Functional Regression
Using the `fda` Package in R

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Ramsay, Hooker and Graves (2009) *Functional Data Analysis with R and Matlab* (Springer)

This Presentation

- What Is Functional Regression?
- Different types of Functional Regression
- fRegress.numeric: Scalar Response
- fRegress.fdPar: Concurrent Functional Model
- fRegress.formula: Simple fRegress Setup
- linmod: Full Integration Regression
- pda.fd: Estimating a Differential Equation
- Closing Remarks
- References

What Is Functional Regression?

Functional regression = fitting a model where the response or an explanatory variable is a function.

Different types of Functional Regression

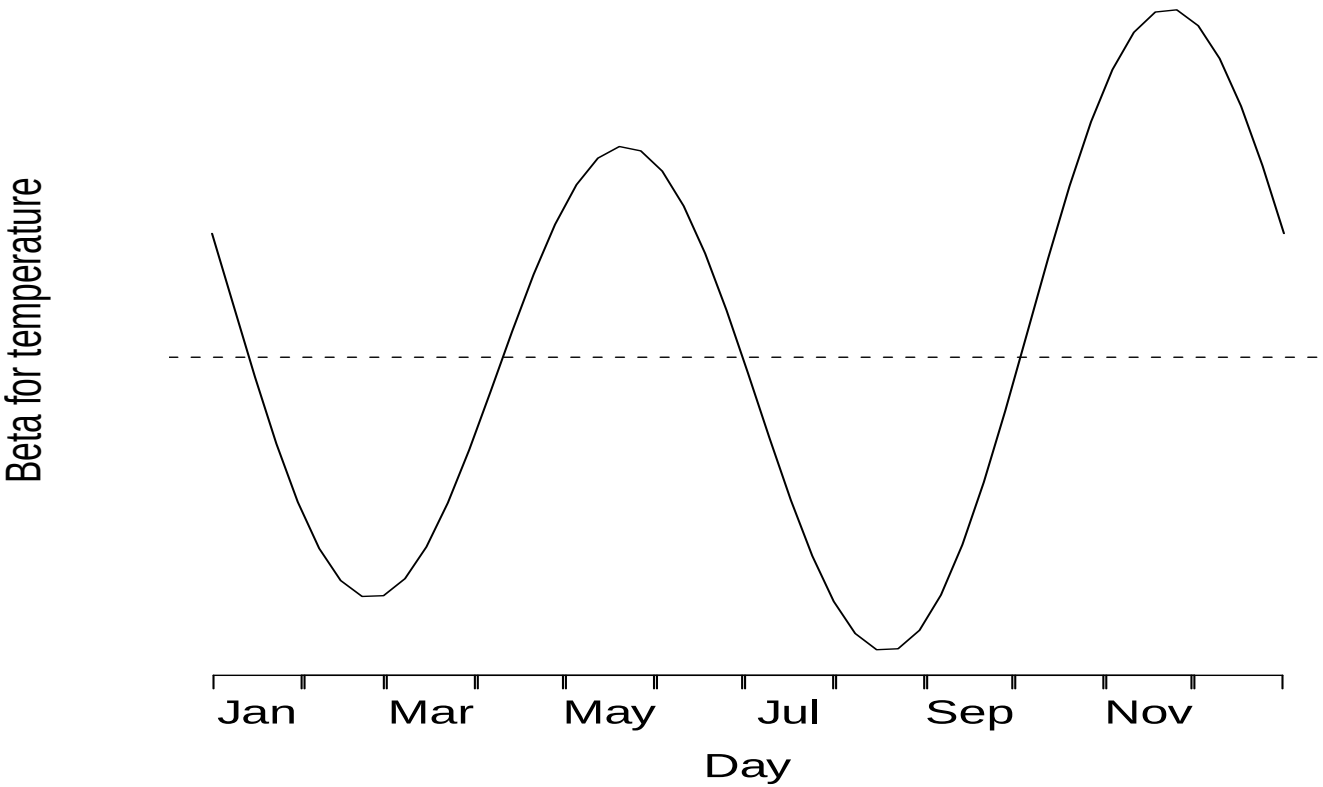
Functional regression = fitting a model where the response or an explanatory variable is a function.

	Explanatory Variable	
response	*scalar*	*function*
scalar	lm	fRegress.numeric
function	fRegress.fdPar	fRegress.fdPar / linmod / pda.df

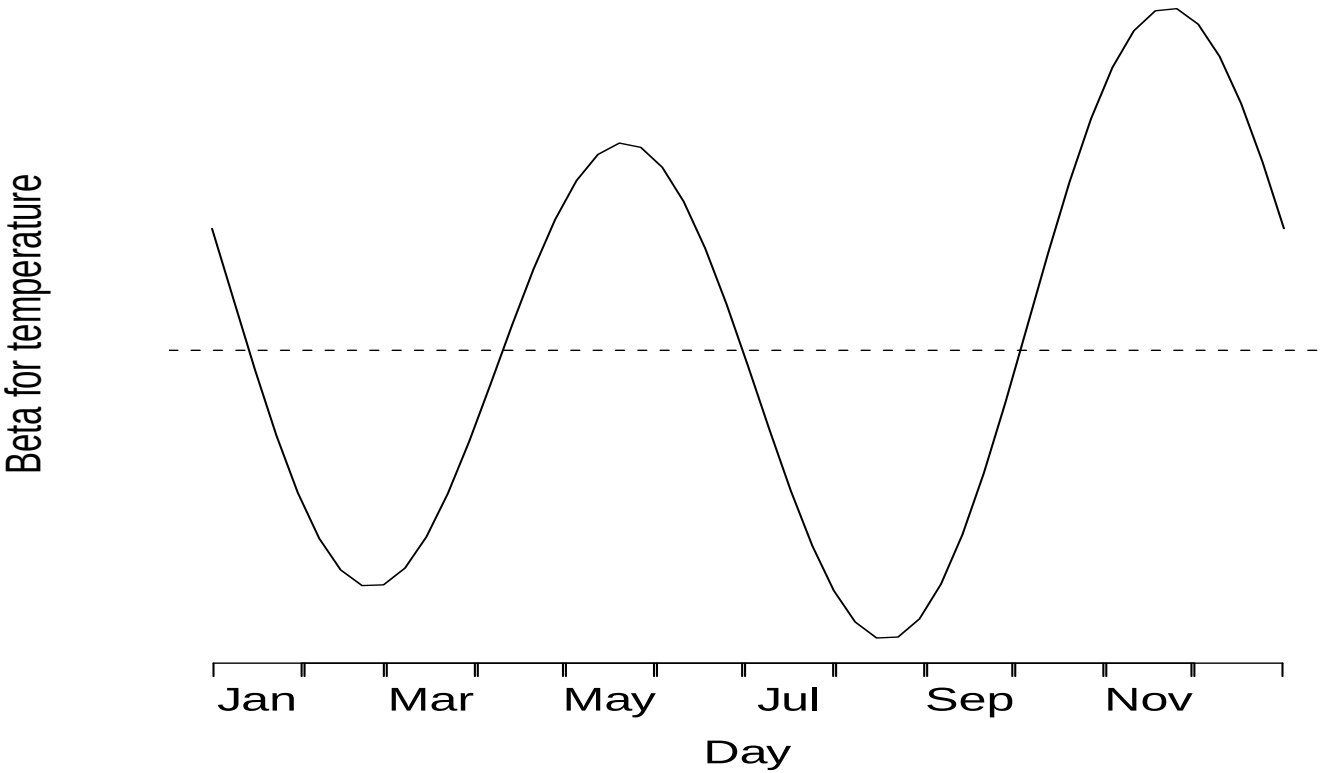
fRegress.numeric: Scalar Response

$$y_i = \alpha_0 + \int x_i(t)\beta(t)dt + \epsilon_i.$$

`log(annual precipitation) ~ (temperature profile)`



log(annual precipitation) ~ temperature(t)



Conclusion: Wetter locations tend to be cooler in February and August and warmer in May and November

Ramsay, Hooker, Graves (2009, Fig. 9.1)

fRegress.fdPar: Concurrent Functional Model

Ramsay, Hooker and Graves (2009) *Functional Data Analysis with R and Matlab* (Springer,ch. 10)

fRegress.formula: Simple fRegress Setup

linmod: Full Integration Regression

Ramsay, Hooker and Graves (2009) *Functional Data Analysis with R and Matlab* (Springer, ch. 10)

pda.fd: Estimating a Differential Equation

Ramsay, Hooker and Graves (2009) *Functional Data Analysis with R and Matlab* (Springer, ch. 11)

Closing Remarks

References