

# Package ‘pervasive’

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**Title** Pervasiveness Functions for Correlational Data

**Version** 1.0

**Description** Analysis of pervasiveness of effects in correlational data. The Observed Proportion (or Percentage) of Concordant Pairs (OPCP) is Kendall's Tau expressed on a 0 to 1 metric instead of the traditional -1 to 1 metric to facilitate interpretation. As its name implies, it represents the proportion of concordant pairs in a sample (with an adjustment for ties). Pairs are concordant when a participant who has a larger value on a variable than another participant also has a larger value on a second variable. The OPCP is therefore an easily interpretable indicator of monotonicity. The pervasive functions are essentially wrappers for the 'arules' package by Hahsler et al. (2025)<[doi:10.32614/CRAN.package.arules](https://doi.org/10.32614/CRAN.package.arules)> and serve to count individuals who actually display the pattern(s) suggested by a regression. For more details, see the paper ``Considering approaches to pervasiveness in the context of personality psychology'' now accepted at the journal Personality Science.

**License** MIT + file LICENSE

**Encoding** UTF-8

**RoxygenNote** 7.3.2

**Imports** arules, dplyr, tibble, psych, methods, stats

**Suggests** knitr, rmarkdown, psychTools

**VignetteBuilder** knitr

**NeedsCompilation** no

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**OPCP***Calculate Observed Proportion of Concordant Pairs (OPCP)***Description**

This function calculates the Observed Proportion of Concordant Pairs (OPCP) using Kendall's Tau as a measure of association. The pervasive functions also provide the OPCP.

**Usage**

```
OPCP(formula, data)
```

**Arguments**

- |         |   |
|---------|---|
| formula | A formula specifying the dependent and independent variables.   |
| data    | A data frame containing the variables specified in the formula. |

**Value**

A numeric value representing the OPCP.

**Examples**

```
# Example using the spi dataset from the psychTools package
sc <- psych:::scoreVeryFast(psychTools:::spi.keys, psychTools:::spi)
spi_sc <- cbind(psychTools:::spi, sc)
spi_sc_vars <- spi_sc |>
  dplyr::select(age, Agree, Consc, Neuro, Extra, Open)

formula <- age ~ Agree + Consc + Neuro + Extra + Open
OPCP(formula = formula, data = spi_sc_vars)
```

---

OPCP\_glm*Calculate Observed Proportion of Concordant Pairs (OPCP)*

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**Description**

This function calculates the Observed Proportion of Concordant Pairs (OPCP) using Kendall's Tau as a measure of association. The pervasive functions also provide the OPCP.

**Usage**

```
OPCP_glm(formula, data)
```

**Arguments**

- |         |   |
|---------|---|
| formula | A formula specifying the dependent and independent variables.   |
| data    | A data frame containing the variables specified in the formula. |

**Value**

A numeric value representing the OPCP.

**Examples**

```
#Example using the spi dataset from the psychTools package
sc <- psych::scoreVeryFast(psychTools::spi.keys, psychTools::spi)
spi_sc <- cbind(psychTools::spi, sc)
spi_sc_vars <- spi_sc |>
  dplyr::select(sex, Agree, Consc, Neuro, Extra, Open)
spi_sc_vars$sex = spi_sc_vars$sex -1

formula <- sex ~ Agree + Consc + Neuro + Extra + Open
OPCP_glm(formula = formula, data = spi_sc_vars)
```

---

OPCP\_mat

*Calculate Observed Proportion of Concordant Pairs (OPCP)*

---

**Description**

This function provides a matrix that contains Pearson correlations in the lower triangle and Observed Proportions of Concordant Pairs (OPCPs) in the upper triangle between multiple variables.

**Usage**

```
OPCP_mat(data, round_digits = 2)
```

## Arguments

- data** A data frame containing the variables specified in the formula.  
**round\_digits** The number of decimals to be included in the resulting table.

## Value

A matrix of correlations and OPCPs.

## Examples

```
# Example using the spi dataset from the psychTools package
sc <- psych::scoreVeryFast(psychTools::spi.keys, psychTools::spi)
spi_sc <- cbind(psychTools::spi, sc)
spi_sc_age_sex_B5 <- spi_sc |>
  dplyr::select(age, sex, Agree, Consc, Neuro, Extra, Open)

OPCP_mat(data = spi_sc_age_sex_B5)
```

## Description

This function provides the same information as `pervasive_tric` but with dichotomized data instead of trichotomized data. Trichotomized data is generally to be preferred when possible. Researchers interested in mixing trichotomized variables with dichotomized variables should use the `arules` package directly.

## Usage

```
pervasive_dic(formula, data, min_support = 0.03)
```

## Arguments

- formula** A formula specifying the dependent and independent variables.  
**data** A data frame containing the variables specified in the formula.  
**min\_support** The minimum proportion of rows that a rule must have to be considered for top rules.

## Value

@return A list with the following components:

- OPCP: Observed proportion of concordant pairs.
- adj\_r\_squared: Adjusted R-squared value for the regression model.
- exact\_match\_lhs, exact\_match\_rhs: The left and right-hand side of the rule suggested by the regression model, respectively
- exact\_match\_quality: Quality metrics for the rule suggested by the regression.
- exact\_match\_lhs\_opp, exact\_match\_rhs\_opp: The left and right-hand side of the rule suggested by the low end of the regression model, respectively
- exact\_match\_quality\_opp: Quality metrics for the rule suggested by the low end of the regression.
- top\_rule\_lhs, top\_rule\_rhs, top\_rule\_quality: Information relevant to the highest lift rule meeting min\_support for high values of the dependent variable.
- top\_rule\_opp\_lhs, top\_rule\_opp\_rhs, top\_rule\_opp\_quality: Information relevant to the highest lift rule meeting min\_support for low values of the dependent variable.
- quality\_table: A table summarizing the quality statistics for extracted association rules.
- freq\_tables: Frequency tables (cutoffs and membership) for dichotomization binning.

## Examples

```
# Example using the spi dataset from the psychTools package
sc <- psych::scoreVeryFast(psychTools::spi.keys, psychTools::spi)
spi_sc <- cbind(psychTools::spi, sc)
spi_sc_vars <- spi_sc |>
  dplyr::select(age, Agree, Consc, Neuro, Extra, Open)

formula <- age ~ Agree + Consc + Neuro + Extra + Open
example <- pervasive_dic(formula = formula, data = spi_sc_vars)
example
```

## Description

This function provides similar information as pervasive\_dic() and pervasive\_tric() but should be the preferred option when the outcome variable is binary.

## Usage

```
pervasive_dic_glm(formula, data, min_support = 0.03)
```

## Arguments

<code>formula</code>	A formula specifying the dependent and independent variables.
<code>data</code>	A data frame containing the variables specified in the formula.
<code>min_support</code>	The minimum proportion of rows that a rule must have to be considered for top rules.

## Value

@return A list with the following components:

- `OPCP`: Observed proportion of concordant pairs.
- `adj_r_squared`: Adjusted R-squared value for the regression model.
- `exact_match_lhs`, `exact_match_rhs`: The left and right-hand side of the rule suggested by the regression model, respectively
- `exact_match_quality`: Quality metrics for the rule suggested by the regression.
- `exact_match_lhs_opp`, `exact_match_rhs_opp`: The left and right-hand side of the rule suggested by the low end of the regression model, respectively
- `exact_match_quality_opp`: Quality metrics for the rule suggested by the low end of the regression.
- `top_rule_lhs`, `top_rule_rhs`, `top_rule_quality`: Information relevant to the highest lift rule meeting `min_support` for high values of the dependent variable.
- `top_rule_opp_lhs`, `top_rule_opp_rhs`, `top_rule_opp_quality`: Information relevant to the highest lift rule meeting `min_support` for low values of the dependent variable.
- `quality_table`: A table summarizing the quality statistics for extracted association rules.
- `freq_tables`: Frequency tables (cutoffs and membership) for dichotomization binning.

## Examples

```
# Example using the spi dataset from the psychTools package
sc <- psych::scoreVeryFast(psychTools::spi.keys, psychTools::spi)
spi_sc <- cbind(psychTools::spi, sc)
spi_sc_vars <- spi_sc |>
  dplyr::select(sex, Agree, Consc, Neuro, Extra, Open)
spi_sc_vars$sex = spi_sc_vars$sex -1

formula <- sex ~ Agree + Consc + Neuro + Extra + Open
example <- pervasive_dic_glm(formula = formula, data = spi_sc_vars)
example
```

## Description

This function extracts a specific set of association rules and reports quality measures for these rules. The OPCP and adjusted R-square for the regression model analyzed are also reported for a fuller pervasiveness context of the regression.

## Usage

```
pervasive_tric(formula, data, min_support = 0.03)
```

## Arguments

formula	A formula specifying the dependent and independent variables.
data	A data frame containing the variables specified in the formula.
min_support	The minimum proportion of rows that a rule must have to be considered for top rules.

## Value

@return A list with the following components:

- OPCP: Observed proportion of concordant pairs.
- adj\_r\_squared: Adjusted R-squared value for the regression model.
- exact\_match\_lhs, exact\_match\_rhs: The left and right-hand side of the rule suggested by the regression model, respectively
- exact\_match\_quality: Quality metrics for the rule suggested by the regression.
- exact\_match\_lhs\_opp, exact\_match\_rhs\_opp: The left and right-hand side of the rule suggested by the low end of the regression model, respectively
- exact\_match\_quality\_opp: Quality metrics for the rule suggested by the low end of the regression.
- top\_rule\_lhs, top\_rule\_rhs, top\_rule\_quality: Information relevant to the highest lift rule meeting min\_support for high values of the dependent variable.
- top\_rule\_opp\_lhs, top\_rule\_opp\_rhs, top\_rule\_opp\_quality: Information relevant to the highest lift rule meeting min\_support for low values of the dependent variable.
- quality\_table: A table summarizing the quality statistics for extracted association rules.
- freq\_tables: Frequency tables (cutoffs and membership) for trichotomization binning.

## Examples

```
# Example using the spi dataset from the psychTools package
sc <- psych::scoreVeryFast(psychTools::spi.keys, psychTools::spi)
spi_sc <- cbind(psychTools::spi, sc)
spi_sc_vars <- spi_sc |>
  dplyr::select(age, Agree, Consc, Neuro, Extra, Open)

formula <- age ~ Agree + Consc + Neuro + Extra + Open
example <- pervasive_tric(formula = formula, data = spi_sc_vars)
#From the results, it appears we would be rather unlikely to meet individuals
#with the patterns of personality traits suggested for old and young people
#by a linear regression when data is trichotomized.

example
```

pervasive\_tric\_glm      *Association Rule Mining With Trichotomized Data and a Binary outcome*

## Description

This function extracts a specific set of association rules and reports quality measures for these rules. The OPCP for the logistic regression model analyzed is also reported for a fuller pervasiveness context of the regression.

## Usage

```
pervasive_tric_glm(formula, data, min_support = 0.03)
```

## Arguments

<code>formula</code>	A formula specifying the dependent and independent variables.
<code>data</code>	A data frame containing the variables specified in the formula.
<code>min_support</code>	The minimum proportion of rows that a rule must have to be considered for top rules.

## Value

@return A list with the following components:

- `OPCP`: Observed proportion of concordant pairs.
- `adj_r_squared`: Adjusted R-squared value for the regression model.
- `exact_match_lhs`, `exact_match_rhs`: The left and right-hand side of the rule suggested by the regression model, respectively
- `exact_match_quality`: Quality metrics for the rule suggested by the regression.

- `exact_match_lhs_opp, exact_match_rhs_opp`: The left and right-hand side of the rule suggested by the low end of the regression model, respectively
- `exact_match_quality_opp`: Quality metrics for the rule suggested by the low end of the regression.
- `top_rule_lhs, top_rule_rhs, top_rule_quality`: Information relevant to the highest lift rule meeting `min_support` for high values of the dependent variable.
- `top_rule_opp_lhs, top_rule_opp_rhs, top_rule_opp_quality`: Information relevant to the highest lift rule meeting `min_support` for low values of the dependent variable.
- `quality_table`: A table summarizing the quality statistics for extracted association rules.
- `freq_tables`: Frequency tables (cutoffs and membership) for trichotomization binning.

## Examples

```
# Example using the spi dataset from the psychTools package
sc <- psych::scoreVeryFast(psychTools::spi.keys, psychTools::spi)
spi_sc <- cbind(psychTools::spi, sc)
spi_sc_vars <- spi_sc |>
  dplyr::select(age, Agree, Consc, Neuro, Extra, Open)

formula <- age ~ Agree + Consc + Neuro + Extra + Open
example <- pervasive_tric(formula = formula, data = spi_sc_vars)
#From the results, it appears we would be rather unlikely to meet
#individuals with the patterns of personality traits suggested for
#old and young people by a linear regression when data is trichotomized.
example
```

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