

Adventures in Bayesian Structural Time Series Part 1: Introduction

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The Adventure



Structural time series

The Adventure



- Structural time series
- Bayesian approach to structural time series

The Adventure



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



Predicting the Present with Bayesian Structural Time Series

Useful Resources



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



- Predicting the Present with Bayesian Structural Time Series
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- 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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Time Series Review



Stochastic process indexed by time

Time Series Review



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- (weak) Stationarity
 - Φ $E[X_t] = \mu$
 - \otimes $Cov(X_t, X_{t+k}) = \gamma(k)$
- ♥ Not i.i.d.

AR(1)



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

AR(1)

 \otimes

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



AR(1)

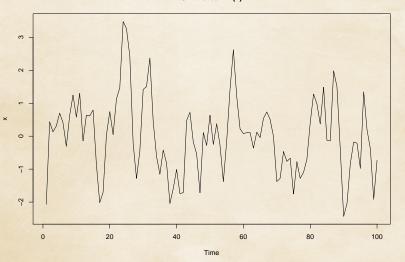
 \otimes

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

- \otimes e_t i.i.d. $(0, \sigma^2)$
- $|\phi| < 1$



Simulated AR(1)





MA(1)



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



MA(1)

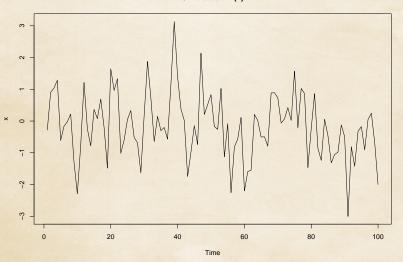


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 \otimes e_t i.i.d. $(0, \sigma^2)$



Simulated MA(1)





ARMA(p,q)



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



ARMA(p,q)

 \otimes

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



ARMA(p,q)

 \otimes

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

$$\theta(B)e_t = e_t + \theta_1 e_{t-1} + \cdots + \theta_q e_{t-q}$$



Your quest...