

Package ‘SwPcIndex’

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Type Package

Title Computation of Survey Weighted PC Based Composite Index

Version 0.1.0

Depends R(>= 2.10)

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

Description An index is created using a mathematical model that transforms multi-dimensional variables into a single value. These variables are often correlated, and while PCA-based indices can address the issue of multicollinearity, they typically do not account for survey weights, which can lead to inaccurate rankings of survey units such as households, districts, or states. To resolve this, the current package facilitates the development of a principal component analysis-based composite index by incorporating survey weights for each sample observation. This ensures the generation of a survey-weighted principal component-based normalized composite index. Additionally, the package provides a normalized principal component-based composite index and ranks the sample observations based on the values of the composite indices.

For method details see, Skinner,

C. J., Holmes, D. J. and Smith, T. M. F. (1986) <[DOI:10.1080/01621459.1986.10478336](https://doi.org/10.1080/01621459.1986.10478336)>, Singh, D., Basak, P., Kumar, R. and Ahmad, T. (2023) <[DOI:10.3389/fams.2023.1274530](https://doi.org/10.3389/fams.2023.1274530)>.

License GPL (>= 2.0)

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Imports stats

RoxygenNote 7.3.1

NeedsCompilation no

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PcIndex	<i>Generates the unweighted and survey weighted principal component based normalized composite index</i>
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Description

The PcIndex function generates the survey weighted principal component based normalized composite index by assigning survey weights to each of the sample observations. Besides this, the function also generates the principal component based normalized composite index without incorporating survey weights. Further, the function provides composite index values for both the methods in descending order along with the corresponding sample id as well as rank of the sample observations. Here, the sample observations having highest and lowest composite index values are given first and last rank respectively. Data Requirements: The input data must be in CSV format and include the following columns: • Sample_id: A unique identifier for each sample observation. • SW: The survey weight associated with each sample observation. • Variables: Columns representing the variables used to construct the composite index, with each column corresponding to a distinct variable.

Usage

```
PcIndex(data)
```

Arguments

data Input multivariate survey data with survey weights.

Details

This function returns the principal component based normalized composite index without incorporating survey weights as well as survey weighted principal component based normalized composite index.

Value

A list with the following components:

PC based composite index

Ordered principal component based normalized composite index values in descending order along with the corresponding Sample_id as well as its rank of the sample observations.

Survey weighted PC based composite index

Ordered survey weighted principal component based normalized composite index values in descending order along with the corresponding Sample_id as well as its rank of the sample observations.

References

Skinner, C. J., Holmes, D. J. and Smith, T. M. F. (1986). The Effect of Sample Design on Principal Component Analysis. *Journal of the American Statistical Association* 81(395): 789-798. <DOI:10.1080/01621459.1986.10478336>

Singh, D., Basak, P., Kumar, R. and Ahmad, T. (2023). On the Methodological Framework of Composite index under complex Surveys and its application in development of food consumption index for India. *Frontiers in Applied Mathematics and Statistics* 9:1274530. <DOI:10.3389/fams.2023.1274530>

Singh, D., Basak, P., Ahmad, T., Kumar, R. and Rai, A. (2024). Development of Survey Weighted Composite Indices under Complex Surveys. *Statistics and Applications* 22(1): 73-82.

Examples

```
# Sample data
SERIAL_NO<- c(1:12)
SW<- c(20,10,40,50,13,25,23,26,14,10,07,05)
x <- c(840,204,944,1009,745,811,883,593,254,215,172,169)
y <- c(150,104,293,331,113,52,164,201,124,108,95,90)
z <- c(350,214,693,731,413,352,364,301,214,208,186,130)
# View the sample data
data<-cbind(SERIAL_NO, SW, x, y, z)
# Calculate composite indices using the sample data
PcIndex(data)
```

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