

• Chi-squared distribution

$$\chi_{dof}^2 = \frac{1}{N-1} \sum_{i=1}^N \left(\frac{x_i - \bar{x}}{\sigma_i} \right)^2$$

We expect χ_{dof}^2 to be 1 to within a few $\sqrt{2/(N-1)}$

If not, then we have a problem: either error distribution is not Gaussian, or the values of σ_i are unreliable, or the underlying quantity x does not have a fixed value μ .

If $(\chi_{dof}^2 - 1)$ is M times larger than $\sqrt{2/(N-1)}$, then we have M -sigma significant detection of the variability of x .