

QUESTIONNAIRES AND BEYOND: THE RASCH MODEL

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1 The intuition

2 The model

3 Wait...

4 Why is it useful?

5 Closing time

Q1

$$4 + 5 = ?$$

Q2

$$\frac{3}{2} + \frac{5}{4} = ?$$

Q1

$$4 + 5 = ?$$

d_{q1}

Q2

$$\frac{3}{2} + \frac{5}{4} = ?$$

d_{q2}



A_{Bart}

Q1

$$4 + 5 = ?$$

d_{q1}

Q2

$$\frac{3}{2} + \frac{5}{4} = ?$$

d_{q2}



A_{Lisa}

$$\frac{A_p}{d_i} \quad (1)$$

$$> 1 \text{ if } A_p > d_i$$

$$< 1 \text{ if } A_p < d_i$$

$$P(X_{pi} = 1) = \frac{\frac{A_p}{d_i}}{1 + \frac{A_p}{d_i}} \quad (2)$$

① The intuition

② **The model**

③ Wait...

④ Why is it useful?

⑤ Closing time



$$\ln(A_p) = \beta_p$$

$$\ln(d_i) = \delta_i$$

$$P(X_{vi}|\beta_p, \delta_i) = \frac{\exp(\beta_p - \delta_i)}{1 + \exp(\beta_p - \delta_i)} \quad (3)$$

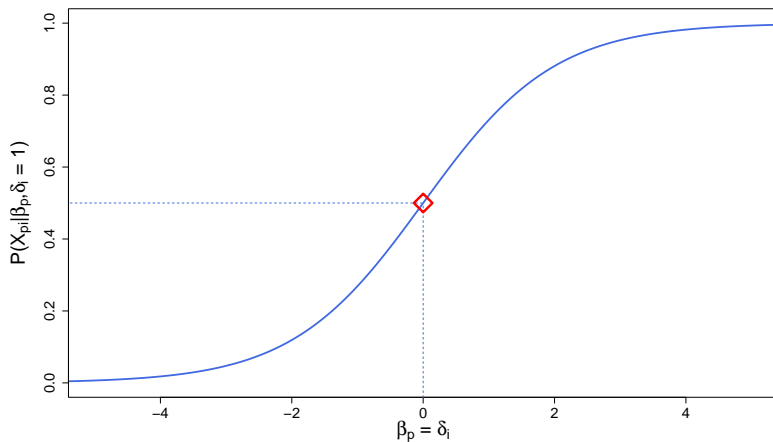
The intuition
○○

The model
○○●

Wait...
○○

Why is it useful?
○○○○

Closing time
○○○



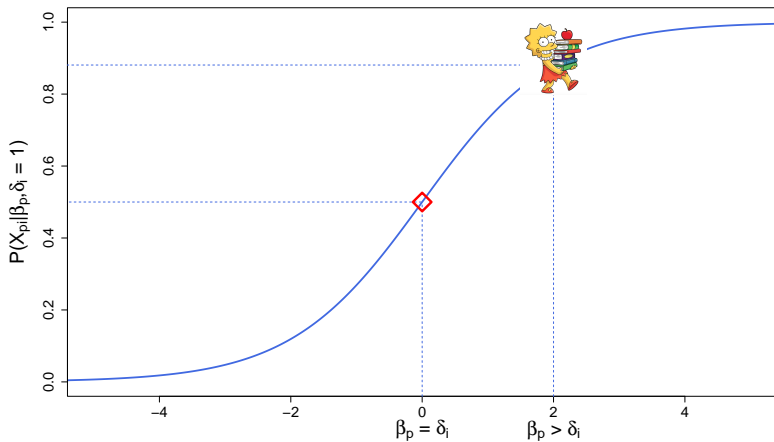
The intuition
○○

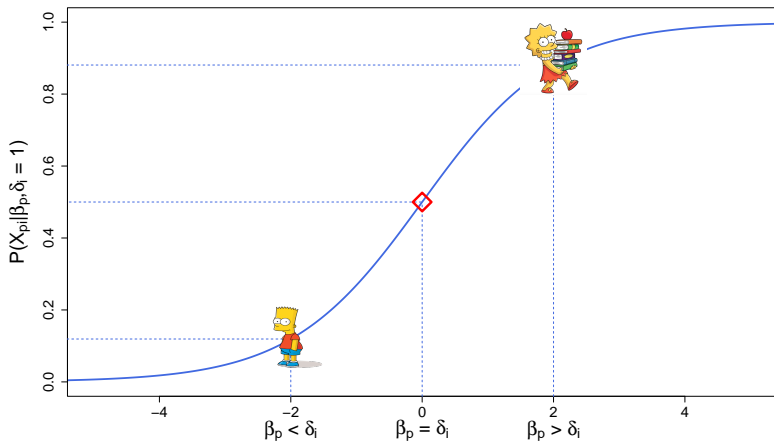
The model
○○●

Wait...
○○

Why is it useful?
○○○○

Closing time
○○○





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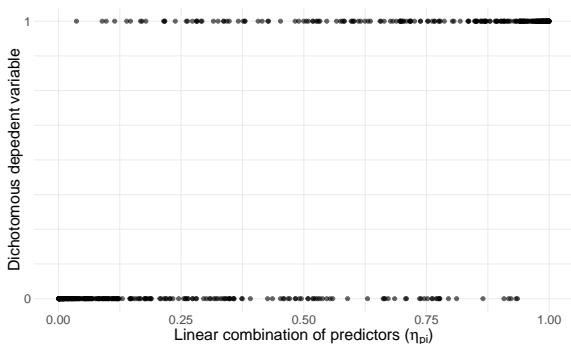
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Generalized Linear Model (GLM)

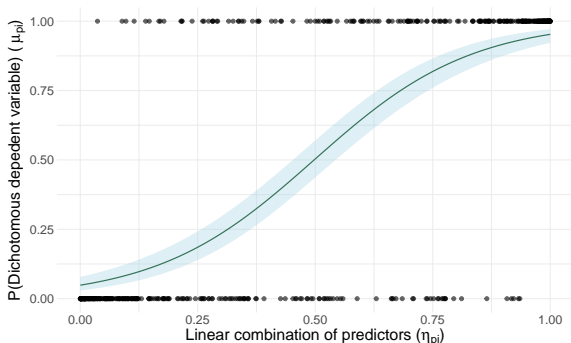
binomially distributed responses

Generalized Linear Model (GLM) binomially distributed responses



$$\mu_{pi} = g(\eta_{pi}) = \log \left(\frac{\mu_{pi}}{1 - \mu_{pi}} \right)$$

Generalized Linear Model (GLM) binomially distributed responses



$$\mu_{pi} = g(\eta_{pi}) = \log \left(\frac{\mu_{pi}}{1 - \mu_{pi}} \right)$$

$$g^{-1} = \frac{\exp(\eta_{pi})}{1 + \exp(\eta_{pi})}$$

① The intuition

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Rasch model: Dichotomous responses

Rasch model: Dichotomous responses

Issue

Quite limiting in Psychological Research

Rasch model: Dichotomous responses

Issue

Quite limiting in Psychological Research

(Generalized) Linear Model: “Any” kind of response

Rasch model: Dichotomous responses

Issue



















Quite limiting in Psychological Research



















(Generalized) Linear Model: “Any” kind of response

e.g.: Response times

log-transformation and log-normal model parametrization



















**Linearity of
the scores
Comparison
invariance
Local
independence**

	Condition A			Condition B		
Francesco						
Giulia						
Jessica						

	Condition A			Condition B		
Francesco						
Giulia						
Jessica						



Local independence



















	Condition A			Condition B		
Francesco						
Giulia						
Jessica						



Local independence

Rasch model

Generalized Linear Model

	Condition A			Condition B		
Francesco						
Giulia						
Jessica						



Local independence

Rasch model

- Can't be applied
- The estimates would make no sense

Generalized Linear Model

- Add the random part (Go Mixed)
- Obtain a Rasch-like parametrization of the data

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- Think outside of the box
- Rasch estimates vs. Rasch-like parametrization
- The sky is the limit
- Don't over complicate things
- Keep it maximal vs. Keep it minimal



Thank you