

# Package ‘IndexNumber’

January 13, 2021

**Type** Package

**Title** Index Numbers in Social Sciences

**Version** 1.3.1

**Date** 2021-01-13

**Author** Alejandro Saavedra-Nieves, Paula Saavedra-Nieves

**Maintainer** Alejandro Saavedra-Nieves <alejandro.saavedra.nieves@gmail.com>

**Description** We provide an R tool for teaching in Social Sciences. It allows the computation of index numbers. It is a measure of the evolution of a fixed magnitude for only a product or for several products. It is very useful in Social Sciences. Among others, we obtain simple index numbers (in chain or in serie), index numbers for not only a product or weighted index numbers as the Laspeyres index (Laspeyres, 1864), the Paasche index (Paasche, 1874) or the Fisher index (Lapedes, 1978).

**License** GPL-2

**LazyData** true

**RoxygenNote** 7.0.2

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2021-01-13 18:20:05 UTC

## R topics documented:

IndexNumber-package . . . . .	2
ActivePeople . . . . .	3
aggregated.index.number . . . . .	4
ECResources . . . . .	5
edgeworth.index.number . . . . .	6
fisher.index.number . . . . .	7
Food . . . . .	8
index.number.chain . . . . .	10
index.number.serie . . . . .	11
laspeyres.index.number . . . . .	12
Mortgages . . . . .	13
paasche.index.number . . . . .	14

---

IndexNumber-package    *Index Numbers in Social Sciences*

---

### Description

We provide an R tool for teaching in Social Sciences. It allows the computation of index numbers. It is a measure of the evolution of a fixed magnitude for only a product or for several products. It is very useful in Social Sciences. Among others, we obtain simple index numbers (in chain or in serie), index numbers for not only a product or weighted index numbers as the Laspeyres index (Laspeyres, 1864), the Paasche index (Paasche, 1874) or the Fisher index (Lapedes, 1978).

### Details

The DESCRIPTION file:

```
Package:      IndexNumber
Type:        Package
Title:       Index Numbers in Social Sciences
Version:     1.3.1
Date:        2021-01-13
Author:      Alejandro Saavedra-Nieves, Paula Saavedra-Nieves
Maintainer:  Alejandro Saavedra-Nieves <alejandro.saavedra.nieves@gmail.com>
Description: We provide an R tool for teaching in Social Sciences. It allows the computation of index numbers. It is a mea
License:     GPL-2
LazyData:   true
RoxygenNote: 7.0.2
```

Index of help topics:

```
ActivePeople      Economically active people in Spain from 2002
                  to 2019.
ECResources       Combustibles and energy resources for the main
                  home in Spain from 2006 to 2015.
Food              Food in Spain from 2006 to 2015.
IndexNumber-package  Index Numbers in Social Sciences
Mortgages         Mortgages constituted on urban properties in
                  Spain from 2003 to 2018.
aggregated.index.number  Calculate an aggregate index number
edgeworth.index.number   Calculate the Edgeworth index number
fisher.index.number     Calculate the Fisher index number
index.number.chain      Calculate an index number in chain
index.number.serie      Calculate an index number in serie
laspeyres.index.number
```

```

                                Calculate the Laspeyres index number
paasche.index.number          Calculate the Paasche index number

```

Once we have defined a magnitude for a product (of several products), we can analyse how it (they) evolves along the time. Index Numbers model this effect in Social Science. In this sense, several approaches may be considered. We include in this package several options of analysing this problem.

### Author(s)

Alejandro Saavedra-Nieves, Paula Saavedra-Nieves

Maintainer: Alejandro Saavedra-Nieves <alejandro.saavedra.nieves@gmail.com>

### References

- (2004) Consumer Price Index Manual: Theory and Practice. ILO, IMF, CPI Manual OECD, UN, Eurostat, and The World Bank by ILO, Geneva.

Index Number (2008) In: The Concise Encyclopedia of Statistics. Springer, New York, NY. <doi:https://doi.org/10.1007/978-0-387-32833-1>.

Laspeyres, E. (1871) Die Berechnung einer mittleren Waarenpreissteigerung. Jahrb. Natl. Stat. 16, 296–314.

Paasche, H. (1874) Über die Preisentwicklung der letzten Jahre nach den Hamburger Borsennotirungen. Jahrb. Natl. Stat. 23, 168–178.

### Examples

```

prices<-c(70,75,77,77,85,90,85,75,77,87,85,90,70,75,77,77,85,90)
index.number.serie(prices,name="Prices",opt.plot=TRUE,opt.summary=TRUE)

```

---

ActivePeople

*Economically active people in Spain from 2002 to 2019.*

---

### Description

Number (thousands) of economically active women and men in Spain between 2002 and 2019

### Usage

```
data(ActivePeople)
```

### Format

A data frame with columns:

**Time** A trimester (T1, T2, T3 and T4) between 2002 and 2019.

**TotalWomen** Number (thousands) of economically active women.

**TotalMen** Number (thousands) of economically active men.

**Source**

Spanish Statistical Office (INE), <http://www.ine.es>

**Examples**

```
## Not run:
  ActivePeople

## End(Not run)
```

---

```
aggregated.index.number
```

*Calculate an aggregate index number*

---

**Description**

This function determines index numbers without weights for those cases in which there exist more than an only product (in chain or in serie)

**Usage**

```
aggregated.index.number(x, base, type, name, opt.plot=FALSE, opt.summary=FALSE)
```

**Arguments**

x	It is a matrix containing that magnitude to be studied. In each column, it contains the magnitud of a different product. Thus, we have nrow(x) values of a magnitud for ncol(x) products.
base	Chain of characters that indicates the nature of the index number. If we introduce base="serie", we compare each value with respect to the initial one. In this case, it is said to be an index number in serie. Otherwise, if we introduce base="chain", we obtain the index number in chain, by comparing each value with the immediately previous value.
type	Chain of characters to indicate the type of non-weighted index number to evaluate the evolution of a set of magnitudes (even for different products). By considering base="serie", if we introduce type="arithmetic", we obtain the Sauerbeck index number. If we introduce type="geometric", we obtain the Geometric index. If we choose type="harmonic", we obtain the Harmonic mean index. If we write type="BDutot", we will obtain the Bradstreet-Dutot index. Otherwise, if we take base="chain" and type="Carli", we obtain the Carli index number. If we introduce type="Jevons", we obtain the Jevons index and if we choose type="Dutot", we obtain the Dutot index.
name	Chain of characters to indicate the name of the variable under study.
opt.plot	Logical option to indicate if a graphical description of the index number along the different stages is required. It takes the value TRUE or FALSE.

`opt.summary` Logical option to indicate if a statistical summary of the index number is required. It takes the value TRUE or FALSE.

### Value

`Summary` Statistical summary (optional) of the index number along the considered period.  
`Agg. index number` Table containing the values of the index number for the considered stages and the aggregate value.  
`Graphical` Graphical summary (optional) of the index number along the considered period.

### Author(s)

A. Saavedra-Nieves, P. Saavedra-Nieves

### References

CPI Manual (2004). Consumer Price Index Manual: Theory and Practice. OECD, UN, Eurostat, and TheWorld Bank by ILO, Geneva.

Index Number (2008). In: The Concise Encyclopedia of Statistics. Springer, New York, NY. <doi:https://doi.org/10.1007/978-0-387-32833-1>

### Examples

```
prices<-matrix(c(70,75,77,77,85,90,85,75,77,87,85,90,70,75,77,77,85,90),ncol=3)
aggregated.index.number(prices,"chain","geometric","Price",opt.plot=TRUE,opt.summary=TRUE)
```

---

ECResources *Combustibles and energy resources for the main home in Spain from 2006 to 2015.*

---

### Description

Unitary value (euros) and consumed amount (thousands of units) of combustibles and other energy resources for the main home in Spain from 2006 to 2015.

### Usage

```
data(ECResources)
```

### Format

A data frame with columns:

**Time** Year between 2006 and 2015.

**ElectricityPrice** Unitary value of electricity (KWh).

**NaturalGasPrice** Unitary value of natural gas (m3).

**LiquifiedGasPrice** Unitary value of liquified gas (kilo).  
**LiquifiedCombustiblesPrice** Unitary value of liquified combustibles (l).  
**SolidCombustiblesPrice** Unitary value of Solid combustibles(l).  
**ElectricityConsumed** Consumed (thousands of units) of electricity (KWh).  
**NaturalGasConsumed** Consumed (thousands of units) of natural gas (m3).  
**LiquifiedGasConsumed** Consumed (thousands of units) of liquified gas (kilo).  
**LiquifiedCombustiblesConsumed** Consumed (thousands of units) of liquified combustibles (l).  
**SolidCombustiblesConsumed** Consumed (thousands of units) of solid combustibles (l).

### Source

Spanish Statistical Office (INE), <http://www.ine.es>

### Examples

```
## Not run:
  ECResources

## End(Not run)
```

---

edgeworth.index.number

*Calculate the Edgeworth index number*

---

### Description

This function determines the Marshall-Edgeworth index number for those cases in which there exist more than an only product.

### Usage

```
edgeworth.index.number(x, y, name, opt.plot = FALSE, opt.summary = FALSE)
```

### Arguments

x	Matrix that contains the magnitude(s) under study. In each column, it contains the magnitude of a different product considered. Thus, we have $nrow(x)$ values of a magnitude for $ncol(x)$ products.
y	Matrix that contains that magnitude used as weight. In each column, it contains another magnitude associated to each different product along the time. Thus, we have $nrow(x)$ values of magnitudes for the set of $ncol(x)$ products.
name	Chain of characters to indicate the name of the variable under study.
opt.plot	Logical option to indicate if a graphical description of the index number along the different stages is required. It takes the value TRUE or FALSE.
opt.summary	Logical option to indicate if a statistical summary of the index number is required. It takes the value TRUE or FALSE.

**Value**

Summary	Statistical summary (optional) of the index number along the considered period.
Agg. index number	Table containing the values of the index number for the considered stages and the aggregate value.
Graphical	Graphical summary (optional) of the index number along the considered period.

**Author(s)**

A. Saavedra-Nieves, P. Saavedra-Nieves

**References**

Edgeworth, F. (1887) Measurement of change in value of money i. First Memorandum presented to the British Association for the Advancement of Science. Reprinted in his Papers Relating to Political Economy, 1, 198–259.

Marshall, A. (1887) Remedies for fluctuations of general prices. The Contemporary review, 1866-1900, 51, 355–375.

**Examples**

```
prices<-matrix(c(70,75,77,77,85,90,85,75,77,87,85,90,70,75,77,77,85,90),ncol=3)
weights<-matrix(c(1,1.5,0.8,1.1,1,0.9,0.7,0.8,0.6,1,1.1,0.9,1,1,0.9,1.1,0.6,0.8),ncol=3)
edgeworth.index.number(prices,weights,"Price",opt.plot=TRUE,opt.summary=TRUE)
```

---

fisher.index.number     *Calculate the Fisher index number*

---

**Description**

This function determines the Fisher index number for those cases in which there exist more than an only product.

**Usage**

```
fisher.index.number(x, y, name, opt.plot = FALSE, opt.summary = FALSE)
```

**Arguments**

x	It is a matrix containing that magnitude to be studied. In each column, it contains the magnitud of a different product. Thus, we have nrow(x) values of a magnitud for ncol(x) products.
y	It is a matrix containing that magnitude used as weight. In each column, it contains another magnitud of the different products along the time. Thus, we have nrow(x) values of a magnitud for ncol(x) products.
name	Chain of characters to indicate the name of the variable under study.

opt.plot	Logical option to indicate if a graphical description of the index number along the different stages is required. It takes the value TRUE or FALSE.
opt.summary	Logical option to indicate if a statistical summary of the index number is required. It takes the value TRUE or FALSE.

**Value**

Summary	Statistical summary (optional) of the index number along the considered period.
Agg. index number	Table containing the values of the index number for the considered stages and the aggregate value.
Graphical	Graphical summary (optional) of the index number along the considered period.

**Author(s)**

A. Saavedra-Nieves, P. Saavedra-Nieves

**References**

Fisher, I. (1922) The making of index numbers: a study of their varieties, tests, and reliability, volume 1. Houghton Mifflin.

Lapedes, Daniel N. (1978) Dictionary of Physics and Mathematics. McGraw-Hill. p. 367. ISBN 0-07-045480-9.

**Examples**

```
prices<-matrix(c(70,75,77,77,85,90,85,75,77,87,85,90,70,75,77,77,85,90),ncol=3)
weights<-matrix(c(1,1.5,0.8,1.1,1,0.9,0.7,0.8,0.6,1,1.1,0.9,1,1,0.9,1.1,0.6,0.8),ncol=3)
fisher.index.number(prices,weights,name="Price",opt.plot=TRUE,opt.summary=TRUE)
```

---

Food

*Food in Spain from 2006 to 2015.*

---

**Description**

Unitary value (euros) and consumed amount (thousands of units) of food in Spain from 2006 to 2015.

**Usage**

data(Food)

**Format**

A data frame with columns:

**Year** Year from 2006 and 2015.

**RicePrice** Unitary value of rice (kilo).

**BreadPrice** Unitary value of bread (kilo).

**PorkPrice** Unitary value of pork meat (kilo).

**FishPrice** Unitary value of fish (kilo).

**WholeMilkPrice** Unitary value of whole milk (l).

**EggsPrice** Unitary value of eggs (unit).

**OliveOilPrice** Unitary value of olive oil (l).

**ApplesPrice** Unitary value of apples (kilo).

**DriedFruitAndNutsPrice** Unitary value of dried fruit and nuts (kilo).

**GreenVegetablePrice** Unitary value value of green vegetables (kilo).

**PotatoesPrice** Unitary value value of potatoes (kilo)

**SugarPrice** Unitary value value of sugar (kilo)

**ChocolatePrice** Unitary value value of chocolate (kilo)

**CoffeePrice** Unitary value value of coffee (l).

**MineralWaterPrice** Unitary value value of mineral water (l).

**WinePrice** Unitary value value of wine (l).

**BeerPrice** Unitary value value of beer (l).

**RiceConsumed** Total amount (thousands of units) of consumed rice (kilo).

**BreadConsumed** Total amount (thousands of units) of consumed bread (kilo).

**PorkConsumed** Total amount (thousands of units) of consumed pork meat (kilo).

**FishConsumed** Total amount (thousands of units) of consumed fish (kilo).

**WholeMilkConsumed** Total amount (thousands of units) of consumed whole milk (l).

**EggsConsumed** Total amount (thousands of units) of consumed eggs (unit).

**OliveOilConsumed** Total amount (thousands of units) of consumed olive oil (l).

**ApplesConsumed** Total amount (thousands of units) of consumed apples (kilo).

**DriedFruitAndNutsConsumed** Total amount (thousands of units) of consumed dried fruit and nuts (kilo).

**GreenVegetableConsumed** Total amount (thousands of units) of consumed green vegetables (kilo).

**PotatoesConsumed** Total amount (thousands of units) of consumed potatoes (kilo)

**SugarConsumed** Total amount (thousands of units) of consumed sugar (kilo)

**ChocolateConsumed** Total amount (thousands of units) of consumed chocolate (kilo)

**CoffeeConsumed** Total amount (thousands of units) of consumed coffee (l).

**MineralWaterConsumed** Total amount (thousands of units) of consumed mineral water (l).

**WineConsumed** Total amount (thousands of units) of consumed wine (l).

**BeerConsumed** Total amount (thousands of units) of consumed beer (l).

**Source**

Spanish Statistical Office (INE), <http://www.ine.es>

**Examples**

```
## Not run:
  Food

## End(Not run)
```

---

index.number.chain      *Calculate an index number in chain*

---

**Description**

This function determines index numbers “in chain” for those cases with an only product.

**Usage**

```
index.number.chain(x, name, opt.plot = FALSE, opt.summary = FALSE)
```

**Arguments**

x	It is a vector containing that magnitude to be studied for a product. Thus, we have length(x) values of it.
name	Chain of characters to indicate the name of the variable under study.
opt.plot	Logical option to indicate if a graphical description of the index number along the different stages is required. It takes the value TRUE or FALSE.
opt.summary	Logical option to indicate if a statistical summary of the index number is required. It takes the value TRUE or FALSE.

**Value**

Summary	Statistical summary (optional) of the index number along the considered period.
Index number	Table containing the values of the index number for the considered stages.
Graphical	Graphical summary (optional) of the index number along the considered period.

**Author(s)**

A. Saavedra-Nieves, P. Saavedra-Nieves

**References**

Index Number (2008) In: The Concise Encyclopedia of Statistics. Springer, New York, NY. <doi:https://doi.org/10.1007/978-0-387-32833-1>.

**Examples**

```
prices<-c(70,75,77,77,85,90,85,75,77,87,85,90,70,75,77,77,85,90)
index.number.chain(prices,"Prices",opt.plot=TRUE,opt.summary=TRUE)
```

---

index.number.serie      *Calculate an index number in serie*

---

**Description**

This function determines index numbers “in serie” for those cases with an only product.

**Usage**

```
index.number.serie(x, name, opt.plot = FALSE, opt.summary = FALSE)
```

**Arguments**

x	It is a vector containing that magnitude to be studied for a product. Thus, we have length(x) values of it.
name	Chain of characters to indicate the name of the variable under study.
opt.plot	Logical option to indicate if a graphical description of the index number along the different stages is required. It takes the value TRUE or FALSE.
opt.summary	Logical option to indicate if a statistical summary of the index number is required. It takes the value TRUE or FALSE.

**Value**

Summary	Statistical summary (optional) of the index number along the considered period.
Index number	Table containing the values of the index number for the considered stages.
Graphical	Graphical summary (optional) of the index number along the considered period.

**Author(s)**

A. Saavedra-Nieves, P. Saavedra-Nieves

**References**

Index Number (2008). In: The Concise Encyclopedia of Statistics. Springer, New York, NY.  
 <doi:https://doi.org/10.1007/978-0-387-32833-1>

**Examples**

```
prices<-c(70,75,77,77,85,90,85,75,77,87,85,90,70,75,77,77,85,90)
index.number.serie(prices,"Prices",opt.plot=TRUE,opt.summary=TRUE)
```

---

 laspeyres.index.number

*Calculate the Laspeyres index number*


---

### Description

This function determines the Laspeyres index number for those cases in which there exist more than an only product.

### Usage

```
laspeyres.index.number(x, y, name, opt.plot = FALSE, opt.summary = FALSE)
```

### Arguments

x	Matrix that contains the magnitude(s) under study. In each column, it contains the magnitude of a different product considered. Thus, we have <code>nrow(x)</code> values of a magnitude for <code>ncol(x)</code> products.
y	Matrix that contains that magnitude used as weight. In each column, it contains another magnitude associated to each different product along the time. Thus, we have <code>nrow(x)</code> values of magnitudes for the set of <code>ncol(x)</code> products.
name	Chain of characters to indicate the name of the variable under study.
opt.plot	Logical option to indicate if a graphical description of the index number along the different stages is required. It takes the value TRUE or FALSE.
opt.summary	Logical option to indicate if a statistical summary of the index number is required. It takes the value TRUE or FALSE.

### Value

Summary	Statistical summary (optional) of the index number along the considered period.
Agg. index number	Table containing the values of the index number for the considered stages and the aggregate value.
Graphical	Graphical summary (optional) of the index number along the considered period.

### Author(s)

A. Saavedra-Nieves, P. Saavedra-Nieves

### References

- Laspeyres, E. (1864) Hamburger Warenpreise 1850–1863 und die kalifornisch-australischen Geldentdeckung seit. *Jahrb. Natl. Stat.* 3, 81–118, 209–236.
- Laspeyres, E. (1871) Die Berechnung einer mittleren Waarenpreissteigerung. *Jahrb. Natl. Stat.* 16, 296–314.

**Examples**

```
prices<-matrix(c(70,75,77,77,85,90,85,75,77,87,85,90,70,75,77,77,85,90),ncol=3)
weights<-matrix(c(1,1.5,0.8,1.1,1,0.9,0.7,0.8,0.6,1,1.1,0.9,1,1,0.9,1.1,0.6,0.8),ncol=3)
laspeyres.index.number(prices,weights,"Price",opt.plot=TRUE,opt.summary=TRUE)
```

---

Mortgages	<i>Mortgages constituted on urban properties in Spain from 2003 to 2018.</i>
-----------	--

---

**Description**

Number of mortgages constituted on urban properties and mortgages amounts (thousands of euros) from 2003 to 2018.

**Usage**

```
data(Mortgages)
```

**Format**

A data frame with columns:

**Year** Year from 2003 to 2018

**Number.of.bank.mortgages** Numbers of bank mortgages.

**Amount.of.bank.mortgages** Amount (thousands of euros) of bank mortgages.

**Number.of.savings.bank.mortgages** Numbers of savings bank mortgages.

**Amount.of.savings.bank.mortgages** Amount (thousands of euros) of savings bank mortgages.

**Number.of.other.entities.mortgages** Numbers of other entities mortgages.

**Amount.of.other.entities.mortgages** Amount (thousands of euros) of other entities mortgages.

**Source**

Spanish Statistical Office (INE), <http://www.ine.es>

**Examples**

```
## Not run:
Mortgages

## End(Not run)
```

---

paasche.index.number *Calculate the Paasche index number*

---

### Description

This function determines the Paasche index number for those cases in which there exist more than an only product.

### Usage

```
paasche.index.number(x, y, name, opt.plot = FALSE, opt.summary = FALSE)
```

### Arguments

x	Matrix that contains the magnitude(s) under study. In each column, it contains the magnitude of a different product considered. Thus, we have <code>nrow(x)</code> values of a magnitude for <code>ncol(x)</code> products.
y	Matrix that contains that magnitude used as weight. In each column, it contains another magnitude associated to each different product along the time. Thus, we have <code>nrow(x)</code> values of magnitudes for the set of <code>ncol(x)</code> products.
name	Chain of characters to indicate the name of the variable under study.
opt.plot	Logical option to indicate if a graphical description of the index number along the different stages is required. It takes the value TRUE or FALSE.
opt.summary	Logical option to indicate if a statistical summary of the index number is required. It takes the value TRUE or FALSE.

### Value

Summary	Statistical summary (optional) of the index number along the considered period.
Agg. index number	Table containing the values of the index number for the considered stages and the aggregate value.
Graphical	Graphical summary (optional) of the index number along the considered period.

### Author(s)

A. Saavedra-Nieves, P. Saavedra-Nieves

### References

Paasche, H. (1874) *Über die Preisentwicklung der letzten Jahre nach den Hamburger Borsennotirungen.* Jahrb. Natl. Stat. 23, 168–178.

### Examples

```
prices<-matrix(c(70,75,77,77,85,90,85,75,77,87,85,90,70,75,77,77,85,90),ncol=3)
weights<-matrix(c(1,1.5,0.8,1.1,1,0.9,0.7,0.8,0.6,1,1.1,0.9,1,1,0.9,1.1,0.6,0.8),ncol=3)
paasche.index.number(prices,weights,"Price",opt.plot=TRUE,opt.summary=TRUE)
```

# Index

- \* **Fisher**
    - fisher.index.number, 7
  - \* **IndexNUMBER**
    - IndexNumber-package, 2
  - \* **aggregated**
    - aggregated.index.number, 4
  - \* **datasets**
    - ActivePeople, 3
    - ECResources, 5
    - Food, 8
    - Mortgages, 13
  - \* **edgeworth**
    - edgeworth.index.number, 6
  - \* **indexnumberchain**
    - index.number.chain, 10
  - \* **indexnumberserie**
    - index.number.serie, 11
  - \* **laspeyres**
    - laspeyres.index.number, 12
  - \* **paasche**
    - paasche.index.number, 14
- ActivePeople, 3
- aggregated.index.number, 4
- ECResources, 5
- edgeworth.index.number, 6
- fisher.index.number, 7
- Food, 8
- index.number.chain, 10
- index.number.serie, 11
- IndexNumber (IndexNumber-package), 2
- IndexNumber-package, 2
- laspeyres.index.number, 12
- Mortgages, 13
- paasche.index.number, 14