Errors in PDF fits

Uncertainties

~~Errors~~ in PDF fits

We do our best to avoid errors!

Uncertainties in PDF fits

- Multiplicative, additive or poissonian rescaling
- Correlated or uncorrelated sources

Uncertainties rescaling

CHI2SettingsName:	StatScale	UncorSysScale	CorSysScale	Scaling rule
CHI2Settings				
Poisson	+	+	−	$\sqrt{m^i \mu^i}$
Linear	−	+	+	m^i
NoRescale	+	+	+	μ^i

- Scaling rules determine how experimental uncertainties are rescaled to the theory predictions
- Correct choice of scaling rules can be important, it depends on the nature of the uncertainty, and on the observable

Uncertainties rescaling

Cross section observables

$$\sigma = \frac{N_{\mathrm{DATA}}}{\epsilon \cdot L} - \sigma_{\mathrm{background}}$$

- N_{DATA}: poissonian
- ε, L: multiplicative (linear rescaling)
- $\sigma_{background}$: additive (no rescaling)

Uncertainties rescaling

Asymmetries observables

$$A = \frac{\sigma_1 - \sigma_2}{\sigma_1 + \sigma_2}$$

- Exact rescaling is non trivial
- If $\sigma_1 \sim \sigma_2$ additive (no rescaling) is a reasonable approximation

Uncertainties correlations

- Experiments provide information on the uncertainties correlations in different forms: correlation or covariance matrices, splitting of uncertainties into fully bin-to-bin correlated sources
- Sometimes short-cuts are made in the correlations
- Examples: data driven background, data driven efficiencies are assumed as 100% bin-to-bin correlated, but they can have a significant statistical uncorrelated components in their uncertainties