11 Confounding and interaction in regression

Applied regression analysis and other multivariate methods

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Preview

Two goals in a regression analysis

- To predict the dependent variable (Y), to find a model
- To quantify the relationship between X and Y, to produce statistical inference about coefficients

The second goal is of paticular interest in clarufying a causal process

Overview

- Interaction
  - The relationship of interest is different at different levels of the extraneous variables
  - e.g., dose the PAL-SBP relationship vary with AGE
  - Require a statistical test
- Confounding
  - Meaningfully different interpretations of the relationship of interest result when the extraneous variable is ingnored or included
  - e.g., dose the PAL-SBP relationship vary if we ignore AGE
  - Comparison between a crude estimate of an association and an adjusted one
  - Do not require a statistical test

Interaction

Case 1

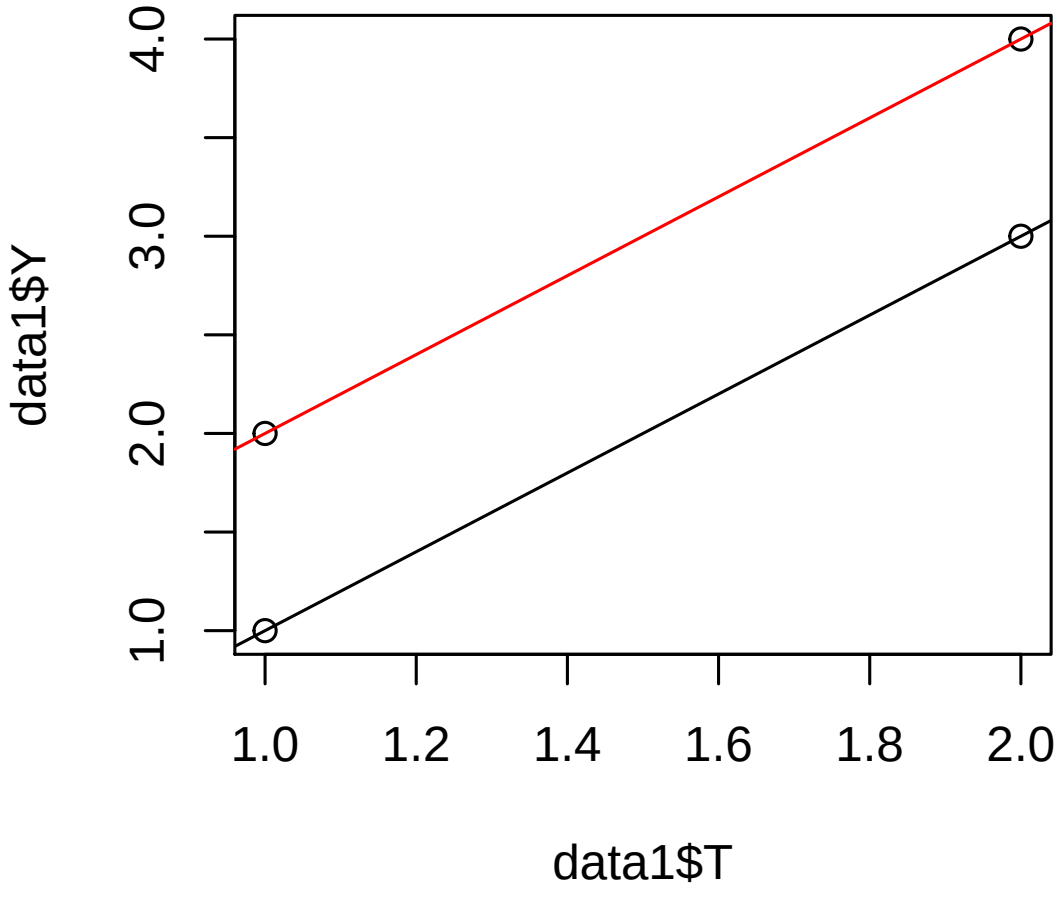

Table 1:

	Y	
	black	red
	(1)	(2)
T	2	2
Constant	−1	0
Observations	2	2
R^2	1	1
Note:	*p<0.1; **p<0.05; ***p<0.01	

Case 2

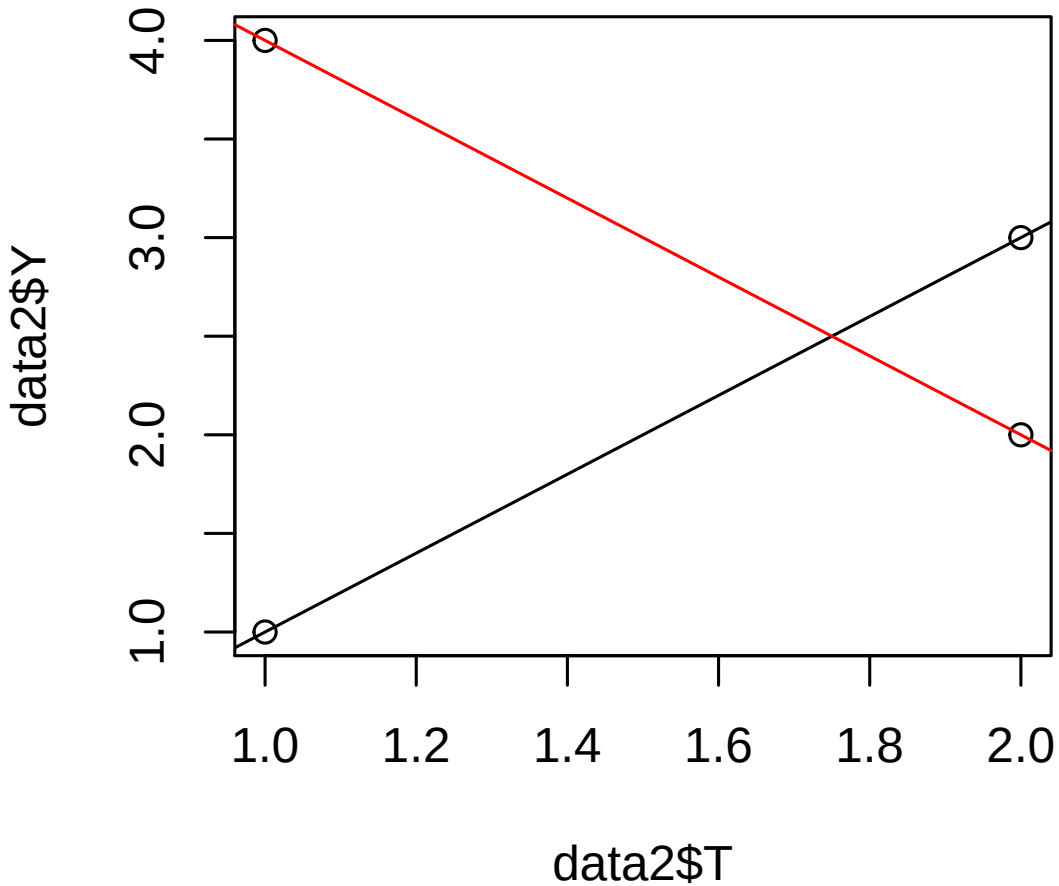

Table 2:

	Y		
	black	red	total
	(1)	(2)	(3)
T	2	−2	6
C			7
T:C			−4
Constant	−1	6	−8
Observations	2	2	4
R^2	1	1	1
Note:	*p<0.1; **p<0.05; ***p<0.01		

Interaction modeling in general

Three approaches to spicify which terms to include

- interactions resonable a prior based on literature and expertise
- a full set of product terms
- interaction with the primary factors

Effect modification

Effect-measurement modification

- Variation in the magnitude of a measure of exposure effect across levels of another variable
- A finding to be reported
- `Statistics` and `epidemiology`
- heterogeniety of effect, nonuniformity of effect, effect variation
- risk-difference modification vs. risk-ratio modification
- the presence/abscence of (statistical) interaction is decided by the (epidemiological) scale (difference/ratio)

Confounding

We have to determine subjectively

- A bias to be avoided
- Confounding should take precedence over precision
- Interactino should take precedence over confounding