(y-a)^2}{2b^2}} \sim N(a, b^2)$$

$$E[Y] = \int_R y \cdot f_X(h^{-1}(y)) \left|\frac{dh^{-1}}{dy}\right| dy$$

$$E[h(X)] = \int_R h(x) \cdot f_X(x)\,dx = \left| \begin{array}{l} h(x) = y \\ x = h^{-1}(y) \\ dx = \frac{dh^{-1}(y)}{dy}\,dy \end{array} \right|$$

Střední hodnota Cauchyho rozdělení

Cauchy: $\frac{1}{\pi(1+x^2)}$

SLIDE 17: ZVČ

$$E[X] = \int_R x \frac{1}{\pi(1+x^2)}\,dx = \left| \begin{array}{l} x^2 = y \\ 2x\,dx = dy \end{array} \right| = \frac{1}{2\pi} \int_{\infty}^{\infty} \frac{1}{1+y}\,dy = \frac{1}{2\pi}\Big[\ln|1+y|\Big]_{\infty}^{\infty}$$

$\to \nexists$

NESTRANNÝ ODHAD

$E\left[\frac{1}{n}\sum X_i\right] = A$ $\quad$ ALE $\mathrm{Var}[\hat{A}^2] = \frac{1}{n^2}\sum \mathrm{Var}[X_i^2] = \frac{1}{n}\sigma^2$

$E[X_1] = A$ $\quad$ $\mathrm{Var}[\check{A}^2] = \mathrm{Var}[X_1^2] = \sigma^2$

SLIDE 24: TEORIE ODHADŮ