Replication of Lyubchich et al. (2020): A data-driven approach to detecting change points in linear regression models

Emi McGeady

2024-12-12

```
Warning: package 'funtimes' was built under R version 4.4.2
```

Regression Models

- (25%) Estimates in equations (8) and (9); retype the equations in this format in your report

$$\hat{y}_{1t} = -0.98\ (0.405) + 6.903101e-06\ (1.069109e-06)\ JanAprTNLoad_t, \tag{8}$$

$$\hat{y}_{2t} = -0.217\ (0.426) + 5.596 \cdot 10^{-6}\ (1.360 \cdot 10^{-6})\ JanMayTNLoad_t, \tag{9}$$

where $\hat{y}_{1t}$ is Chesapeake Bay early summer anoxic volumes, and $\hat{y}_{2t}$ is late summer anoxic volumes, $JanAprTNLoad_t$ is total nitrogen load from Susquehanna and Potomac Rivers during January–April, $JanMayTNLoad_t$ is total nitrogen load from Susquehanna River during January–May, and standard errors of the coefficients are shown in parentheses.

- (25%) Figure 3 (can provide a different look but preserve the superscripts in axes labels and labels for the lines in A and D; format as subfigures and not separate figures)
- (25%) Figure 4 (this figure can be presented as separate figures)
- (25%) Bootstrapped p-values (closely) corresponding to the two lines for CART in Table 2.

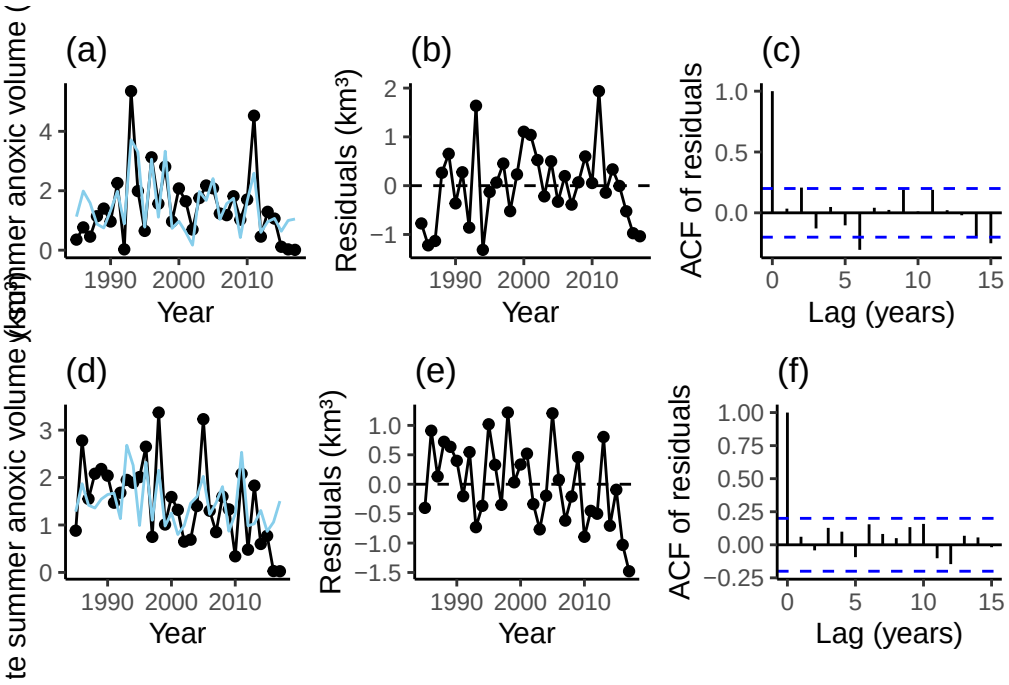

Figure 1: Regression models of anoxic volumes in Chesapeake Bay: (a) anoxic volumes in early summer, fitted with (8); (d) anoxic volumes in late summer, fitted with (9); (b, e) respective residuals; (c, f) sample autocorrelation functions (ACFs) of the residuals

Table 1: Bootstrapped p-values by CART Method

x
0.0216978
0.0072993