Slow Convergence of Simulations

Long-range dependent traffic generators => long transients

Toy example: convergence of sample mean in distribution

heavy tailed probability distribution (Pareto), infinite variance

$$P[X <= x] = 1 - (k/x)^{\alpha}$$

Levy's CLT (i.i.d. X_i)

$$A_n = \frac{1}{n}\sum_{i=1}^{n} X_i$$

then

$$|A_n - \langle A \rangle| \sim c_1 n^{1/\alpha - 1}$$

if want k digits accuracy

$$|A_n - \langle A \rangle| < 10^{-k}$$

then

$$n > c_2 10^{\frac{k}{1 - 1/\alpha}}$$

for k = 2, $c_2 \sim 1$, traffic case $\alpha \sim 1.5$

need n ~ 1,000,000 i.i.d. samples!

Crovella, Lipsky 1997