\[ \theta^*_t = \theta_0 + \beta \theta^*_t + e_t \sim \text{IID } N(0, \sigma^2) \]

\[(k=1) \]

Auto-regressive model of order 1

\[ \text{linear regression model} \]

\[ y_t = \beta_0 + \beta_1 x_t + e_t \sim \text{IID } N(0, \sigma^2) \]

with first-order auto-correlation

\[ \begin{bmatrix} \theta^*_1 \\ \theta^*_2 \\ \vdots \\ \theta^*_m \end{bmatrix} \]

\[ \begin{bmatrix} X \\ \theta^*_1 \\ \theta^*_2 \\ \vdots \\ \theta^*_m \end{bmatrix} \]

ACF

\[ \hat{\rho}_1 = 0.2 \]

\[ \hat{\rho}_4 = 0.2 \]

\[ 0 \quad 1 \quad 2 \]

\[ \log \]
\[ \text{ASE} \]

\[ \hat{\rho}_1 = \ldots \]

\[ 0.1 \]

\[ 0.2 \]

\[ 0.3 \]

\[ 0.4 \]

\[ 0.5 \]

\[ 0.6 \]

\[ 0.7 \]

\[ 0.8 \]

\[ 0.9 \]

\[ 1.0 \]

\[ \text{ICD} \]

\[ \text{MSE} \]

\[ \frac{\sum_{j=1}^{m} \mu_j^* \top}{m} \]

\[ \frac{5}{\sqrt{m}} \]

\[ \frac{1 + \rho^2}{\sqrt{1 - \rho^2}} \]

\[ \text{if} \quad 0 \leq \rho_1 \leq 1, \quad \text{then} \quad n \geq 1 \]

\[ \sqrt{1/J} \]

\[ \frac{\text{M} = 404.29713}{0.0018} \text{ MSE} \]

\[ = (404.30 \pm 0.0018) \text{ MC summary} \]
$$p(0.445 \pm 0.002)$$

3.911 $\pm$ 0.002

3.91 $\pm$ 0.0024

$$o.4445896$$

$$\text{LN p} \uparrow \text{mp. 49} \rightarrow$$

Bayesian hierarchical modeling

$$N \sim \text{P}$$

all elderly

non-institutionalized people in 1980

mean $\mu_E = ?$

$$H \sim \text{log.}$$

$$N + \text{cont.}$$

$$N = ?$$

$$\text{in 1980}$$
\bar{E} = 0.9 \text{ est. of } \mu_E

\bar{c} = \frac{\bar{E} - \bar{c}}{\bar{c}}

\left( \frac{\bar{E} - \bar{c}}{\bar{c}} \right) \text{ least of } \left( \frac{\mu_E - \mu_c}{\mu_c} \right)

\text{dev's advocate (DA)}: \mu_E = \mu_c \text{ i.e. } (\mu_E - \mu_c)

null hypothesis: \frac{\mu_E - \mu_c}{\mu_c} = 0
positive conclusion

false (bad)

even positive

IHGA works when it doesn't

IHGA doesn't work when it does

99.9% CI for (μE - μC)

\[ (\hat{\gamma}_E - \hat{\gamma}_C) \pm \text{CI} \]

if 0 not in (99.9%) CI, declare that diff. between \((\gamma_E - \gamma_C)\) is stat. sig.
if statistically significant (stat.sig.), we do not support DA null story; instead we draw a positive conclusion (false \( \Theta \) is possible) but unlikely (99.9%).

\[ \Delta = \frac{M_E - M_C}{M_C} \]

\[ P(\Delta | D \ldots B) \]

\[ P \left( \frac{M_E - M_C}{M_C} | D \ldots B \right) \]