Package ‘rcrtan’

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Title Criterion-Referenced Test Analysis
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Description Contains methods for criterion-referenced test analyses as described in Brown & Hudson (2002). This includes cut-score item discrimination analyses and measures of dependability.
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agree_stat

Description
Calculate Agreement statistic

Usage
agree_stat(data, items, cut_score, scale = "raw")

Arguments
data A data frame of dichotomously scored test times
items Raw column indices representing the test items
cut_score A raw or percentage cut-score
scale A character vector indicating whether the cut-score is 'raw' (default) or 'percent'

Value
Agree Agreement statistic values for items on the test

Examples
agree_stat(bh_depend, 2:31, 21, scale = 'raw')
Description

A data set containing the 45 scored responses to 30 items on a test of Listening (1-10), Reading (11-20), and Grammar (20-30)

Usage

data(bh_depend)

Format

A data frame with 45 rows and 30 variables

- ID. ID numbers.
- L_1. Listening question 1.
- L_2. Listening question 2.
- L_3. Listening question 3.
- L_5. Listening question 5.
- L_10. Listening question 10.
- R_1. Reading question 1.
- R_2. Reading question 2.
- R_3. Reading question 3.
- R_4. Reading question 4.
- R_5. Reading question 5.
- R_7. Reading question 7.
- R_8. Reading question 8.
- R_10. Reading question 10.
- G_2. Grammar question 2.
• G_5. Grammar question 5.

Source
Brown and Hudson (2002)

| bh_gstudy | Brown and Hudson's (2002, p. 177) Table 5.8 Data for 30 examinees on 30 test items with an ID column and a total score column. |

Description
A data set containing the 30 scored responses to 30 items on a test

Usage
data(bh_gstudy)

Format
A data frame with 30 rows and 32 variables

• ID. ID numbers.
• I1. Item 1
• I2. Item 2
• I3. Item 3
• I4. Item 4
• I5. Item 5
• I6. Item 6
• I7. Item 7
• I8. Item 8
• I9. Item 9
• I10. Item 10
• I11. Item 11
• I12. Item 12
• I13. Item 13
• I14. Item 14
• I15. Item 15
• I16. Item 16
• I17. Item 17
• I18. Item 18
• I19. Item 19
• I20. Item 20
• I21. Item 21
• I22. Item 22
• I23. Item 23
• I24. Item 24
• I25. Item 25
• I26. Item 26
• I27. Item 27
• I28. Item 28
• I29. Item 29
• I30. Item 30
• SCORE. Total score

Source

Brown and Hudson (2002)

<table>
<thead>
<tr>
<th>bh_item</th>
<th>Brown and Hudson’s (2002, p. 124) Table 4.8 Item analysis data (first 10 items only)</th>
</tr>
</thead>
</table>

Description

A data set containing the scored responses to first 10 items of a test and the total scores for 15 people

Usage

data(bh_item)
Format

A data frame with 15 rows and 12 variables

- Students. Student names.
- Q1. Question 1.
- Q2. Question 2.
- Q5. Question 5.
- Q8. Question 8.
- Q10. Question 10.
- Total. Total score.

Source

Brown and Hudson (2002)

b_index

Calculate B-index

Description

Calculate B-index

Usage

b_index(data, items, cut_score, scale = "raw")

Arguments

data A data frame of dichotomously scored test times
items Raw column indices representing the test items
cut_score A raw or percentage cut-score
scale A character vector indicating whether the cut-score is 'raw' (default) or 'percent'

Value

Bindex B-index values for items on the test

Examples

b_index(bh_depend, 2:31, 21, scale = 'raw')
crt_iteman

Calculate criterion-referenced item discrimination indices

Description

Calculate criterion-referenced item discrimination indices

Usage

crt_iteman(data, items, cut_score, scale = "raw")

Arguments

data       A data frame of dichotomously scored test times
items      Raw column indices representing the test items
cut_score  A raw or percentage cut-score
scale      A character vector indicating whether the cut-score is 'raw' (default) or 'percent'

Value

if_pass contains item facility values for test items for students who passed the test
if_fail contains item facility values for test items for students who did not pass the test
if_total contains item facility values for test items
b_index contains b-index values for items on the test
agree_stat contains agreement statistic values for items on the test
item_phi contains item phi values for items on the test

Examples

crt_iteman(bh_depend, 2:31, 21, scale = "raw")

if_fail

Calculate item facility for failing students

Description

Calculate item facility for failing students

Usage

if_fail(data, items, cut_score, scale = "raw")
Arguments

data A data frame of dichotomously scored test times
items Raw column indices representing the test items
cut_score A raw or percentage cut-score
scale A character vector indicating whether the cut-score is 'raw' (default) or 'percent'

Value

Item_facility_fail Item facility values for test items of test takers who failed the test

Examples

if_fail(bh_depend, 2:31, 21, scale = 'raw')

if_pass

Calculate item facility for passing students

Description

Calculate item facility for passing students

Usage

if_pass(data, items, cut_score, scale = "raw")

Arguments

data A data frame of dichotomously scored test times
items Raw column indices representing the test items
cut_score A raw or percentage cut-score
scale A character vector indicating whether the cut-score is 'raw' (default) or 'percent'

Value

Item_facility_pass Item facility values for test items of test takers who passed the test

Examples

if_pass(bh_depend, 2:31, 21, scale = 'raw')
if_total  

**Description**

Calculate item facility

**Usage**

```r
if_total(data, items)
```

**Arguments**

- **data**: A data frame of dichotomously scored test times
- **items**: Raw column indices representing the test items

**Value**

- **Item_facility**: Item facility values for test items

**Examples**

```r
if_total(bh_depend, 2:31)
```

---

item_phi  

**Description**

Calculate Item Phi

**Usage**

```r
item_phi(data, items, cut_score, scale = "raw")
```

**Arguments**

- **data**: A data frame of dichotomously scored test times
- **items**: Raw column indices representing the test items
- **cut_score**: A raw or percentage cut-score
- **scale**: A character vector indicating whether the cut-score is 'raw' (default) or 'percent'

**Value**

- **Phi**: Item Phi values for items on the test
phi_domain

**Examples**

```r
item_phi(bh_depend, 2:31, 21, scale = 'raw')
```

---

**Description**

Calculate Brown’s (1990) short-cut estimate for phi dependability

**Usage**

```r
phi_domain(data, items, total = NULL)
```

**Arguments**

- `data` A data frame of dichotomously scored test items
- `items` Raw column indices representing the test items or number of items on the test (see Details).
- `total` Total score column name of the test (see Details)

**Details**

When the item-level information is available, Kuder-Richardson 20 is used as an estimate of alpha. If only the total scores on the test are available and the number of items is known, Kuder-Richardson 21 is used as an estimate of alpha.

**Value**

The phi estimate for domain score dependability.

**Examples**

```r
phi_domain(bh_depend, 2:31)
```
phi_lambda

Calculate Brennan's (1984) estimate for phi lambda

Description
Calculate Brennan's (1984) estimate for phi lambda

Usage
phi_lambda(data, items, cut_score, total = NULL)

Arguments
- data: A data frame of dichotomously scored test items
- items: Raw column indices representing the test items or number of items on the test
- cut_score: Cut-score of the test expressed as a proportion (e.g., 0.70)
- total: Column name of raw test scores.

Examples
phi_lambda(data = bh_item, items = 100, total = "Total", cut_score = 0.70)

sd_pop
Calculate standard deviation for the population

Description
Calculate standard deviation for the population

Usage
sd_pop(x, n)

Arguments
- x: A vector of total scores from a dichotomously score test.
- n: The number of people who took the test

Examples
sd_pop(bh_item$Total, nrow(bh_item))
subkoviak

**Calculate Subkoviak's (1988) single administration consistency indices**

**Description**

Calculate Subkoviak's (1988) single administration consistency indices

**Usage**

subkoviak(data, items, raw_cut_score, total = NULL, look_up = FALSE)

**Arguments**

- **data**: A data frame of dichotomously scored test items
- **items**: Raw column indices representing the test items or number of items on the test (see Details)
- **raw_cut_score**: The raw cut-score for the test
- **total**: Total score column of the test (see Details)
- **look_up**: If TRUE, the agreement and kappa tables from Subkoviak (1988) are returned with the results

**Details**

When the item-level information is available, Kuder-Richardson 20 is used as an estimate of alpha. If only the total scores on the test are available and the number of items is known, Kuder-Richardson 21 is used as an estimate of alpha.

**Value**

- The z_cut score and the rounded z_cut_rounded score for the test
- The estimated alpha coefficient. K-R21 is used when there is no item-level information. Otherwise, K-R20 is used.
- The rounded values for the agree_coef (agreement) and kappa_coef (kappa) coefficients from Subkoviak’s (1988) tables

**Examples**

subkoviak(data = bh_depend, items = 2:31, raw_cut_score = 21)
**sub_agree_coef**

<table>
<thead>
<tr>
<th>sub_agree_coef</th>
<th>Subkoviak’s (1988) table of approximate values of the agreement coefficient</th>
</tr>
</thead>
</table>

**Description**

Subkoviak’s (1988) table of approximate values of the agreement coefficient

**Usage**

```r
data(sub_agree_coef)
```

**Format**

A data frame with 21 rows and 10 columns

- `z`: z cut-score for test.
- `r_0.1`: Reliability of 0.1.
- `r_0.1`: Reliability of 0.2.
- `r_0.1`: Reliability of 0.3.
- `r_0.1`: Reliability of 0.4.
- `r_0.1`: Reliability of 0.5.
- `r_0.1`: Reliability of 0.6.
- `r_0.1`: Reliability of 0.7.
- `r_0.1`: Reliability of 0.8.
- `r_0.1`: Reliability of 0.9.

**Source**

Subkoviak (1988)

---

**sub_kappa_coef**

Subkoviak’s (1988) table of approximate values of the kappa coefficient

**Usage**

```r
data(sub_kappa_coef)
```
Format

A data frame with 21 rows and 10 columns

- z. z cut-score for test.
- r_0.1. Reliability of 0.1.
- r_0.1. Reliability of 0.2.
- r_0.1. Reliability of 0.3.
- r_0.1. Reliability of 0.4.
- r_0.1. Reliability of 0.5.
- r_0.1. Reliability of 0.6.
- r_0.1. Reliability of 0.7.
- r_0.1. Reliability of 0.8.
- r_0.1. Reliability of 0.9.

Source

Subkoviak (1988)
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