Advanced Time Series Analysis: Computer Exercise 2

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Part 1

There is generated $n = 1000$ noise samples from a $x \sim \mathcal{N}(0, 1)$ which is used as the noise input for `t` in all simulations in part one.

The equation below, eq. 1 and eq. **??**, determines the parameter set for the SETAR(2,1,1) model (eq. 4).

$$a_0 = [2.0, -1.0] \tag{1}$$

$$a_1 = [0.6, -0.9] \tag{2}$$

Simulation of the SETAR(2,1,1)

The Self-Exciting Threshold AR (SETAR) model is given by eq. 3.

$$X_t = a_0^{(J_t)} + \sum_{i=1}^{k_{(J_t)}} a_i^{(J_t)} X_{t-i} + \epsilon^{(J_t)} \tag{3}$$

where J_t are regime processes. The complete model are defined in eq. 4.

$$X_t = \begin{Bmatrix} a_{0,1} + a_{1,1} X_{t-1} + \epsilon_t & for & X_{t-1} \leq 0 \\ a_{0,2} + a_{1,2} X_{t-1} + \epsilon_t & for & X_{t-1} > 0 \end{Bmatrix} \tag{4}$$

The model X_t (eq. 4) has been simulated with two different set of parameters (eq. 1 - eq. **??**) and its simulations are plotted in fig. 1.

Fig. 1 shows the plot of the SETAR(2,1,1) model with the two different parameter sets.

- For both model it is possible to differentiate between the regimes and their transitions.
- It is also possible to see the inverse properties of the slop for the two models.
- Both models are using different offsets where the transition are most separated in the model which is using par_2.

Estimate the parameters using conditional least squares

see section 5.5 on page 115

```
RSSSetar <- function(theta) {
    p1 <- theta[1]
    p2 <- theta[2]
    ## Calculate the objective function value
    obj <- 1

    #
    return(obj)
}
```

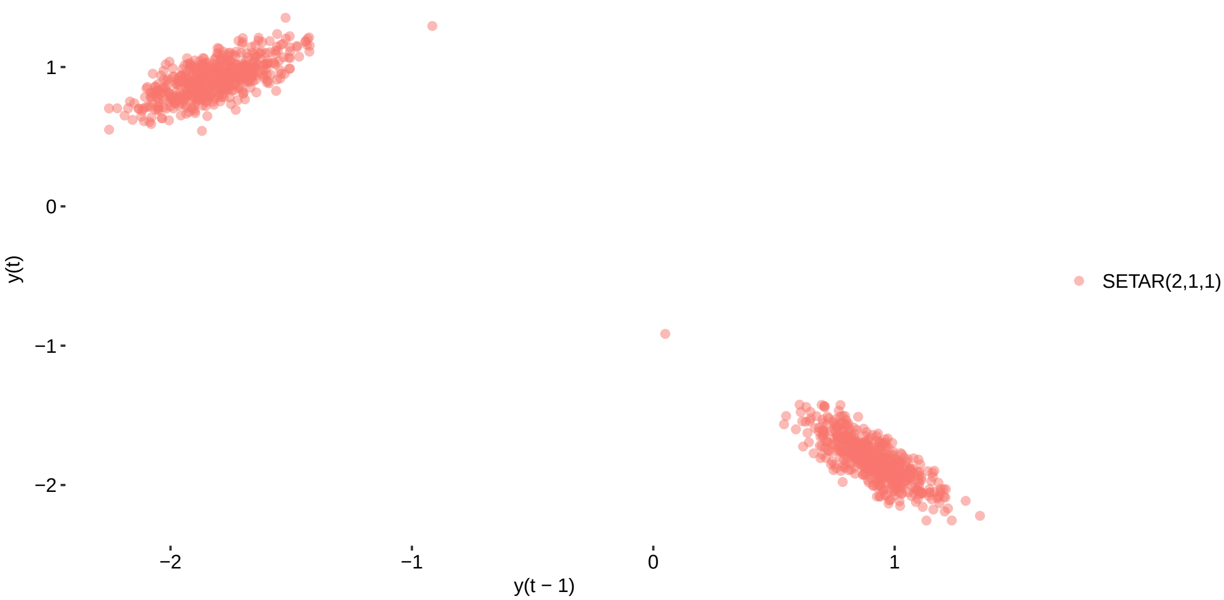

Figure 1: Two simulated SETAR(2,1,1) models using par_1 and par_2.