MATH 569 Statistical Learning

Part IV: Basis Expansions and Regularization

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Fig 5.1

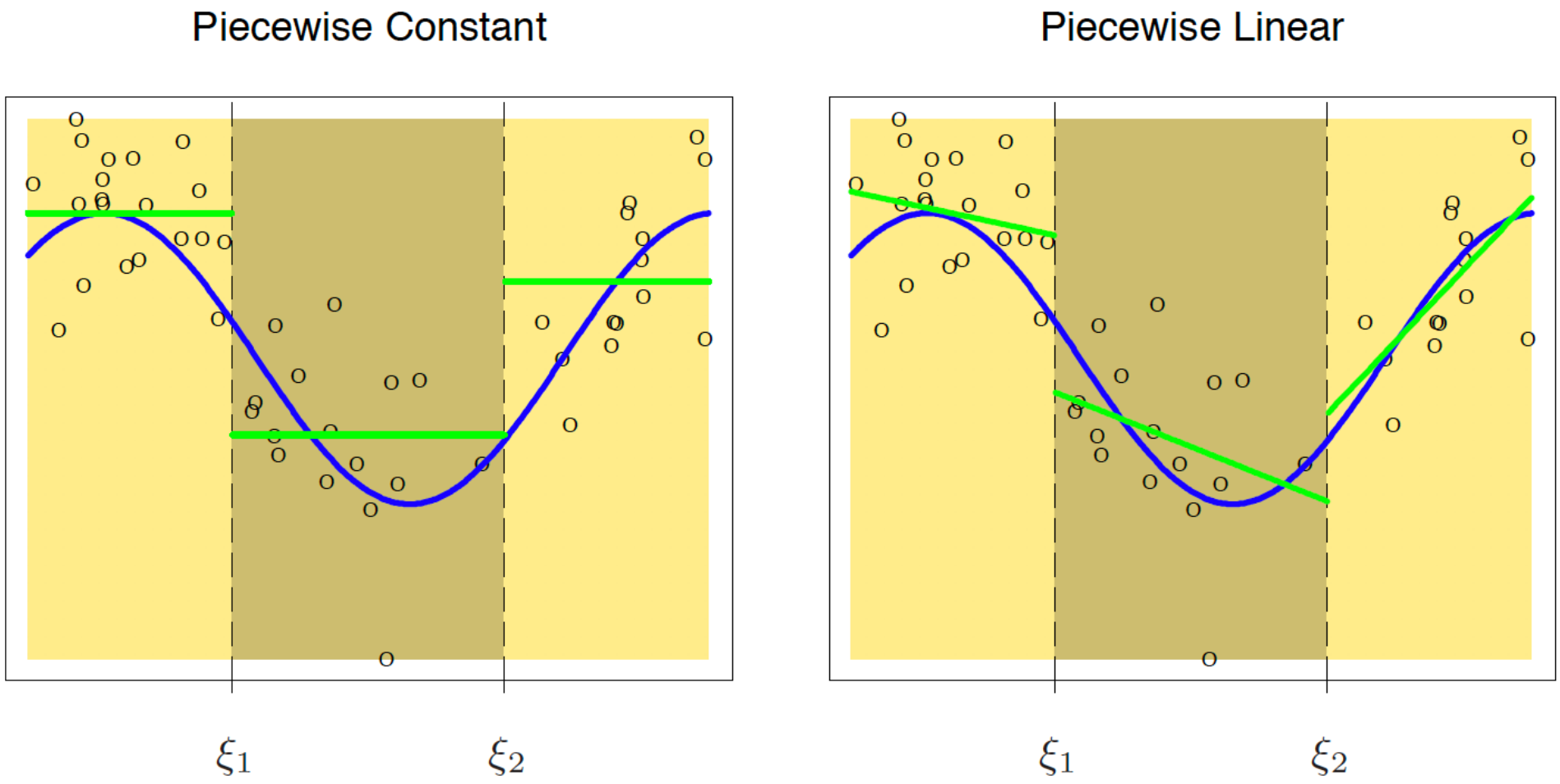


Fig 5.1

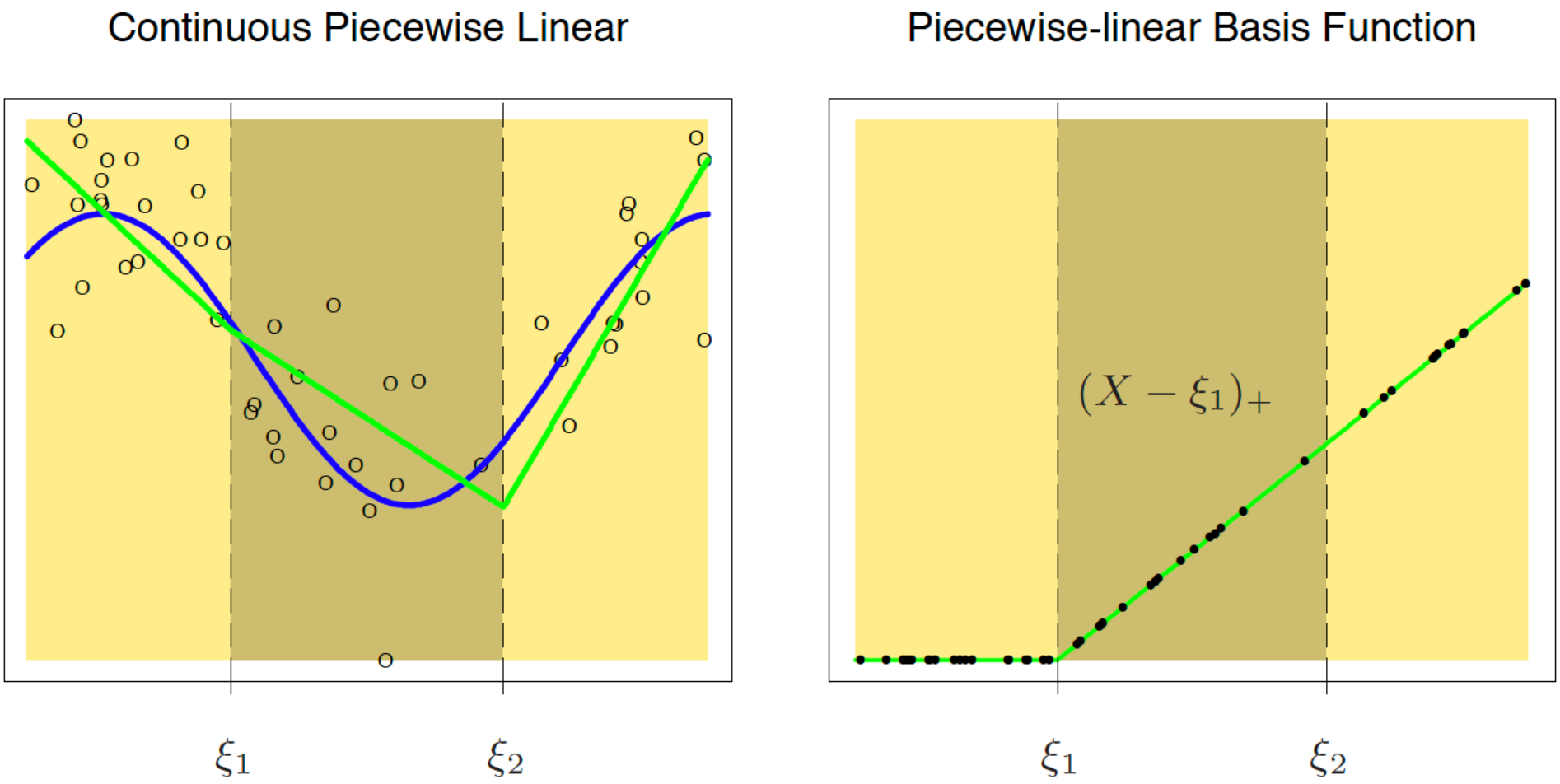

Continuous Piecewise Linear
Piecewise-linear Basis Function
$(X - \xi_1)_+$
ξ_1
ξ_2
ξ_1
ξ_2

Fig 5.2 Piecewise cubic polynomials

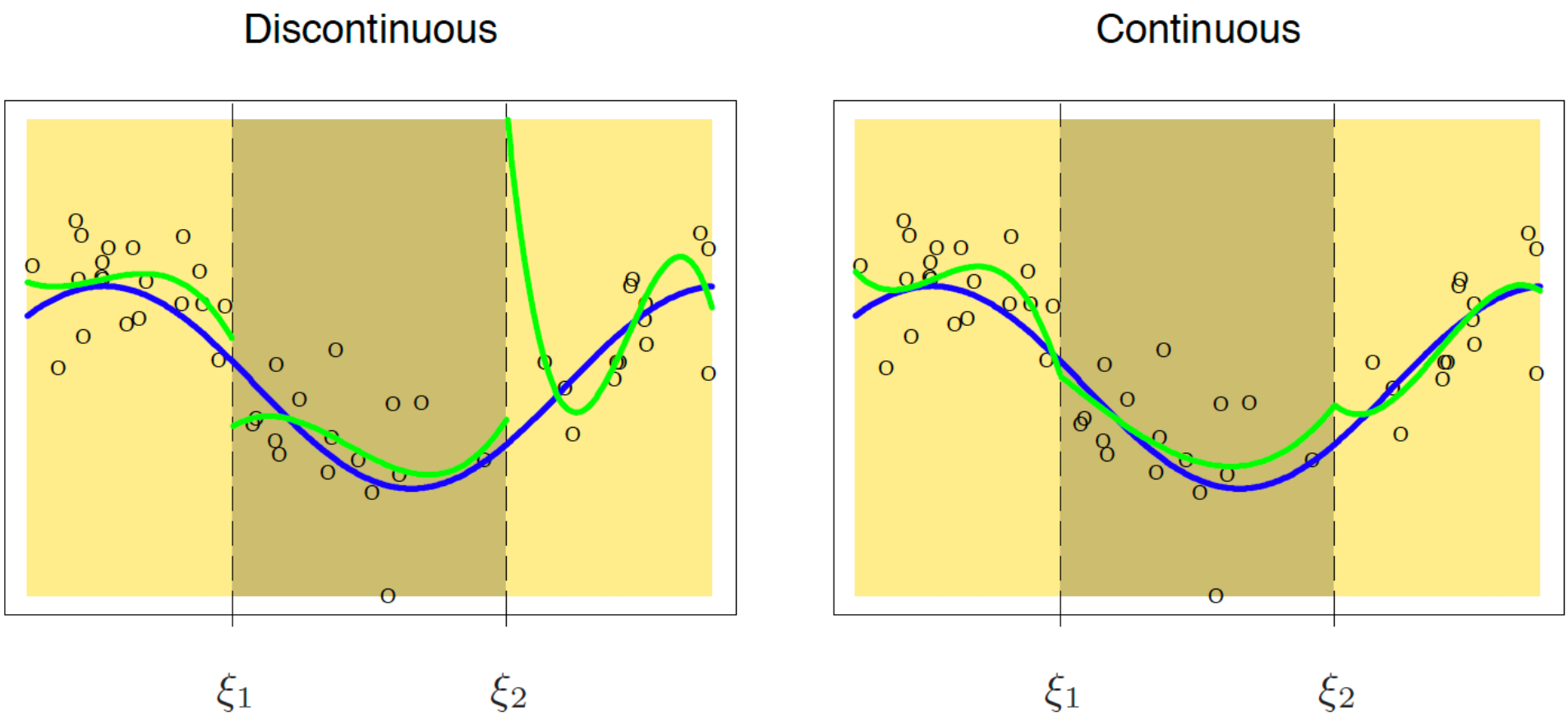


Fig 5.2 Piecewise cubic polynomials

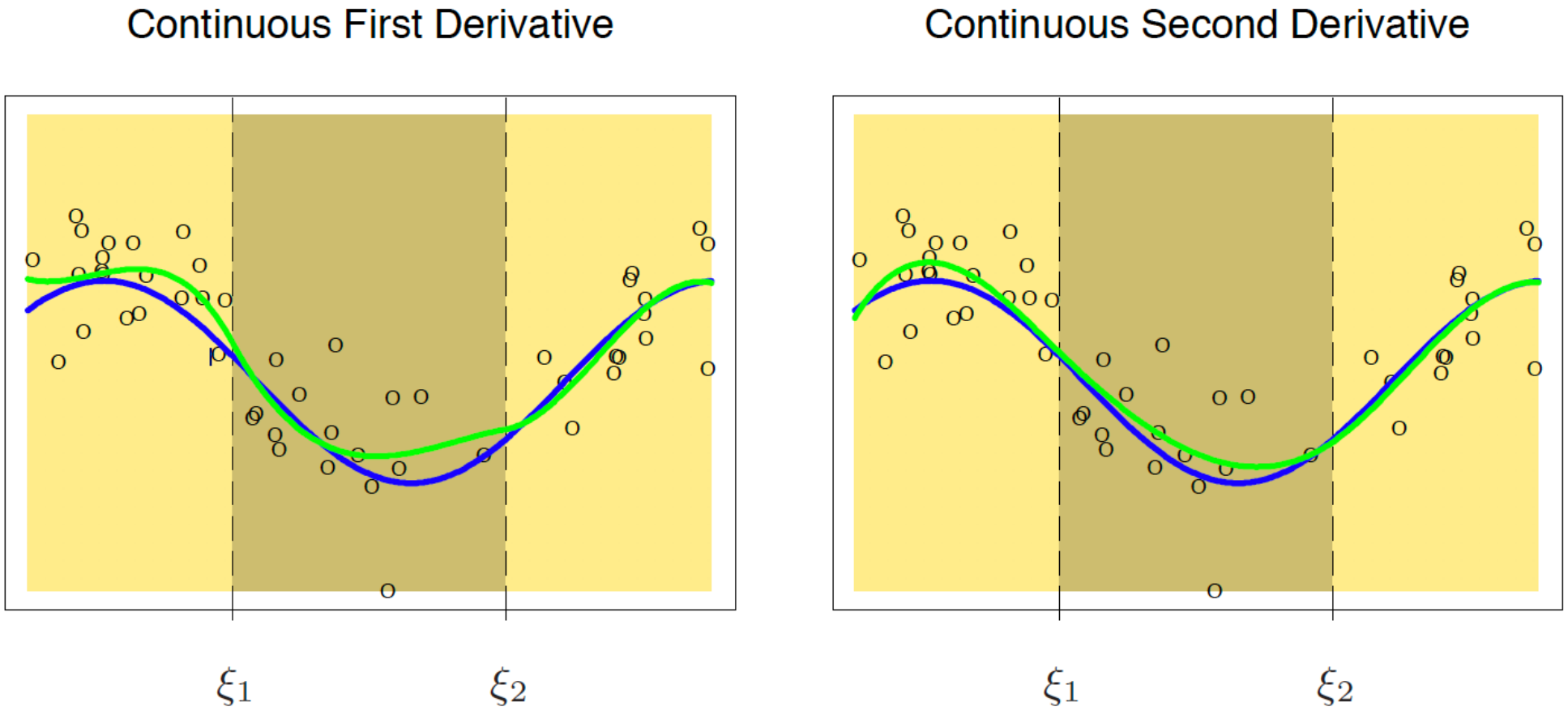


Fig 5.3 All models have boundary effect
(the explosion of the variance near the boundaries)
Cubic spline is the worst

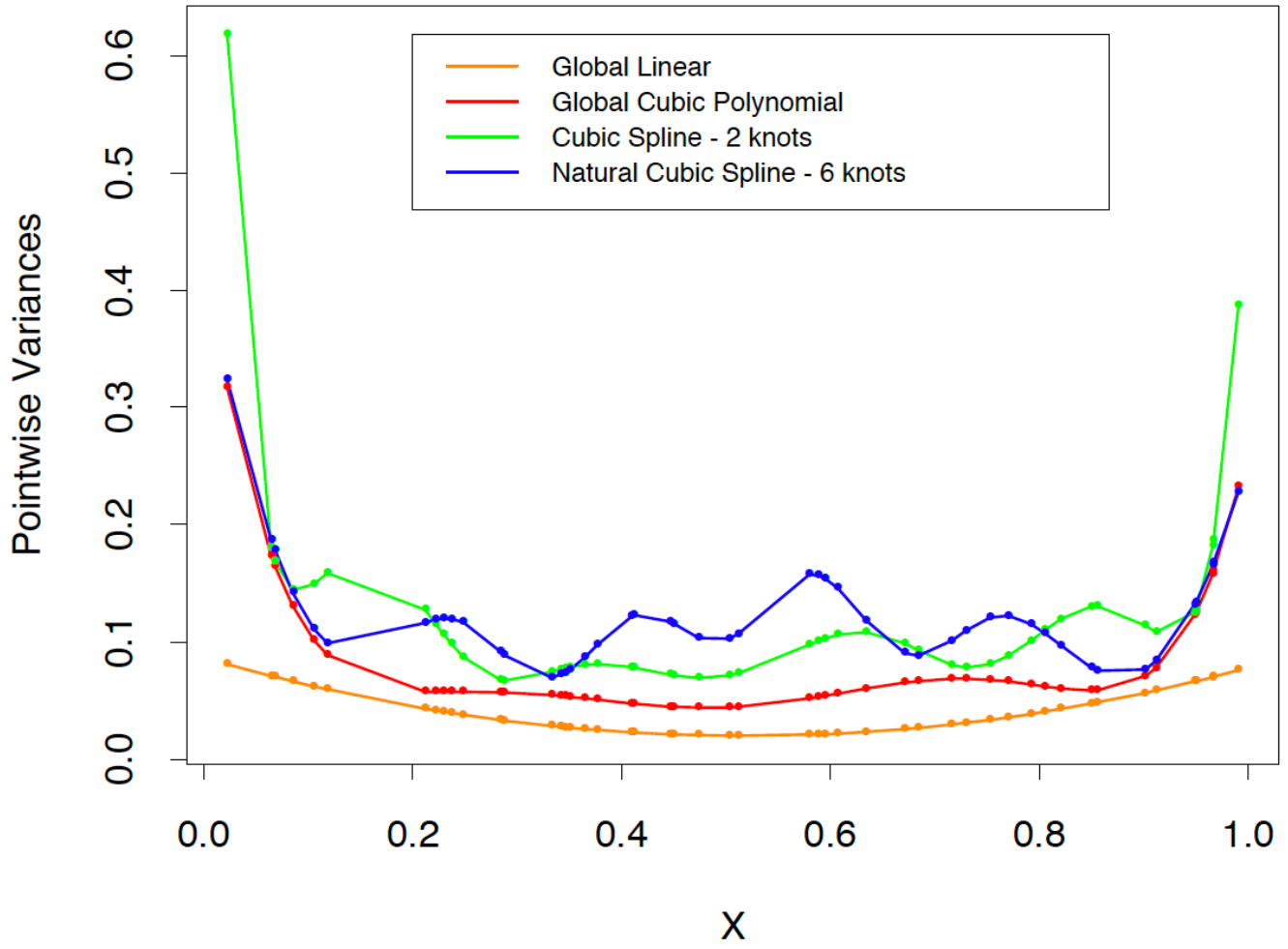
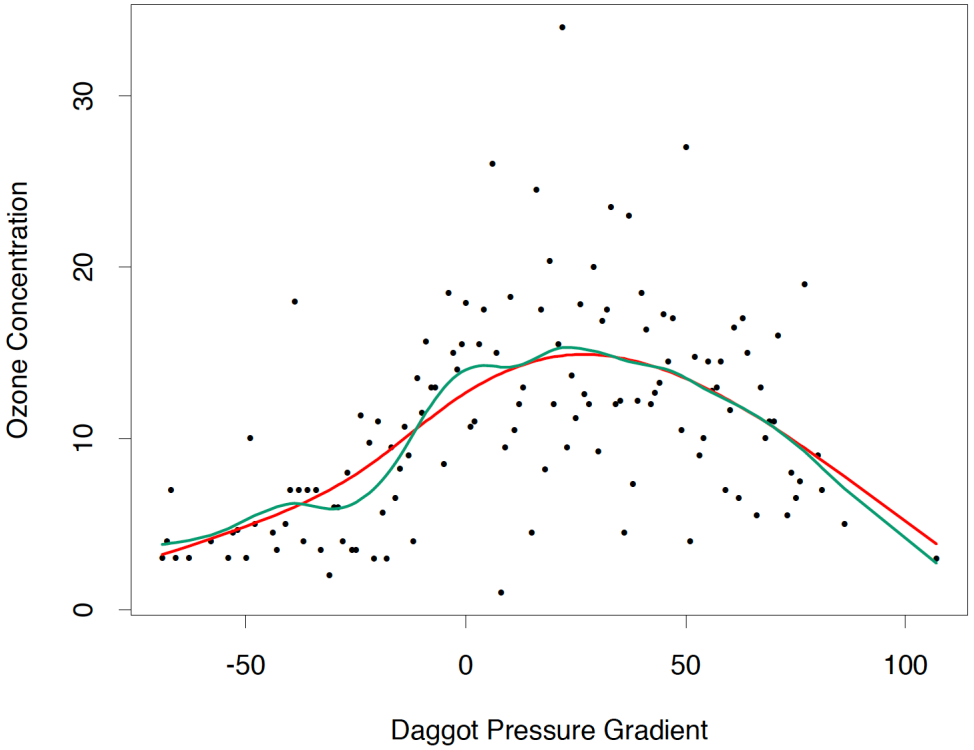
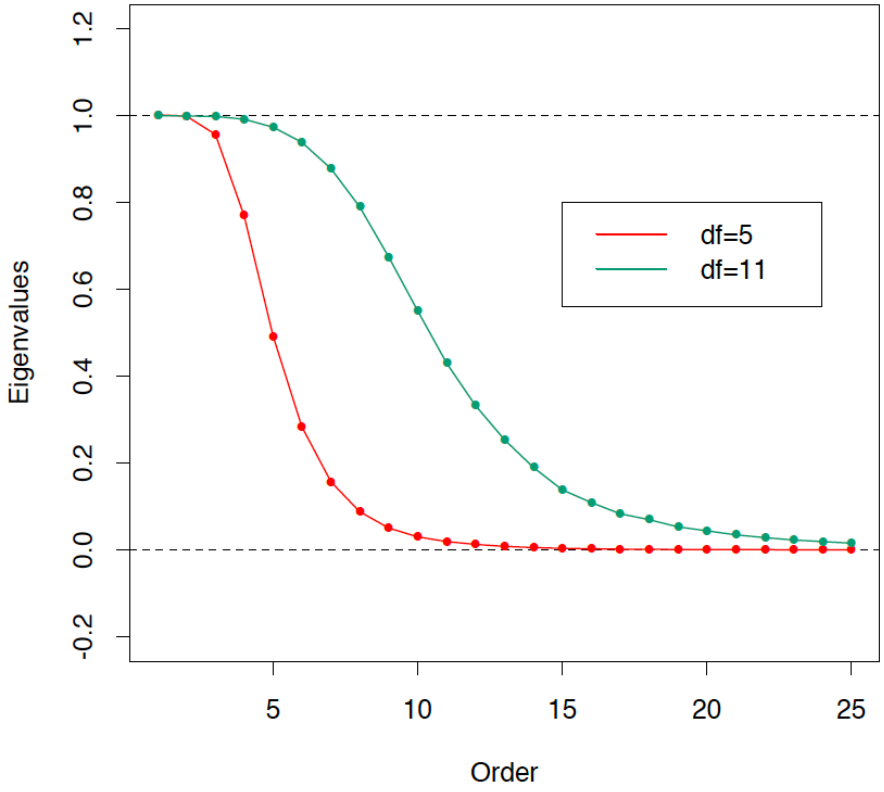


Fig 5.7 Smoothing spline fit
(ozone concentration versus Daggot pressure gradient)

smoothing splines

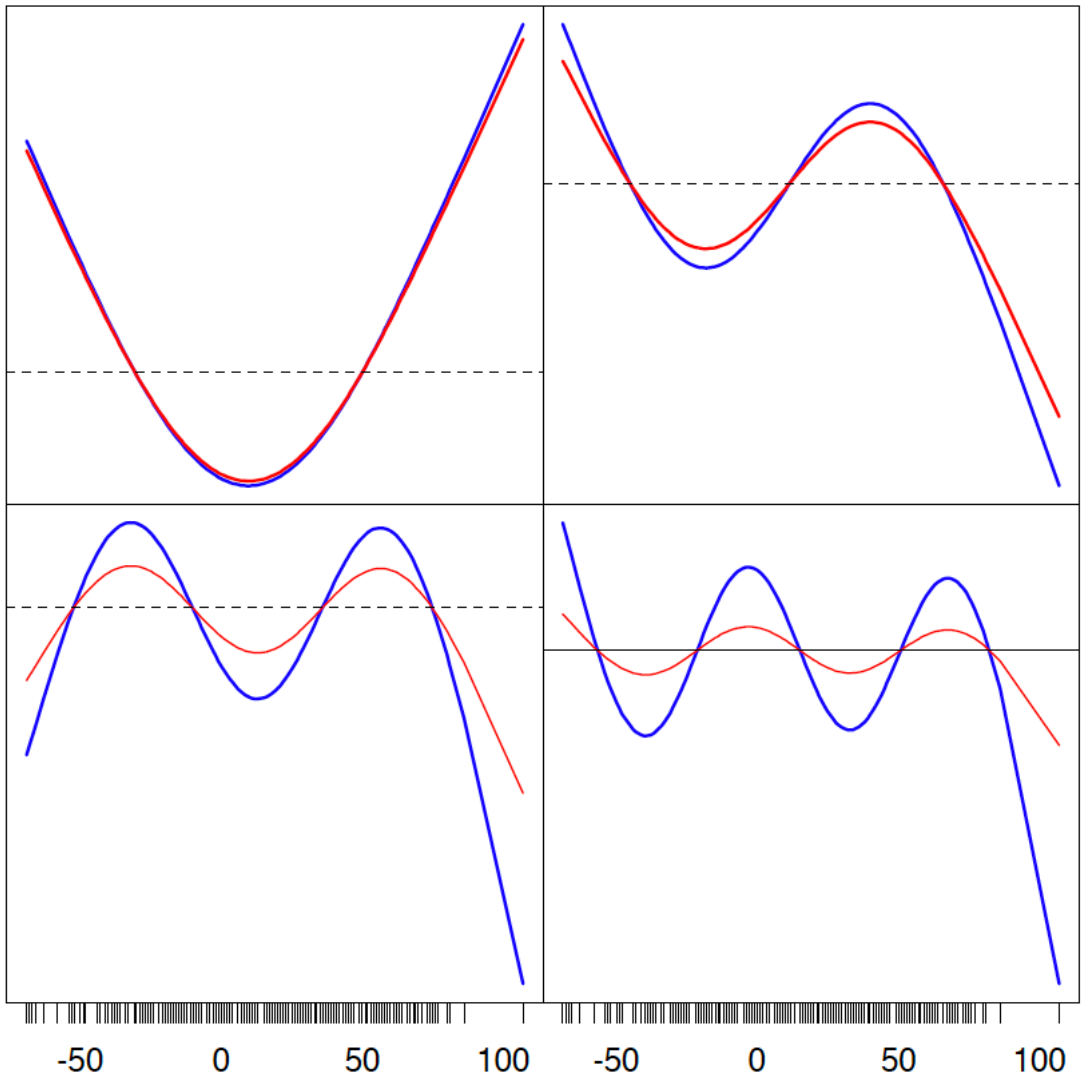


first 25 eigenvalues for the two smoothing-spline matrices (S).



Green curve with df = trace(S) = 11.
Red curve with df = trace(S) = 5.

Fig 5.7 p_k plotted against x
using df=5 as example



blue curve undamped
red curve damped

3rd, 4th
5th, 6th
Eigenvectors of S
Increased complexity
increased shrinkage
More shrinkage for large k

Fig 5.8 smoother matrix (S) is nearly banded