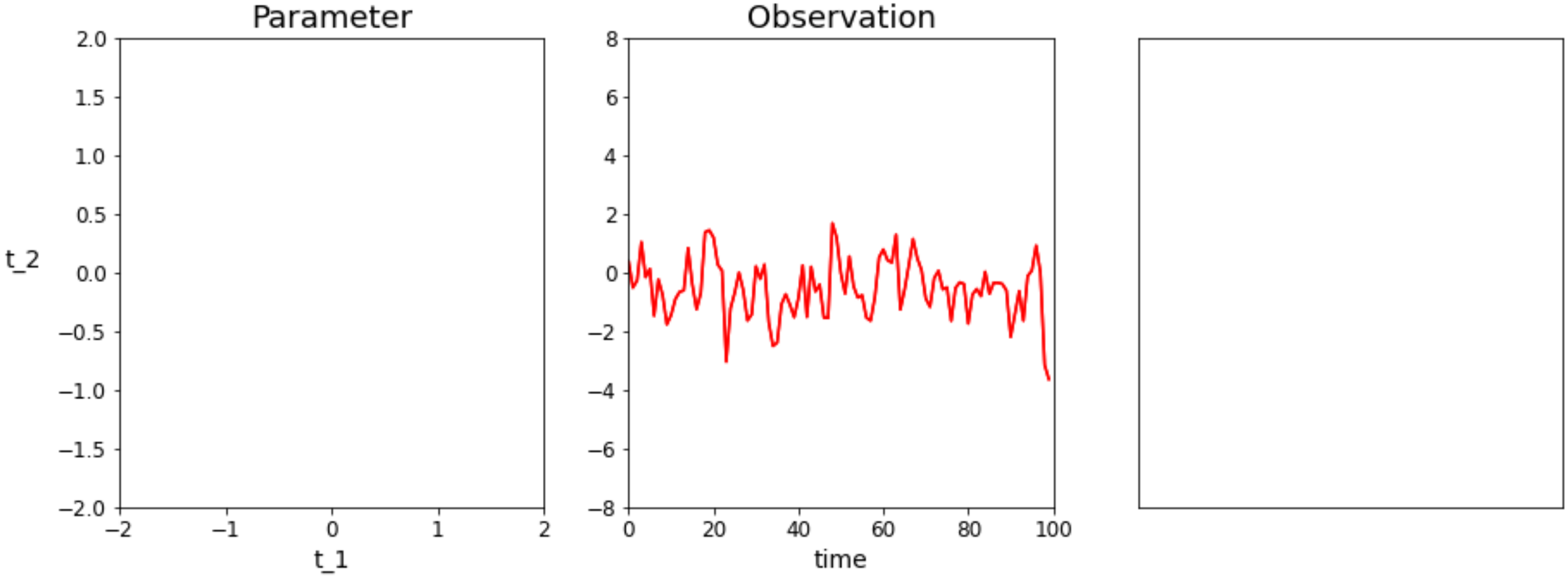
Example

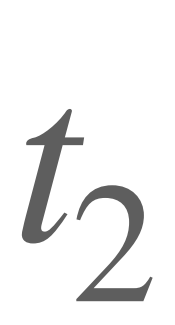
MA(2) model

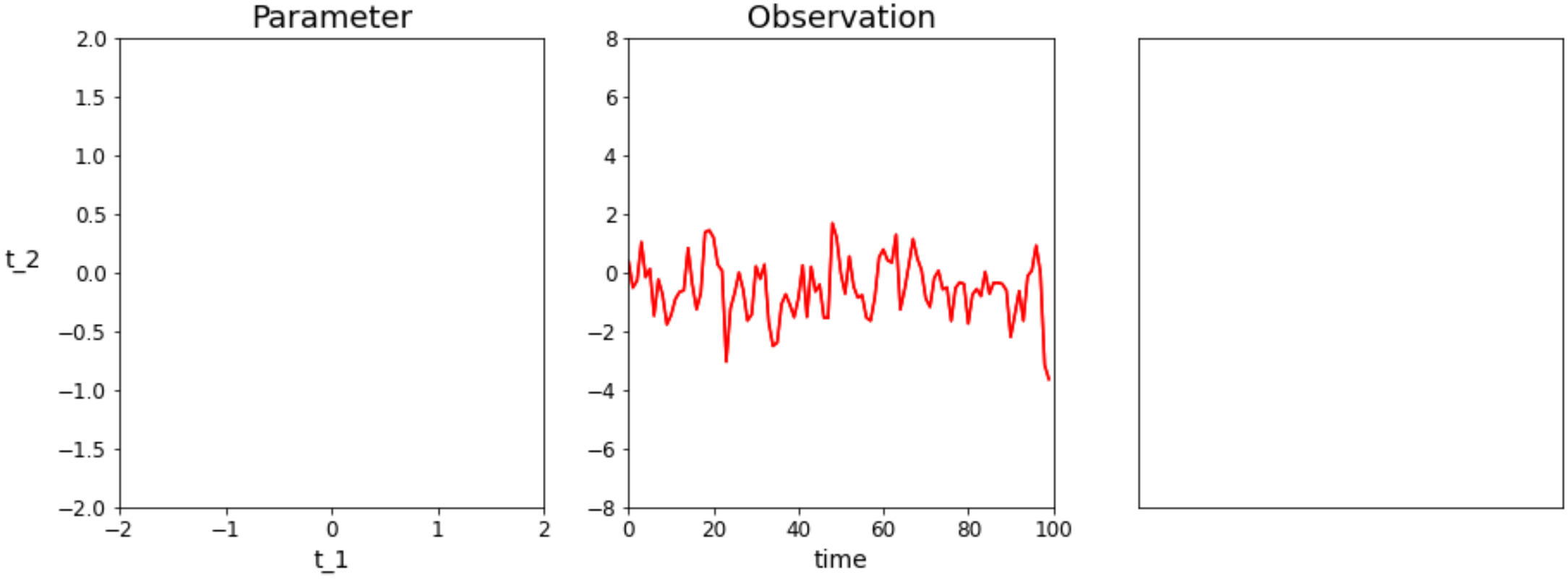
- Simple time series model

- $x_t = w_t + t_1 w_{t-1} + t_2 w_{i-2}, \quad w_t \sim \text{Normal}(0,1)$


Parameter
Observation
t_2
t_1
time
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2
−1
0
1
2
8
6
4
2
0
−2
−4
−6
−8
0
20
40
60
80
100

t_1


t_2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Example

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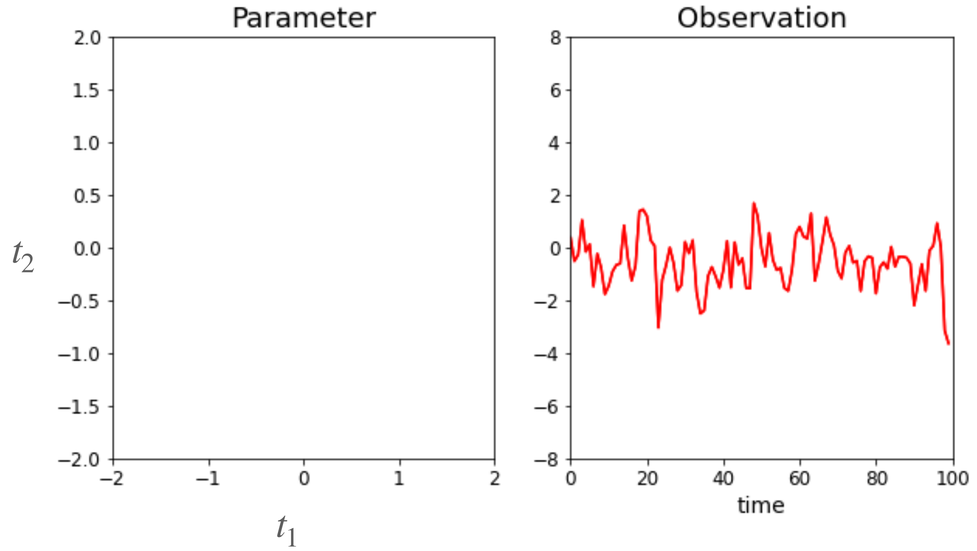

Example

Transmissions of bacterial infections in daycare centers.

- Cross-sectional data from a stochastic SIS-model
- Continuous-time Markov process with transition probabilities:

$$P(I_{is}(t+dt)=1 \mid I_{is}(t)=0) = \theta_1 \cdot E_s(I(t)) + \theta_2 \cdot P_s, \quad \text{if} \quad I_{i1}(t) + \cdots + I_{iN_s}(t) = 0$$
$$P(I_{is}(t+dt)=1 \mid I_{is}(t)=0) = \theta_3 \cdot (\theta_1 \cdot E_s(I(t)) + \theta_2 \cdot P_s), \quad \text{otherwise}$$
$$P(I_{is}(t+dt)=0 \mid I_{is}(t)=1) = \gamma$$

- $I_{is}(t)$ is the status of carriage of strain s for individual i.
- $E_s(I(t))$ is the probability of sampling the strain s
- θ_1 is the rate of transmission from other children at the DCC
- θ_2 is the rate of transmission from the community outside the DCC
- θ_3 scales the rate of an infected child being infected with another strain
- γ is the relative probability of healing from a strain (scaled to 1)