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

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2024-12-13

Regression Models

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Table 1: Regression Model Estimates

	Model	Variable	Coefficient	SE
(Intercept)	m8	(Intercept)	-0.9804024	0.4045868
JanAprTNLoad	m8	JanAprTNLoad	0.0000069	0.0000011
(Intercept)1	m9	(Intercept)	-0.2174008	0.4264990
JanMayTNLoad	m9	JanMayTNLoad	0.0000056	0.0000014

$$\hat{y}_{1t} = -0.980\ (0.405) + 6.903 \cdot 10^{-6}\ (1.069 \cdot 10^{-6})\ JanAprTNLoad_t, \tag{8}$$

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

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.

Table 2: Bootstrapped p-values by CART Method

x
0.0247975
0.0084992

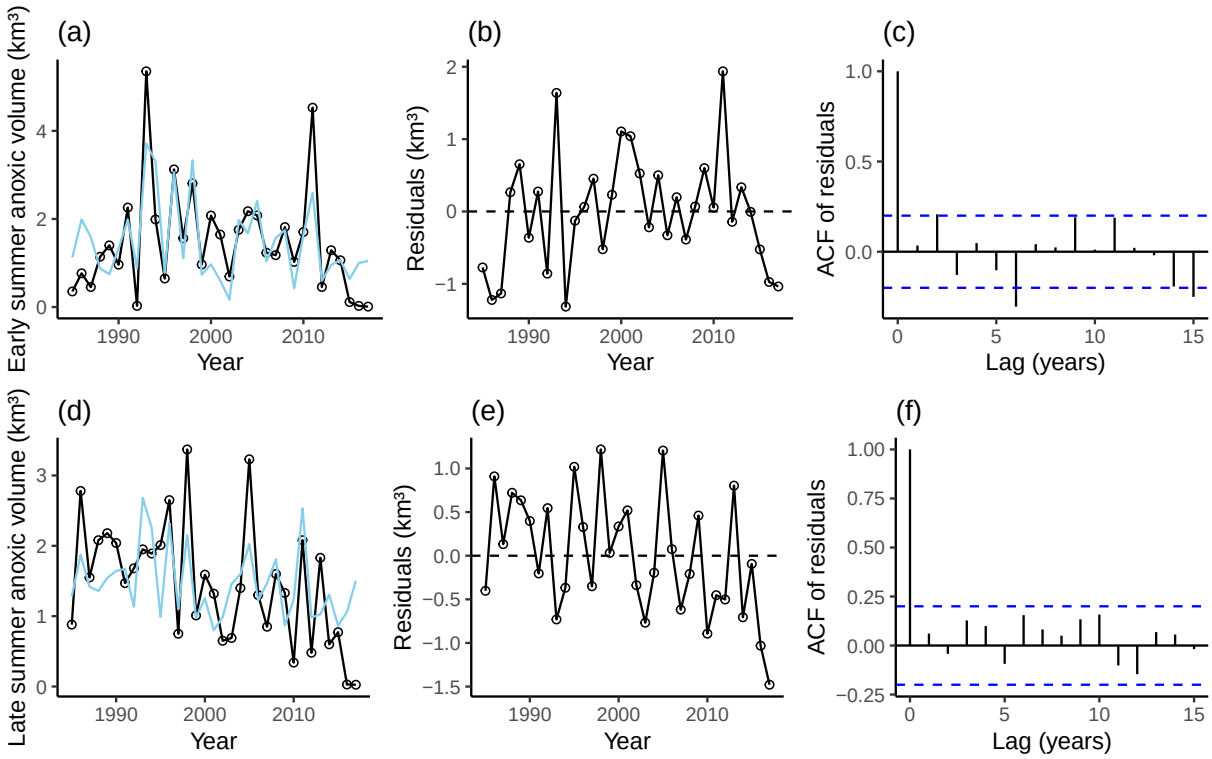

Figure 1: Regression models of anoxic volumes in Chesapeake Bay: (a) anoxic volumes in early summer, fitted with (8); (d) anoxic volumes in late summer, fitted with (9); (b, e) respective residuals; (c, f) sample autocorrelation functions (ACFs) of the residuals

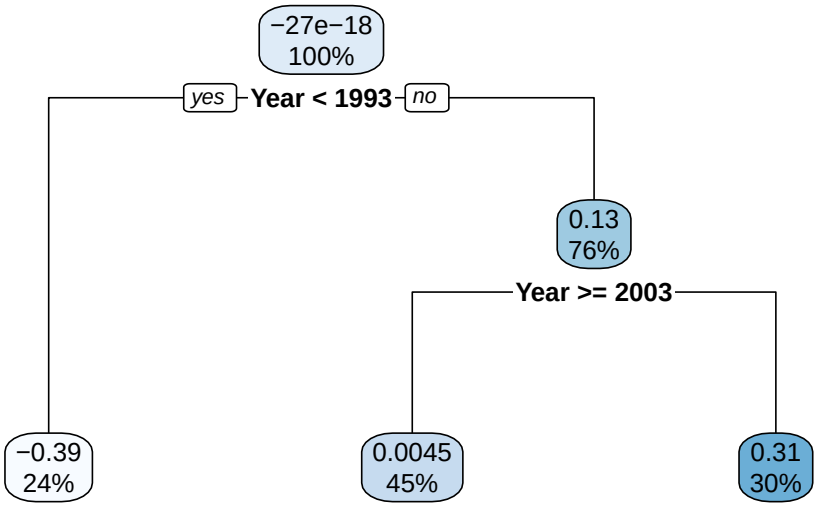

Figure 2: Classification and regression trees applied to residuals of (a) model (8) for anoxic volumes in early summer, and (b) model (9) for anoxic volumes in late summer. For each node, the average value of the residuals is reported along with the node size expressed as percentage of the total sample size T = 33

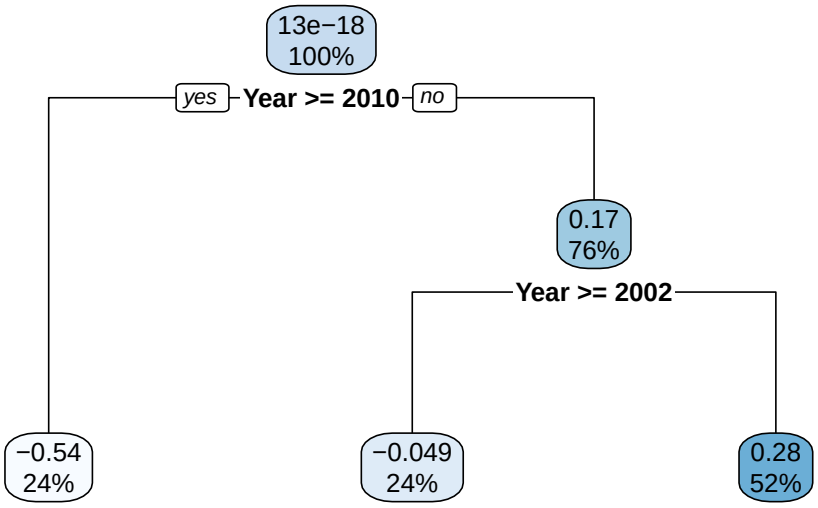

Figure 3: Classification and regression trees applied to residuals of (a) model (8) for anoxic volumes in early summer, and (b) model (9) for anoxic volumes in late summer. For each node, the average value of the residuals is reported along with the node size expressed as percentage of the total sample size T = 33