# Package 'rcrtan'

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**Type** Package

**Title** Criterion-Referenced Test Analysis

**Version** 0.1.1

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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.

**URL** https://github.com/gtlaflair/rcrtan

**BugReports** https://github.com/gtlaflair/rcrtan/issues

**Depends** R (>= 2.10)

**License** GPL-3

**LazyData** TRUE

**Encoding** UTF-8

**Imports** dplyr, magrittr, purrrlyr, stats, tibble, tidyr

**Suggests** knitr, rmarkdown

**VignetteBuilder** knitr

**RoxygenNote** 6.1.0

**NeedsCompilation** no

**Repository** CRAN

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## R topics documented:

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`agree_stat` *Calculate Agreement statistic*

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## 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')
```

bh_depend *Brown and Hudson's (2002, p. 153) Table 5.1a Data for 45 examinees on 30 test items*

## 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_4. Listening question 4.
- L_5. Listening question 5.
- L_6. Listening question 6.
- L_7. Listening question 7.
- L_8. Listening question 8.
- L_9. Listening question 9.
- 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_6. Reading question 6.
- R_7. Reading question 7.
- R_8. Reading question 8.
- R_9. Reading question 9.
- R_10. Reading question 10.
- G_1. Grammar question 1.
- G_2. Grammar question 2.

- G_3. Grammar question 3.
- G_4. Grammar question 4.
- G_5. Grammar question 5.
- G_6. Grammar question 6.
- G_7. Grammar question 7.
- G_8. Grammar question 8.
- G_9. Grammar question 9.
- G_10. Grammar question 10.

## Source

Brown and Hudson (2002)

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`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.*

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## 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)

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`bh_item` *Brown and Hudson's (2002, p. 124) Table 4.8 Item analysis data (first 10 items only)*

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## 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.
- Q3. Question 3.
- Q4. Question 4.
- Q5. Question 5.
- Q6. Question 6.
- Q7. Question 7.
- Q8. Question 8.
- Q9. Question 9.
- Q10. Question 10.
- Total. Total score.

## Source

Brown and Hudson (2002)

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# 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 of test takers who failed the test

### Examples

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

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## if_pass *Calculate item facility for passing students*

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### 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 of test takers who passed the test

### Examples

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

## if_total *Calculate item facility*

### Description

Calculate item facility

### Usage

```
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

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

## item_phi *Calculate Item Phi*

### Description

Calculate Item Phi

### Usage

```
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

## Examples

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

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`phi_domain` *Calculate Brown's (1990) short-cut estimate for phi dependability*

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## Description

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

## Usage

```
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

```
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 — *Subkoviak's (1988) table of approximate values of the agreement coefficient*

### Description

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

### Usage

```
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*

### Description

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

### Usage

```
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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