



Adventures in Bayesian Structural Time Series

Part 1: Introduction

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⊠ Structural time series



- ⊠ Structural time series
- ⊠ Bayesian approach to structural time series



- ⊠ Structural time series
- ⊠ Bayesian approach to structural time series
- ⊠ Implementation via `bsts` in R



⊠ Predicting the Present with Bayesian Structural Time Series



- ⊠ Predicting the Present with Bayesian Structural Time Series
- ⊠ An Introduction to State Space Time Series Analysis



- ⊗ Predicting the Present with Bayesian Structural Time Series
- ⊗ An Introduction to State Space Time Series Analysis
- ⊗ Time Series Analysis By State Space Methods



- ⊠ Predicting the Present with Bayesian Structural Time Series
- ⊠ An Introduction to State Space Time Series Analysis
- ⊠ Time Series Analysis By State Space Methods
- ⊠ `bsts` documentation



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- ⊠ **bsts** documentation
- ⊠ Adventures in BSTS GitHub



Time Series Review

⊠ Stochastic process indexed by time

$$\otimes \{X_t, t \in \mathbb{T}\}$$

⊠ (weak) Stationarity

$$\otimes E[X_t] = \mu$$

$$\otimes \text{Cov}(X_t, X_{t+k}) = \gamma(k)$$

⊠ Not i.i.d.



AR(1)



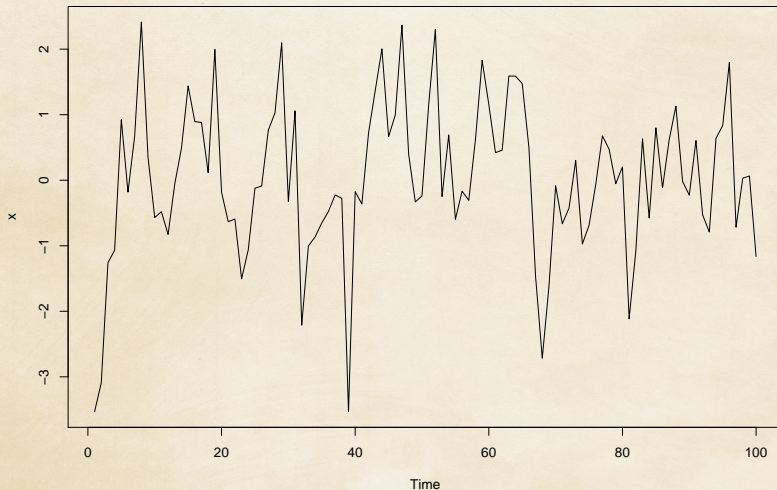
$$X_t = \phi X_{t-1} + e_t$$

e_t i.i.d. $(0, \sigma^2)$

$|\phi| < 1$



Simulated AR(1)






MA(1)

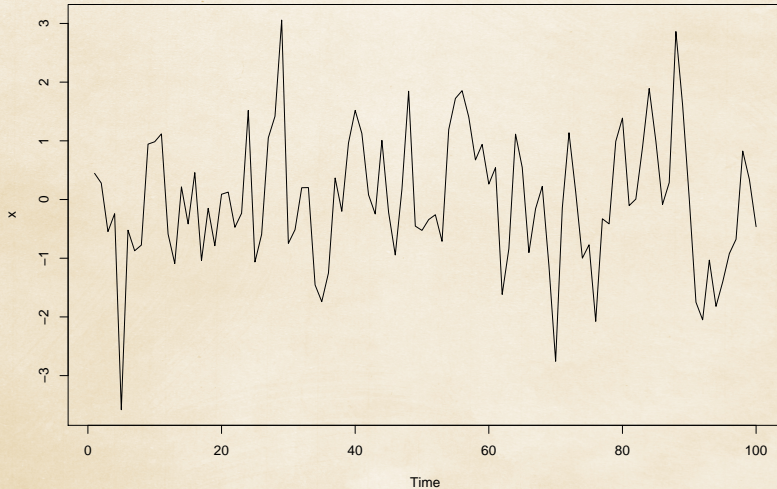


$$X_t = \theta e_{t-1} + e_t$$

 e_t i.i.d. $(0, \sigma^2)$



Simulated MA(1)





ARMA(p,q)



$$\phi(B)X_t = \theta(B)e_t$$

$$\phi(B)X_t = X_t - \phi_1X_{t-1} - \cdots - \phi_pX_{t-p}$$

$$\theta(B)e_t = e_t + \theta_1e_{t-1} + \cdots + \theta_qe_{t-q}$$



Your quest...