Autoregressive moving average (ARMA) processes

Modeling Intensive Longitudinal Data
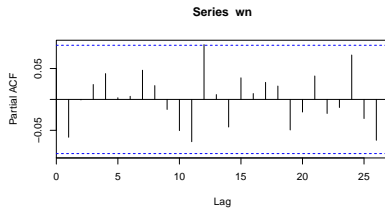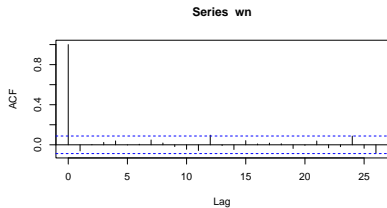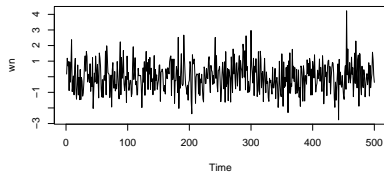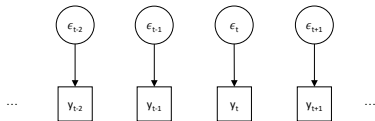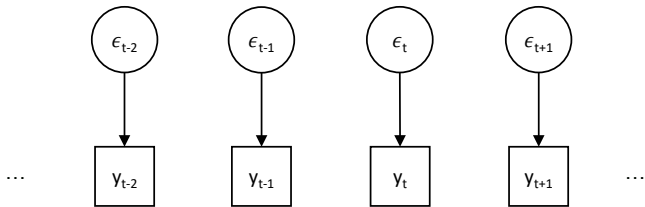
Ellen Hamaker

Utrecht University

Sharing science,
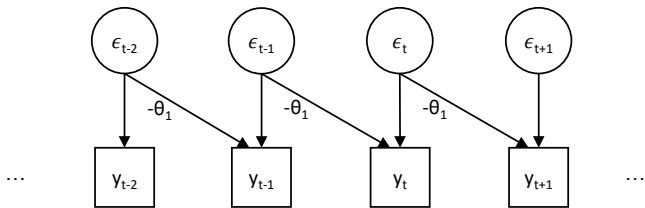*shaping tomorrow*

White noise: $y_t = \epsilon_t$
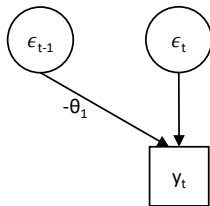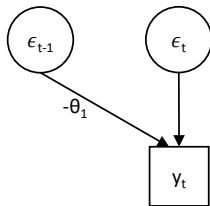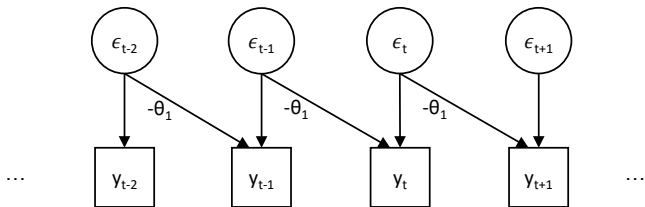
MA(1) process

$$y_t = \epsilon_t - \theta_1 \epsilon_{t-1}$$

MA(1) process

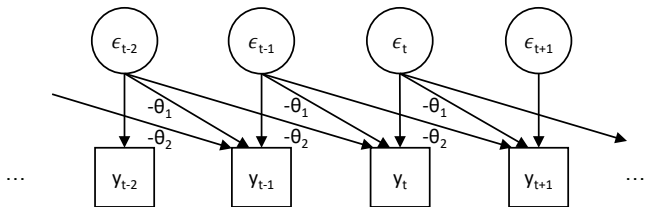$$y_t = \epsilon_t - \theta_1 \epsilon_{t-1}$$

MA(1) process

$$y_t = \epsilon_t - \theta_1 \epsilon_{t-1}$$

Utrecht University

MA(1) process

$$y_t = \epsilon_t - \theta_1 \epsilon_{t-1}$$

MA(2) process

$$y_t = \epsilon_t - \theta_1 \epsilon_{t-1} - \theta_2 \epsilon_{t-2}$$
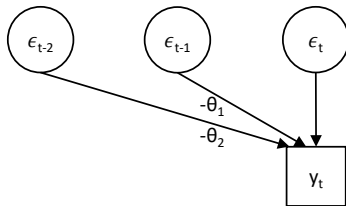
Utrecht
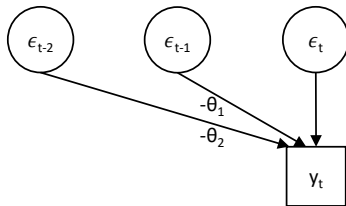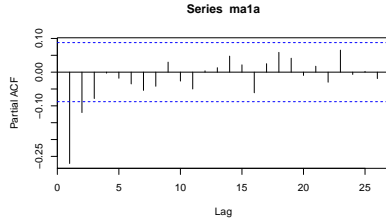University

MA(2) process

$$y_t = \epsilon_t - \theta_1 \epsilon_{t-1} - \theta_2 \epsilon_{t-2}$$

MA(2) process

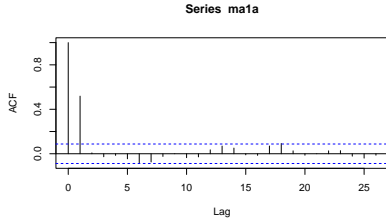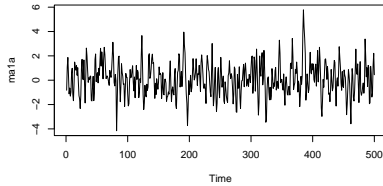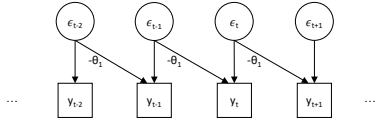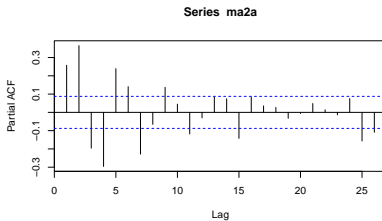$$y_t = \epsilon_t - \theta_1 \epsilon_{t-1} - \theta_2 \epsilon_{t-2}$$
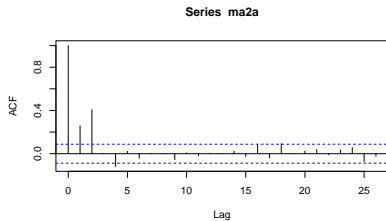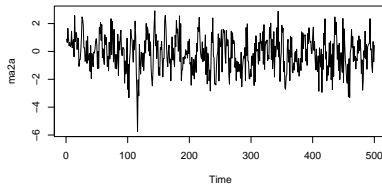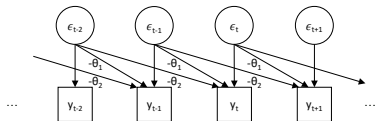
MA(2) process

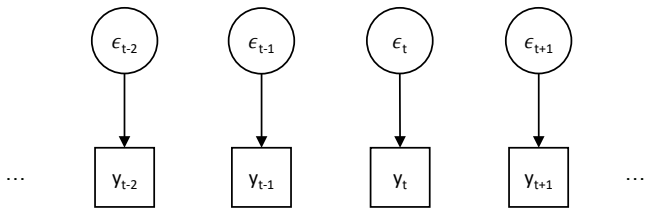$$y_t = \epsilon_t - \theta_1 \epsilon_{t-1} - \theta_2 \epsilon_{t-2}$$

Example MA(1): $y_t = \epsilon_t + 0.8\epsilon_{t-1}$

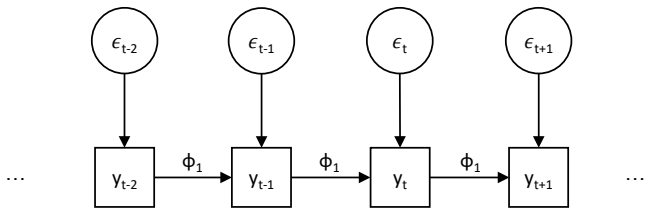# Example MA(2): $y_t = \epsilon_t + 0.2\epsilon_{t-1} + 0.8\epsilon_{t-1}$
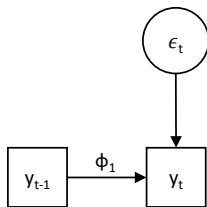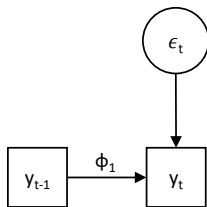
AR(1) process

$$y_t = \phi_1 y_{t-1} + \epsilon_t$$

AR(1) process

$$y_t = \phi_1 y_{t-1} + \epsilon_t$$
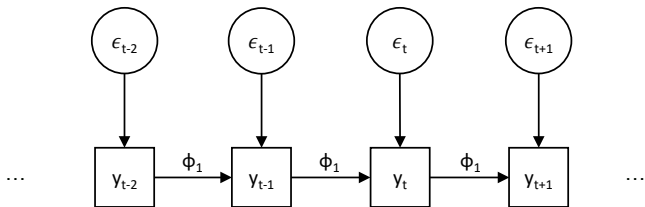
AR(1) process

$$y_t = \phi_1 y_{t-1} + \epsilon_t$$
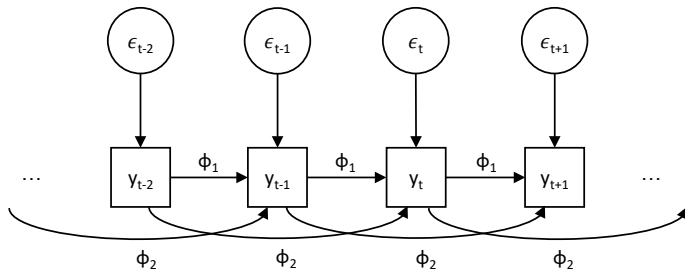
AR(1) process

$$y_t = \phi_1 y_{t-1} + \epsilon_t$$
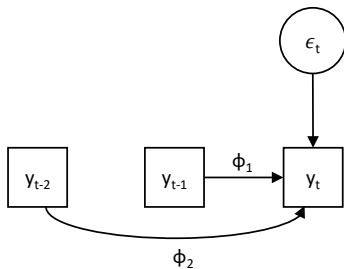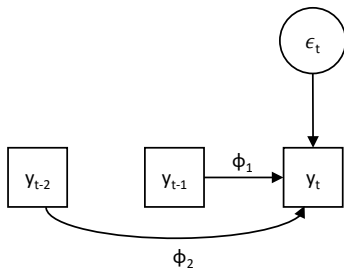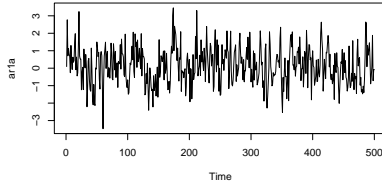
AR(2) process

$$y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \epsilon_t$$

AR(2) process

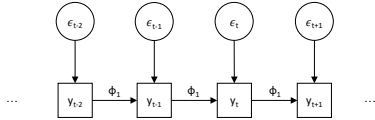$$y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \epsilon_t$$

AR(2) process

$$y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \epsilon_t$$
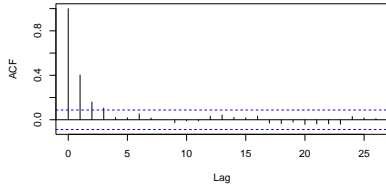
AR(2) process
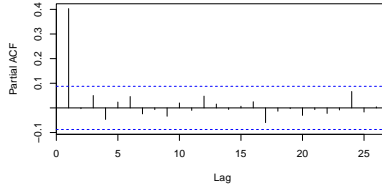

$$y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \epsilon_t$$
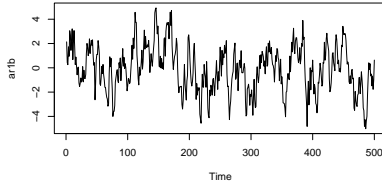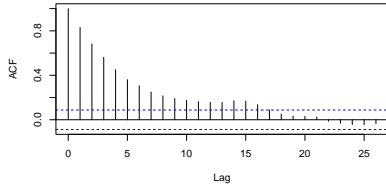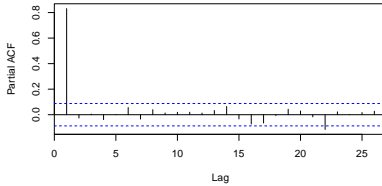
Example AR(1): $y_t = 0.4y_{t-1} + \epsilon_t$

Example AR(1): $y_t = 0.8y_{t-1} + \epsilon_t$
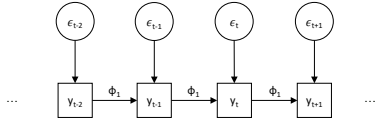
Example AR(1): $y_t = -0.6y_{t-1} + \epsilon_t$
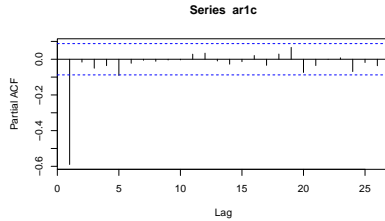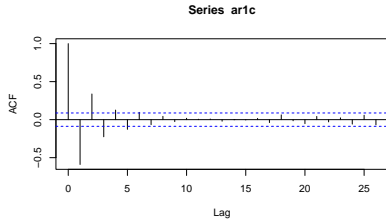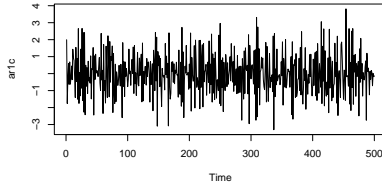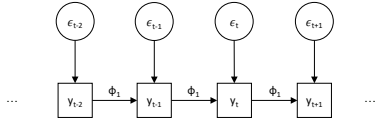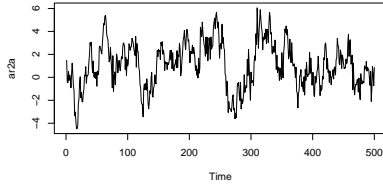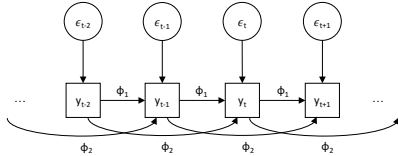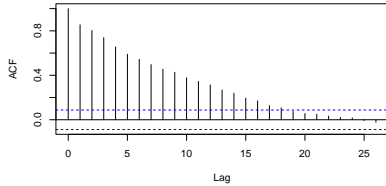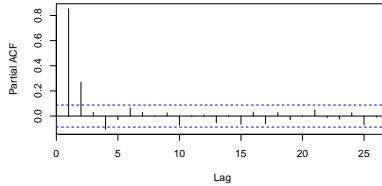
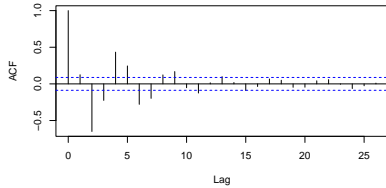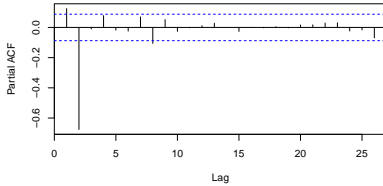# Example AR(2): $y_t = 0.6y_{t-1} + 0.3y_{t-2} + \epsilon_t$

Example AR(2): $y_t = 0.2y_{t-1} - 0.7y_{t-2} + \epsilon_t$
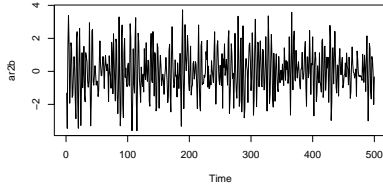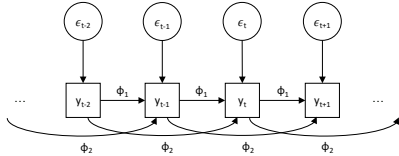
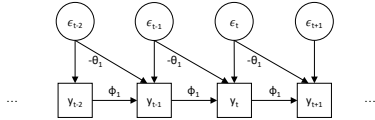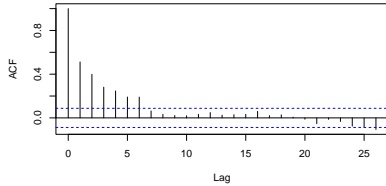# Example ARMA(1,1): $y_t = 0.6y_{t-1} + \epsilon_t - 0.4\epsilon_{t-1}$

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shaping tomorrow