Asymptotic Properties of Chi-Squared Distribution

Kisung You

kyoustat@gmail.com

December 10, 2019

For $X \sim \chi^2(k)$, we have

- **CLT**

$$\frac{X - k}{\sqrt{2k}} \sim N(0, 1)$$

- **Fisher (1922)**

$$\sqrt{2X} \sim N(\sqrt{2k - 1}, 1)$$

- **Wilson-Hilferty (1931)**

$$\left(\frac{X}{k}\right)^{1/3} \sim N(1 - \frac{2}{9k}, \frac{2}{9k})$$

References are

- Wilson and Hilferty
- Handbook of Distributions
- Proof for Fisher

References