Package ‘iotables’

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Type Package

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Description Pre-processing and basic analytical tasks related to working with Eurostat’s symmetric input-output tables and provide basic input-output economics calculations. The package is a part of rOpenGov <http://ropengov.github.io/> to open source open government initiatives.

URL http://iotables.ceemid.eu/

BugReports https://github.com/rOpenGov/iotables/issues

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### Description

Backward linkages as defined by the Eurostat Manual of Supply, Use and Input-Output Tables (see p506-507.)

### Usage

```r
backward_linkages(Im)
```

### Arguments

- **Im**: A Leontieff inverse matrix created by the `leontieff_inverse_create` function.

### Value

The vector of industry (product) backward linkages in a wide data.frame class, following the column names of the Leontieff inverse matrix.

### See Also

Other interindustrial linkage functions: `forward_linkages()`

### Examples

```r
de_coeff <- input_coefficient_matrix_create( iotable_get(), digits = 4 )
I <- leontieff_inverse_create (de_coeff)
broadcast_linkages (I)
```
coefficient_matrix_create

Create a coefficient matrix

Description
Create a coefficient matrix from a Symmetric Input-Output Table. The coefficient matrix is related by default to output, but you can change this to total supply or other total aggregate if it exists in your table.

Usage

```r
coefficient_matrix_create(
  data_table,
  total = "output",
  digits = NULL,
  remove_empty = TRUE,
  households = FALSE,
  return_part = NULL
)
```

Arguments

data_table: A symmetric input-output table, a use table, a margins or tax table retrieved by the `iotable_get` function.
total: Usually an output vector with a key column, defaults to "output" which equals "P1" or "output_bp". You can use other rows for comparison, for example "TS_BP" if it exists in the matrix.
digits: An integer showing the precision of the technology matrix in digits. Default is NULL when no rounding is applied.
remove_empty: Defaults to TRUE. If you want to keep empty primary input rows, choose FALSE. Empty product/industry rows are always removed to avoid division by zero error in the analytical functions.
households: Defaults to NULL. Household column can be added with TRUE.
return_part: Defaults to NULL. You can choose "product" or "industry" to return an input coefficient matrix or "primary_inputs" to get only the total intermediate use and proportional primary inputs.

Value
A data.frame that contains the matrix of data_table divided by total with a key column. Optionally the results are rounded to given digits.

References
See United Kingdom Input-Output Analytical Tables 2010 for explanation on the use of the Coefficient matrix.
conforming_vector_create

See Also

Other indicator functions: direct_effects_create(), input_indicator_create()

Examples

conforming_vector_create (data_table = de_input_flow)
croatia_2010_1700  
*Input-output table for Croatia, 2010.*

**Description**

1700 - Symmetric input-output table at basic prices (product x product) In thousand kunas (T_NAC)

**Usage**

```r
data(croatia_2010_1700)
```

**Format**

A data frame with 13 variables.

- `t_rows2` Technology codes in row names, following the Eurostat convention.
- `t_rows2_lab` Longer labels for `t_rows2`.
- `t_cols2` Technology codes in column names, following the Eurostat convention.
- `t_cols2_lab` Longer labels for `t_cols2`.
- `iotables_col` The standardized iotables column labelling for easier reading.
- `col_order` The column ordering to keep the matrix legible.
- `row_order` The row ordering to keep the matrix legible.
- `iotables_row` The standardized iotables row labelling for easier reading.
- `unit` Different from Eurostat tables, in thousand national currency units.
- `geo` ISO / Eurostat country code for Croatia.
- `geo_lab` ISO / Eurostat country name, Croatia.
- `time` Date of the SIOT.
- `values` The actual values of the table in thousand kunas.

**Source**


**See Also**

Other Croatia 2010 datasets: croatia_2010_1800,croatia_2010_1900,croatia_employment_2013, croatia_employment_aggregation, primary_inputs
**croatia_2010_1800**  
*Input-output table for Croatia, 2010.*

---

**Description**

1800 - Symmetric input-output table for domestic production (product x product) in thousand kunas (T_NAC)

**Usage**

```r
data(croatia_2010_1800)
```

**Format**

A data frame with 13 variables.

- **t_rows2** Technology codes in row names, following the Eurostat convention.
- **t_rows2_lab** Longer labels for t_rows2
- **values** The actual values of the table in thousand kunas
- **t_cols2** Column labels, following the Eurostat convention with differences. CPA_ suffix added to original DZS column names.
- **t_cols2_lab** Longer labels for t_cols2
- **iotables_col** The standardized iotables column labelling for easier reading.
- **col_order** The column ordering to keep the matrix legible.
- **iotables_row** The standardized iotables row labelling for easier reading.
- **row_order** The row ordering to keep the matrix legible.
- **unit** Different from Eurostat tables, in thousand national currency units.
- **geo** ISO / Eurostat country code for Croatia
- **geo_lab** ISO / Eurostat country name, Croatia.
- **time** Date of the SIOT

**Source**


**See Also**

Other Croatia 2010 datasets: [croatia_2010_1700], [croatia_2010_1900], [croatia_employment_2013], [croatia_employment_aggregation], [primary_inputs]
Description

1900 - Symmetric input-output table for imports (product x product) In thousand kunas (T_NAC)

Usage

data(croatia_2010_1900)

Format

A data frame with 13 variables.

- **t_rows2** Technology codes in row names, following the Eurostat convention.
- **t_rows2_lab** Longer labels for t_rows2
- **values** The actual values of the table in thousand kunas
- **t_cols2** Column labels, following the Eurostat convention with differences. CPA_ suffix added to original DZS column names.
- **t_cols2_lab** Longer labels for t_cols2
- **iotables_col** The standardized iotables column labelling for easier reading.
- **col_order** The column ordering to keep the matrix legible.
- **iotables_row** The standardized iotables row labelling for easier reading.
- **row_order** The row ordering to keep the matrix legible.
- **unit** Different from Eurostat tables, in thousand national currency units.
- **geo** ISO / Eurostat country code for Croatia
- **geo_lab** ISO / Eurostat country name, Croatia.
- **time** Date of the SIOT

Source


See Also

Other Croatia 2010 datasets: croatia_2010_1700, croatia_2010_1800, croatia_employment_2013, croatia_employment_aggregation, primary_inputs
croatia_employment_2013

Croatian employment data for the year 2013

Description

Aggregate Croatian detailed employment statistics into the Croatian (EU standard) Symmetric input-output table format.

Usage

data(croatia_employment_2013)

Format

A data frame with 107 observations in 2 variables:

- code
- iotables_row
- employment

employment
Employment in the sector in Croatia, not in thousands!

See Also

Other Croatia 2010 datasets: croatia_2010_1700, croatia_2010_1800, croatia_2010_1900, croatia_employment_aggregation, primary_inputs

croatia_employment_aggregation

Aggregation table for Croatian employment statistics

Description

Aggregate Croatian detailed employment statistics into the Croatian (EU standard) Symmetric input-output table format.

Usage

data(croatia_employment_aggregation)

Format

A data frame with 105 rows (including empty ones) and 2 variables.

- employment_label
- t_cols2

employment_label
Labelling in DZS English language export
t_cols2
Labelling of EU/DZS SIOTs.
direct_effects_create  

Create direct effects

Description

The function creates the effects.

Usage

direct_effects_create(input_requirements, inverse, digits = NULL)

Arguments

input_requirements  
A matrix or vector created by input_indicator_create

inverse  
A Leontieff-inverse created by leontieff_inverse_create.

digits  
Rounding digits, defaults to NULL, in which case no rounding takes place.

Value

A data.frame containing the direct effects and the necessary metadata to sort them or join them with other matrices.

See Also

Other indicator functions: coefficient_matrix_create(), input_indicator_create()

Examples

nl <- netherlands_2006

input_coeff_nl <- input_coefficient_matrix_create( 
  data_table = netherlands_2006, 
  households = FALSE)

compensation_indicator <- input_indicator_create(netherlands_2006, 'compensation_employees')

I_nl <- leontieff_inverse_create( input_coeff_nl )

direct_effects_create(input_requirements = compensation_indicator, 
  inverse = I_nl)
employment_get

Description

Download the employment data for a country and arrange it to the 64x64 SIOTs. Currently works only with product x product tables.

Usage

```r
employment_get(
  geo = "CZ",
  year = "2010",
  sex = "Total",
  age = "Y_GE15",
  labelling = "iotables",
  data_directory = NULL,
  force_download = TRUE
)
```

Arguments

- **geo**: The country code.
- **year**: The year. The average employment will be created for the given year, starting with 2008, when the NACE Rev 2 was introduced in employment statistics.
- **sex**: Defaults to "Total". Enter "Females" or "F" for female employment, "Males" or "M" for male employment.
- **age**: Defaults to "Y_GE15", which is the Eurostat code for employment in all age groups starting from 15-years-old. Any Eurostat code can be used as a parameter.
- **labelling**: Either "iotables" or the applicable short code, for product x product SIOTs "prod_na" and in the case of industry x industry SIOTs "induse".
- **data_directory**: Defaults to NULL, if a valid directory, it will try to save the pre-processed data file here with labelling.
- **force_download**: Defaults to TRUE. If FALSE it will use the existing downloaded file in the data_directory or the temporary directory, if it exists.

Value

A data.frame with auxiliary metadata to conform the symmetric input-output tables.

Source

Eurostat statistic Employment by sex, age and detailed economic activity (from 2008 onwards, NACE Rev. 2 two digit level) - 1 000
employment_metadata

See Also

Other iotables import functions: `iotable_get()`, `iotables_download()`, `iotables_metadata_get()`, `iotables_read_tempdir()`

Examples

```r
## Not run:
io_tables <- get_employment (geo = "CZ", year = "2010", sex = "Total", age = "Y_GE15", data_directory = NULL, force_download = TRUE)

## End(Not run)
```

employment_metadata  Employment metadata

Description

An arrangement of the Eurostat national accounts vocabulary to match with employment statistics data.

Usage

data(metadata)

Format

A data frame with 6 variables.

- **emp_code**  code used in the employment statistics
- **code**  Eurostat labels for SIOTs corresponding to emp_code
- **label**  Eurostat label descriptions for SIOTs corresponding to emp_code
- **variable**  Eurostat vocabulary source, i.e. t_rows, t_cols, prod_na, induse
- **group**  Different from Eurostat tables, in thousand national currency units.
- **iotables_label**  Custom, machine_readable snake format variable names

See Also

Other Metadata datasets: `metadata_uk_2010`, `metadata`
equation_solve  Solve A Basic (Matrix) Equation

Description
The function matches to parts of the matrix equation, using the named formats with row names and solves the matrix equation. This function is used in wrapper functions, such as `multiplier_create`, to solve particular problems, but it can be used directly, too. The function only performs the lhs pairing industries and checking for exceptions.

Usage
```r
equation_solve(LHS = NULL, Im = NULL)
```

Arguments
- **LHS**: A left-hand side vector with a key column containing the industry or product names for matching, for example the employment coefficients.
- **Im**: A Leontieff-inverse with a key column containing the industry or product names for matching.

Value
A data.frame with auxiliary metadata to conform the symmetric input-output tables.

Examples
```r
Im = data.frame(
a = c("row1", "row2"),
b = c(1,1),
c = c(2,0))
LHS = data.frame(
a = "lhs",
b = 1,
c = 0.5)
equation_solve (Im = Im, LHS = LHS)
```

forward_linkages  Forward linkages

Description
Forward linkages as defined by the Eurostat Manual of Supply, Use and Input-Output Tables (see p506-507.)
Usage

forward_linkages(output_coefficient_matrix, digits = NULL)

Arguments

output_coefficient_matrix
  An output coefficient matrix created with the output_coefficient_matrix_create function.

digits
  Number of decimals for rounding, defaults to NULL.

Value

The vector of industry (product) forward linkages in a long-form data.frame, containing the meta-data column of the the row names from the output_coefficient_matrix.

See Also

Other interindustrial linkage functions: backward_linkages()

Examples

data_table = iotable_get()

de_out <- output_coefficient_matrix_create ( data_table, "tfu", digits = 4 )

forward_linkages ( output_coefficient_matrix = de_out, digits = 4 )

---

germany_1990

Simple input-output table for Germany, 1990.

Description

For testing purposes a well documented example data set is used from the Eurostat manual. The table in the Eurostat manual is brought to the format used by the Eurostat database. It is a small dataset for examples, but it is also instructive to understand how Eurostat stores the highly structured SIOTs in long-form tidy datasets. The labels were slightly altered to reflect the transition from the vocabulary of ESA95 to ESA2010 since the publication of the Manual.

Usage

data(germany_1990)
household_column_find

Format

A data frame with 228 observations and 10 variables.

- **prod_na**: Technology codes in row names, following the Eurostat convention.
- **prod_na_lab**: Longer labels for t_rows2
- **induse**: Column labels, following the Eurostat convention with differences.
- **iotables_row**: Row labels, i.e. to be used in key column, for iotables package abbreviations
- **iotables_col**: Column labels for iotables package abbreviations
- **values**: The actual values of the table in million euros
- **unit**: MIO_EUR, the same as Eurostat
- **unit_lab**: Million euros. Eurostat usually has euro and national currency unit values, too.
- **geo**: ISO / Eurostat country code for Germany, i.e. DE
- **geo_lab**: ISO / Eurostat country name, Germany
- **time**: Date of the SIOT

Source

*Eurostat Manual of Supply, Use and Input-Output Tables* p 492

See Also

Other Validation datasets: *netherlands_2006, uk_2010_data, uk_test_results*

---

**household_column_find**  *Return the position of final household expenditure*

### Description

Return the position of final household expenditure

### Usage

`household_column_find(data_table)`

### Arguments

- **data_table**: A symmetric input output table, a use table or a supply table.

### Value

An integer value with the final household expenditure. Returns NULL if not found.

### Examples

```r
household_column_find( iotable_get( source = 'germany_1990') )
```
household_column_get  \textit{Return Final Household Expenditure}

\underline{Description}

Return Final Household Expenditure

\underline{Usage}

\texttt{household\_column\_get(data\_table)}

\underline{Arguments}

data\_table \hspace{0.5cm} A symmetric input output table, a use table or a supply table.

\underline{Value}

The column containing final household expenditure. If not found \texttt{NULL} is returned.

\underline{See Also}

Other iotables processing functions: \texttt{conforming\_vector\_create()}, \texttt{output\_get()}, \texttt{primary\_input\_get()}

\underline{Examples}

\texttt{household\_column\_get( ivotable\_get( source = 'germany_1990' ) )}

\underline{indirect\_effects\_create  \textit{Create indirect effects}}

\underline{Description}

The function creates the effects.

\underline{Usage}

\texttt{indirect\_effects\_create(input\_requirements, inverse, digits = NULL)}

\underline{Arguments}

input\_requirements \hspace{0.5cm} A matrix or vector created by \texttt{input\_indicator\_create}

inverse \hspace{0.5cm} A Leontieff-inverse created by \texttt{leontieff\_inverse\_create}.

digits \hspace{0.5cm} Rounding digits, defaults to NULL, in which case no rounding takes place.
input_coefficient_matrix_create

Examples

dl <- netherlands_2006

input_coeff_nl <- input_coefficient_matrix_create(
  data_table  = netherlands_2006,
  households = FALSE)

compensation_indicator <- input_indicator_create(netherlands_2006, 'compensation_employees')

I_nl <- leontieff_inverse_create( input_coeff_nl )

direct_effects_create(input_requirements = compensation_indicator,
  inverse = I_nl)

input_coefficient_matrix_create

Create an input coefficient matrix

Description

Create an input coefficient matrix from the input flow matrix and the output vector. The two input vectors must have consistent labelling, i.e. the same column names must be found in the use table (input flow) and the output vector.

Usage

input_coefficient_matrix_create(data_table, households = FALSE, digits = NULL)

Arguments

data_table A symmetric input-output table, a use table, a margins or tax table retrieved by the iotable_get function.

households Defaults to NULL. Household column can be added with TRUE.

digits An integer showing the precision of the technology matrix in digits. Default is NULL when no rounding is applied.

Details

The terminology follows the Eurostat Manual of Supply, Use and Input-Output Tables. Input-Output Multipliers Specification Sheet and Supporting Material, Spicosa Project Report, which cannot be linked due to a malformed URL, but can be found with a search engine. This matrix is called 'technological coefficients'. The results of the function are tested on both sources.

This is a wrapper function around coefficient_matrix_create.
**input_flow_get**

**Value**
A data frame that contains the matrix of first quadrant of the use table as input_flow divided by output supported by a key column of product or industries, with a key column. Optionally the results are rounded to given digits.

An input coefficient matrix of data.frame class. The column names are ordered, and the row names are in the first, auxiliary metadata column.

**Examples**

```r
input_coefficient_matrix_create(
    iotable_get(),
    digits = 4
)

# This is a wrapper function and equivalent to
coefficient_matrix_create(
    iotable_get(),
    total = "total",
    return = "products"
)
```

**Description**
Select the use table from a symmetric input-output table.

**Usage**

```r
input_flow_get(data_table, empty_remove = FALSE, households = TRUE)
```

**Arguments**

- `data_table` A symmetric input-output table or use table retrieved by the `iotable_get` function.
- `empty_remove` Defaults to TRUE. If you want to keep empty primary input rows, choose FALSE. Empty product/industry rows are always removed to avoid division by zero error in the analytical functions.
- `households` Defaults to FALSE. If TRUE, the final household expenditure is added to the input flow table.

**Value**
A data flow matrix in a labelled data frame.

**See Also**
Other analytical object functions: `leontieff_matrix_create()`
**Examples**

```r
data_table <- iotable_get()
input_flow <- input_flow_get( data_table = data_table,
    empty_remove = FALSE,
    households = TRUE)
```

---

**input_indicator_create**

Create input indicator(s)

**Description**

The function creates the input indicators from the inputs and the outputs.

**Usage**

```r
input_indicator_create(
    data_table, 
    input_vector = c("gva_bp", "net_tax_production"),
    digits = NULL,
    households = FALSE,
    indicator_names = NULL
)
```

**Arguments**

- `data_table`: A symmetric input-output table, a use table, a margins or tax table retrieved by the `iotable_get` function.
- `input_vector`: The name of inputs for which you want to create the indicators. They must be found in the `data_table`.
- `digits`: Rounding digits, if omitted, no rounding takes place.
- `households`: If the households column should be added, defaults to `FALSE`.
- `indicator_names`: The names of new indicators. Defaults to `NULL` when the names in the key column of `input_matrix` will be used to create the indicator names.

**Value**

A tibble (data frame) containing `input_matrix` divided by the `output_vector` with a key column for products or industries.

**See Also**

Other indicator functions: `coefficient_matrix_create()`, `direct_effects_create()`
**Examples**

```r
input_indicator_create( data_table = iotable_get(),
  input_vector = c("gva", "compensation_employees"),
  digits = 4,
  indicator_names = c("GVA indicator", "Income indicator"))
```

```r
input_multipliers_create
Create input indicators
```

**Description**

The function creates the multipliers (direct + indirect effects).

**Usage**

```r
input_multipliers_create(input_requirements, inverse, digits = NULL)
```

**Arguments**

- `input_requirements`: A matrix or vector created by `input_indicator_create`
- `inverse`: A Leontieff-inverse created by `leontieff_inverse_create`.
- `digits`: Rounding digits, defaults to `NULL`, in which case no rounding takes place.

**Value**

A data frame with the vector of multipliers and an auxiliary metadata column (for joining with other matrices.)

**See Also**

Other multiplier functions: `multiplier_create()`

**Examples**

```r
nl <- netherlands_2006
input_coeff_nl <- input_coefficient_matrix_create(
  data_table = netherlands_2006,
  households = FALSE)
compensation_indicator <- input_indicator_create(netherlands_2006, 'compensation_employees')
I_nl <- leontieff_inverse_create( input_coeff_nl )
input_multipliers_create(input_requirements = compensation_indicator,
  inverse = I_nl)
```
Description

Pre-processing and basic analytical tasks related to working with Eurostat’s symmetric input-output tables and provide basic input-output economics calculations. The package is a part of rOpenGov (<http://ropengov.github.io/> for open source open government initiatives.

iotables import functions

The iotables import function help downloading and pre-processing the Eurostat symmetric input-output tables and related tables.

- `iotable_get` returns a single table.
- `employment_get` downloads the employment data and processes it to a conforming form.

iotables processing functions

These are various helper functions for accessing parts of the symmetric input-output tables and joining them correctly. `conforming_vector_create` is a helper function that creates a named vector that conforms with the analytical objects, such as the use table, the Leontieff-matrix, etc.

- `household_column_get` returns the final household expenditure.
- `primary_input_get` will retrieve any primary input from the input-output table. `output_get` is a wrapper function around the `primary_input_get` function.
- `total_tax_add` adds taxes to an input-output table.

analytical object functions

- `input_flow_get` returns the use (input flow) matrix.
- `leontieff_matrix_create` and the `leontieff_inverse_create` to create the respective analytical matrices.

indicator functions

- `input_indicator_create` The function creates the input indicators from the inputs and the outputs.
- `direct_effects_create` for direct effects.
- `coefficient_matrix_create` The coefficient matrix is related by default to output, but you can change this to total supply or other total aggregate if it exists in the data table.
multiplier functions

multiplier_create is a wrapper around equation_solve to create multipliers. This is a more
generic helper function to calculate various multipliers.

input_multipliers_create is a function to create input multipliers (for direct and indirect eco-
nomic effects.)

interindustrial linkage functions

backward_linkages creates the vector of industry (product) backward linkages in a wide data.frame
class, following the column names of the Leontief inverse matrix.

forward_linkages creates the vector of industry (product) forward linkages in a long-form data.frame,
containing the metadata column of the the row names from the output_coefficient_matrix.

Metadata datasets

Data files that contain descriptive metadata for a correct reproduction of the symmetric input-output
tables. The analytical functions use matrix equations that require a precise column and row order
for each table.

Validation datasets

Data files that replicate published input-output tables with analysis. These files are used to validate
the correct working of the analytical functions.

Croatia data files

These are Croatia’s symmetric input-output tables for the year 2010, when the country was not yet
an EU member state.

---

iotables_download   Download input-output tables

Description

This function downloads standard input-output table files. Currently only Eurostat files are sup-
ported. You are not likely to use this function, because iotable_get will call this function if
necessary and properly filter out an input-output table.

Usage

iotables_download(
    source = "naio_10_cp1700",
    data_directory = NULL,
    force_download = TRUE
)
Arguments

source See the available list of sources above in the Description.

data_directory Defaults to NULL, if a valid directory, it will try to save the pre-processed data file here with labelling.

force_download Defaults to TRUE. If FALSE it will use the existing downloaded file in the data_directory or the temporary directory, if it exists.

Details

The data is downloaded in the tempdir() under the name the statistical product as an rds file. (For example: naio_10_cp1750.rds)

The temporary directory is emptied at every normal R session exit.

To save the file for further use (which is necessary in analytical work because download times are long) set the download_directory [see parameters]. The function will make a copy of the rds file in this directory.

- naio_10_cp1700 Symmetric input-output table at basic prices (product by product)
- naio_10_pyp1700 Symmetric input-output table at basic prices (product by product) (previous years prices)
- naio_10_cp1750 Symmetric input-output table at basic prices (industry by industry)
- naio_10_pyp1750 Symmetric input-output table at basic prices (industry by industry) (previous years prices)
- naio_10_cp15 Supply table at basic prices incl. transformation into purchasers’ prices
- naio_10_cp16 Use table at purchasers’ prices
- naio_10_cp1610 Use table at basic prices
- naio_10_pyp1610 Use table at basic prices (previous years prices) (naio_10_pyp1610)
- naio_10_cp1620 Table of trade and transport margins at basic prices
- naio_10_pyp1620 Table of trade and transport margins at previous years’ prices
- naio_10_cp1630 Table of taxes less subsidies on products at basic prices
- naio_10_pyp1630 Table of taxes less subsidies on products at previous years’ prices
- uk_2010_siott United Kingdom Input-Output Analytical Tables data

Value

A nested data frame. Each input-output table is in a separate row of the nested output, where all the metadata are in columns, and the actual, tidy, ordered input-output table is in the data data column. The data is saved into the actual tempdir(), too.

See Also

Other iotables import functions: employment_get(), iotable_get(), iotables_metadata_get(), iotables_read_tempdir()
# iotables_metadata_get

## Get Metadata from Nested iotables File

### Description

Remove the data column and return only the metadata information of input-output (or related tables) from a source. If `dat` is not inputed as a nested data frame created by `iotables_download`, validate the source input parameter and try to load the table from the current sessions' temporary directory.

- `naio_10_cp1700` Symmetric input-output table at basic prices (product by product)
- `naio_10_pyp1700` Symmetric input-output table at basic prices (product by product) (previous years prices)
- `naio_10_cp1750` Symmetric input-output table at basic prices (industry by industry)
- `naio_10_pyp1750` Symmetric input-output table at basic prices (industry by industry) (previous years prices)
- `naio_10_cp15` Supply table at basic prices incl. transformation into purchasers' prices
- `naio_10_cp16` Use table at purchasers' prices
- `naio_10_cp1610` Use table at basic prices
- `naio_10_pyp1610` Use table at basic prices (previous years prices) (naio_10_pyp1610)
- `naio_10_cp1620` Table of trade and transport margins at basic prices
- `naio_10_pyp1620` Table of trade and transport margins at previous years’ prices
- `naio_10_cp1630` Table of taxes less subsidies on products at basic prices
- `naio_10_pyp1630` Table of taxes less subsidies on products at previous years’ prices
- `uk_2010_siolt` United Kingdom Input-Output Analytical Tables data

### Usage

```r
iotables_metadata_get(dat = NULL, source = "naio_10_cp1700")
```

### Arguments

- **dat**
  - A nested data file created by `iotables_download`. Defaults to `NULL` in which case an attempt is made to find and read in the nested data from the current R sessions’ temporary directory.

- **source**
  - See the available list of sources above in the Description.
**iotables_read_tempdir**

Value

A data frame, which contains the metadata of all available input-output tables from a specific source.

See Also

Other iotables import functions: `employment_get()`, `iotable_get()`, `iotables_download()`, `iotables_read_tempdir()`

Examples

```r
iotables_metadata_get ( source = "naio_10_cp1700" )
```

---

**iotables_read_tempdir**  Read input-output Tables from Temporary Directory

Description

Validate the source input parameter and try to load the table from the current sessions’ temporary directory.

- naio_10_cp1700 Symmetric input-output table at basic prices (product by product)
- naio_10_pyp1700 Symmetric input-output table at basic prices (product by product) (previous years prices)
- naio_10_cp1750 Symmetric input-output table at basic prices (industry by industry)
- naio_10_pyp1750 Symmetric input-output table at basic prices (industry by industry) (previous years prices)
- naio_10_cp15 Supply table at basic prices incl. transformation into purchasers’ prices
- naio_10_cp16 Use table at purchasers’ prices
- naio_10_cp1610 Use table at basic prices
- naio_10_pyp1610 Use table at basic prices (previous years prices) (naio_10_pyp1610)
- naio_10_cp1620 Table of trade and transport margins at basic prices
- naio_10_pyp1620 Table of trade and transport margins at previous years’ prices
- naio_10_cp1630 Table of taxes less subsidies on products at basic prices
- naio_10_pyp1630 Table of taxes less subsidies on products at previous years’ prices
- uk_2010_siott United Kingdom Input-Output Analytical Tables data

Usage

```r
iotables_read_tempdir(source = "naio_10_cp1700")
```

Arguments

- `source`  See the available list of sources above in the Description. Defaults to `source = "naio_10_cp1700"`. 
Value

A nested data frame. Each input-output table is in a separate row of the nested output, where all the metadata are in columns, and the actual, tidy, ordered input-output table is in the data column.

See Also

Other iotables import functions: employment_get(), iotable_get(), iotables_download(), iotables_metadata_get()

Examples

```r
iotables_read_tempdir( source = "naio_10_cp1700" )
```

### Description

This function is used to filter out a single input-output table from a database, for example a raw file downloaded from the Eurostat website. It provides some functionality to avoid some pitfalls.

### Usage

```r
iotable_get(
    labelled_io_data = NULL,
    source = "germany_1990",
    geo = "DE",
    year = 1990,
    unit = "MIO_EUR",
    stk_flow = "DOM",
    labelling = "iotables",
    data_directory = NULL,
    force_download = TRUE
)
```

### Arguments

- **labelled_io_data**
  
  If you have downloaded a bulk data file with iotables_download, it is faster to work with the data in the memory. Defaults to NULL when the data will be retrieved from the hard disk or from the Eurostat website invoking the same function.

- **source**
  
  A data source, for example naio_10_cp1700.

  - naio_10_cp1700 Symmetric input-output table at basic prices (product by product)
  - naio_10_pyp1700 Symmetric input-output table at basic prices (product by product) (previous years prices)
• `naio_10_cp1750` Symmetric input-output table at basic prices (industry by industry)
• `naio_10_pyp1750` Symmetric input-output table at basic prices (industry by industry) (previous years prices)
• `naio_10_cp15` Supply table at basic prices incl. transformation into purchasers’ prices
• `naio_10_cp16` Use table at purchasers’ prices
• `naio_10_cp1610` Use table at basic prices
• `naio_10_pyp1610` Use table at basic prices (previous years prices) (`naio_10_pyp1610`)
• `naio_10_cp1620` Table of trade and transport margins at basic prices
• `naio_10_pyp1620` Table of trade and transport margins at previous years’ prices
• `naio_10_cp1630` Table of taxes less subsidies on products at basic prices
• `naio_10_pyp1630` Table of taxes less subsidies on products at previous years’ prices

For further information consult the Eurostat Symmetric Input-Output Tables page.

geo
A country code or a country name. For example, SK or as Slovakia.

year
A numeric variable containing the year. Defaults to 2010, because this year has the most data.

unit
A character string containing the currency unit, defaults to MIO_NAC (million national currency unit). The alternative is MIO_EUR.

stk_flow
Defaults to DOM as domestic output, alternative IMP for imports and TOTAL for total output. For source = 'naio_10_cp1620' and trade and transport margins and source = 'naio_10_cp1630' taxes less subsidies only TOTAL is not used.

labelling
Defaults to iotables which gives standard row and column names regardless of the source of the table, or if it is a product x product, industry x industry or product x industry table. The alternative is short or eurostat which is the original short row or column code of Eurostat or OECD.

data_directory
Defaults to NULL, if a valid directory, it will try to save the pre-processed data file here with labelling.

force_download
Defaults to TRUE. If FALSE it will use the existing downloaded file in the data_directory or the temporary directory, if it exists. Will force download only in a new session.

Details
Unless you want to work with bulk data files, you should not invoke `iotables_download` directly, rather via this function, if and when it is necessary.

Value
A wide format data.frame with a well-ordered input-output table. The bulk data files on the Eurostat website are in a long form and they are not correctly ordered for further matrix equations.
See Also

Other iotables import functions: employment_get(), iotables_download(), iotables_metadata_get(), iotables_read_tempdir()

Examples

germany_table <- iotable_get( source = "germany_1990",
geo = 'DE', year = 1990, unit = "MIO_EUR",
labelling = "iotables" )

Arguments

labelled_io_data

If you have downloaded a bulk data file with iotables_download, it is faster to work with the data in the memory. Defaults to NULL when the data will be retrieved from the hard disk or from the Eurostat website invoking the same function.

source

A data source, for example naio_10_cp1700. Symmetric input-output table at basic prices (product by product) (naio_10_cp1700) Symmetric input-output table at basic prices (industry by industry) (naio_10_cp1750) Symmetric input-output table at basic prices (product by product) (previous years prices) (naio_10_pyp1700) Symmetric input-output table at basic prices (industry by industry) (previous years prices) (naio_10_pyp1750) Table of trade and transport margins at basic prices (naio_10_cp1620) and at previous years prices (naio_10_pyp1620) Table of taxes less subsidies on products at basic prices (naio_10_cp1630) and at
previous’ years prices (naio_10_pyp1630) For further information consult the Eurostat Symmetric Input-Output Tables page.

geo
A country code or a country name. For example, SK or as Slovakia.

unit
A character string containing the currency unit, defaults to MIO_NAC (million national currency unit). The alternative is MIO_EUR.

time_unit
Defaults to 'year' and years are returned as numbers. Alternative is to return 'time' as vector of dates.

stk_flow
Defaults to DOM as domestic output, alternative IMP for imports and TOTAL for total output. For source = 'naio_10_cp1620' and trade and transport margins and source = 'naio_10_cp1630' taxes less subsidies only TOTAL is not used.

data_directory
Defaults to NULL. Use if it you used a data_directory parameter with iotable_get or iotables_download.

force_download
Defaults to TRUE. If FALSE it will use the existing downloaded file in the data_directory or the temporary directory, if it exists. Will force download only in a new session.

Value
A vector with the years that have available input-output tables.

Examples

germany_years <- iotable_year_get ( source = "germany_1990", geo = 'DE',
unit = "MIO_EUR" )

is_html_output
Check if HTML output is required

Description
Check if HTML output is required

is_latex_output
Check if Latex output is required

Description
Check if Latex output is required
leontieff_inverse_create

Create the inverse of a Leontieff-matrix.

Description

The inversion takes place after the basic properties of the Leontieff matrix.

Usage

leontieff_inverse_create(technology_coefficients_matrix, digits = NULL)

Arguments

- technology_coefficients_matrix
  A technology coefficient matrix created by the input_coefficient_matrix_create or output_coefficient_matrix_create.
- digits
  An integer showing the precision of the technology matrix in digits. Default is NULL when no rounding is applied.

Examples

```r
tm <- input_flow_get(
  data_table = iotable_get(),
  households = FALSE)
I <- leontieff_inverse_create(technology_coefficients_matrix = tm)
```

leontieff_matrix_create

Create a Leontieff matrix

Description

Create a Leontieff matrix from technology matrix after some basic error handling. Most likely you will need this function as a step to invoke the function to create its inverse: leontieff-inverse_create.

Usage

leontieff_matrix_create(technology_coefficients_matrix)

Arguments

- technology_coefficients_matrix
  A technology coefficient matrix created by the input_coefficient_matrix_create or output_coefficient_matrix_create.
Value

A Leontieff matrix of data.frame class. The column names are ordered, and the row names are in the first, auxiliary metadata column.

See Also

Other analytical object functions: input_flow_get()

Examples

tm <- input_flow_get(
da_table = iotable_get(),
households = FALSE)
L <- leontieff_matrix_create( technology_coefficients_matrix = tm )

matrix_round

---

### Description

Round all matrix values to required number of digits.

### Usage

matrix_round(data_table, digits = 0)

### Arguments

- **data_table** A symmetric input output table, a use table or a supply table.
- **digits** An integer number, defaults to 0.

### Value

The matrix, with the intact key column and the numeric columns rounded.
metadata

Metadata

Description
An arrangement of the Eurostat national accounts vocabulary, used to correctly order wide format rows and columns from bulk long-form tables.

Usage
data(metadata)

Format
A data frame with 8 variables.

variable Eurostat vocabulary source, i.e. t_rows, t_cols, prod_na, induse
group Informal labelling for macroeconomic groups
code Eurostat labels
label Eurostat label descriptions
quadrant Where to place the data from a long-form raw data file
account_group Different from Eurostat tables, in thousand national currency units.
numeric_label ordering from quadrant, account_group, digit_1, digit_2
iotables_label Custom, machine_readable snake format variable names

See Also
Other Metadata datasets: employment_metadata, metadata_uk_2010

---

metadata_uk_2010 Multipliers and effects (product) for testing from the United Kingdom Input-Output Analytical Tables, 2010

Description
The Excel-imported UK data.

Usage
data(uk_2010_data)
**multiplier_create**

**Format**

A data frame with 10 variables.

- **variable** Constant for the iotable_get function.
- **uk_row** The UK row identifier. Dots and '&' converted to '-'.
- **uk_col** The UK row identifier. Dots and '&' converted to '-'.
- **uk_row_label** The original UK row labels.
- **uk_col_label** The original UK column labels.
- **eu_prod_na** The Eurostat vocabulary equivalent of uk_row
- **row_order** Ordering variable for rows.
- **col_order** Ordering variable for columns.
- **prod_na** The Eurostat-like key values for rows.
- **induse** The Eurostat-like column names

**See Also**

Other Metadata datasets: `employment_metadata`, `metadata`

---

### Description

This function is in fact a wrapper around the `equation_solve` function, adding a key column with the name to the multiplier the maintain structural consistency.

### Usage

```r
multiplier_create(
  input_vector,
  Im,
  multiplier_name = "multiplier",
  digits = NULL
)
```

### Arguments

- **input_vector** An input matrix or vector created by the `input_indicator_create` function.
- **Im** The Leontieff inverse as a named object created by the `leontieff_inverse_create` function.
- **multiplier_name** A variable name to be given to the returned multipliers. Defaults to `multiplier`.
- **digits** Rounding digits, if omitted, no rounding takes place.
Details

As opposed to direct effects, multipliers are expressed per input of product/industry.

Value

A data frame with the vector of multipliers and the auxiliary metadata column (for joining with other matrixes.)

See Also

Other multiplier functions: `input_multipliers_create()`

Examples

```r
data_table <- iotable_get()

coeff_de <- input_coefficient_matrix_create( data_table )

de_gva_indicator <- input_indicator_create ( 
  data_table = data_table,
  input = 'gva' ) #this is a correct input

I_de <- leontieff_inverse_create( coeff_de )

de_gva_multipliers <- multiplier_create ( 
  input_vector = de_gva_indicator,
  Im = I_de,
  multiplier_name = "employment_multiplier",
  digits = 4 )
```

---

**netherlands_2006**


Description

This simplified SIOT is taken from the Science Policy Integration for Coastal Systems Assessment project’s input-output multiplier specification sheet. It is used as a simple example SIOT for controlled analytical results. The column names were slightly altered to resemble more the current Eurostat conventions and the main example dataset `germany_1990`.

Usage

```r
data(netherlands_2006)
```
Format

A data frame with 14 observations and 13 variables.
A data frame of 13 observations in 14 variables.

- **prod_na**  Product name, simplified, following the Eurostat conventions
- **agriculture_group**  Simple aggregated agricultural products
- **mining_group**  Simple aggregated mining products
- **manufacturing_group**  Simple aggregated manufacturing products
- **construction_group**  Construction
- **utilities_group**  Simple aggregated utilities products/services
- **services_group**  Simple aggregated services products
- **TOTAL**  Column / row sums, simple summary, not included in the original source
- **final_consumption_private**  Simple aggregated final private use
- **final_consumption_households**  Simple aggregated final household consumption
- **final_consumption_government**  Simple aggregated final government consumption
- **gross_fixed_capital_formation**  Gross fixed capital formation ‘GFCF’
- **exports**  Simple aggregated exports
- **total_use**  Simple aggregated total use

Source

Source: Input-Output Multipliers Specification Sheet and Supporting Material in the Spicosa Project Report

See Also

Other Validation datasets: `germany_1990`, `uk_2010_data`, `uk_test_results`

---

**output_coefficient_matrix_create**

Create an output coefficient matrix

Description

Create an output coefficient matrix from the input flow matrix or a symmetric input-output table. If there are zero values in present, they will be changed to 0.000001 and you will get a warning. Some analytical equations cannot be solved with zero elements. You either have faulty input data, or you have to use some sort of data modification to carry on your analysis.

Usage

`output_coefficient_matrix_create(io_table, total = "tfu", digits = NULL)`
output_get

Arguments

io_table  A symmetric input-output table or use table created with the `iotable_get` function which contains the 'total' column. In case you use type="tfu" you need to input a full iotable, create by the `iotable_get`, because you will need the final demand column.

total  The output='total' (or CPA_TOTAL, depending on the names in your table, default) returns the output coefficients for products (intermediates) while the final_demand returns output coefficients for final demand. See Eurostat Manual, p495 and p507.

digits  An integer showing the precision of the technology matrix in digits. Default is `NULL` when no rounding is applied.

Value

An output coefficient matrix of data.frame class. The column names are ordered, and the row names are in the first, auxiliary metadata column.

Examples

```r
io_table <- iotable_get()

output_coefficient_matrix_create(io_table = io_table, total = 'tfu', digits = 4)
```

---

output_get  Get an output vector

Description

This is a wrapper function around the `primary_input_get` function.

Usage

```
output_get(data_table)
```

Arguments

data_table  A symmetric input-output table or use table retrieved by the `iotable_get` function.

Value

A data frame with the vector of multipliers and the an auxiliary metadata column (for joining with other matrixes.)
output_multiplier_create

See Also

Other iotables processing functions: `conforming_vector_create()`, `household_column_get()`, `primary_input_get()`

Examples

```r
output.get ( data_table = iotable_get () )
```

output_multiplier_create

*Output multipliers*

Description

Output multipliers as defined by the Eurostat Manual of Supply, Use and Input-Output Tables on p500.

Usage

```
output_multiplier_create(input_coefficient_matrix)
```

Arguments

- `input_coefficient_matrix`
  
  A Leontieff inverse matrix created by the `input_coefficient_matrix_create` function.

Examples

```
de_input_coeff <- input_coefficient_matrix_create(
  iotable_get(), digits = 4)

output_multiplier_create ( de_input_coeff )
```

primary_inputs

*Primary input abbreviations*

Description

Only currently used primary inputs. Abbreviations for filtering.

Usage

```
data("croatia_employment_aggregation")
```
primary_input_get

Format

A data frame with 105 rows (including empty ones) and 2 variables.

- t_rows2 Eurostat code of the input.
- t_rows2_lab Labelling of the input by Eurostat.
- source Eurostat / DZS
- indicator Human readable abbreviation

See Also

Other Croatia 2010 datasets: croatia_2010_1700, croatia_2010_1800, croatia_2010_1900, croatia_employment_2013, croatia_employment_aggregation

---

primary_input_get Get primary inputs

Description

This function will retrieve any primary input from the input-output table.

Usage

primary_input_get(data_table, primary_input = "compensation_employees")

Arguments

- data_table A symmetric input-output table, a use table, or a supply table retrieved by the iotable_get function.
- primary_input The primary input to be returned from the table.

Value

A data frame with the vector of multipliers and the an auxiliary metadata column (for joining with other matrixes.)

See Also

Other iotables processing functions: conforming_vector_create(), household_column_get(), output_get()

Examples

comp_employees_de <- primary_input_get(
  data_table = iotable_get(),
  primary_input = "compensation_employees")
supplementary_add  
Add Supplementary Data

Description

Download the employment data for a country and arrange it to the 64x64 SIOTs. Currently works only with product x product tables.

Usage

supplementary_add(data_table, supplementary_data, supplementary_names = NULL)

Arguments

data_table  
A SIOT, a use table, a supply table, or a margins table.
supplementary_data  
Supplementary data to be added. It must be a data.frame or tibble with a key column containing the indicator’s name, and the column names must match with the data_table. Can be a vector or a data frame of several rows.
supplementary_names  
Optional names for the new supplementary rows. Defaults to NULL.

Value

A symmetric input-output table with supplementary data, of data.frame class. The column names are ordered, and the row names are in the first, auxiliary metadata column.

Examples

de_io <- iotable_get()
CO2 <- c(0.2379, 0.5172, 0.0456, 0.1320, 0.0127, 0.0530)
names(CO2) <- c("agriculture_group", "industry_group","construction",
  "trade_group","business_services_group","other_services_group")
CO2 <- cbind(data.frame(iotables_row = "CO2"),as.data.frame(t(CO2)))
de_coeff <- input_coefficient_matrix_create(iotable_get())
supplementary_add(de_io, CO2)
total_tax_add  

Summarize And Add Tax Data

Description

Summarize And Add Tax Data

Usage

```r
total_tax_add(
  data_table,
  tax_names = c("d21x31", "d29x39"),
  total_tax_name = "TOTAL_TAX"
)
```

Arguments

- `data_table`
  - A SIOT, a use table, a supply table, or a margins table that has product and production tax rows in among the primary inputs.
- `tax_names`
  - Defaults to ("d21x31", "d29x39"), which are the Eurostat names for taxes. The parameter is not case sensitive.
- `total_tax_name`
  - Defaults to 'TOTAL_TAX'. The name of the summarized row. It is case sensitive.

Value

A data frame with the vector of multipliers and the an auxiliary metadata column (for joining with other matrixes.)

Examples

```r
de_io <- iotable_get()

total_tax_add ( de_io,
    tax_names = c("net_tax_products", "net_tax_production"),
    total_tax_name = "total_tax")
```

uk_2010_data  

United Kingdom Input-Output Analytical Tables, 2010

Description

The Excel-imported UK data.

Usage

```r
data(uk_2010_data)
```
Format

A data frame with 10 variables.

- **uk_row**: The UK row identifier. Dots and '&' converted to '.'.
- **uk_row_lab**: The original UK row labels.
- **uk_col**: The UK row identifier. Dots and '&' converted to '.'.
- **uk_col_lab**: The original UK column labels.
- **geo**: Eurostat-style geocode, i.e. UK
- **geo_lab**: United Kingdom
- **indicator**: The name of the indicator, i.e. Excel sheet.
- **unit**: Eurostat label equivalents units, i.e. MIO_NAC.
- **unit_lab**: Eurostat label equivalents, i.e. millions of national currency unit.
- **values**: The numeric values of the variable
- **year**: Constant = 2010.

Source

United Kingdom Input-Output Analytical Tables 2010

See Also

Other Validation datasets: `germany_1990`, `netherlands_2006`, `uk_test_results`

---

**uk_2010_results_get**  
*Get United Kingdom Multipliers and Effects, 2010*

Description

This function will retrieve the published effects and multipliers from the United Kingdom Input-Output Analytical Tables, 2010 (consistent with UK National Accounts Blue Book 2013 & UK Balance of Payments Pink Book 2013) by Richard Wild.

Usage

```r
uk_2010_results_get(path = NULL)
```

Arguments

- **path**: A path to the downloaded file, if already exists, given with `file.path()` function.

Source

`ukioanalyticaltablesio1062010detailedpubversion.xls`
### Examples

```r
## Not run:
uk_results <- iotables::uk_2010_results_get()

## End(Not run)
```

---

#### uk_test_results

Multipliers and effects (product) for testing from the United Kingdom Input-Output Analytical Tables, 2010

---

#### Description

The Excel-imported UK data.

#### Usage

```r
data(uk_test_results)
```

#### Format

A data frame with 12 variables.

- **uk_row_label** The UK row label
- **Output multiplier** The imported Output multipliers
- **output_multiplier_rank** The imported ranking of output multipliers
- **Employment cost multiplier** The imported Employment cost multipliers.
- **employment_cost_multiplier** The imported ranking of Employment cost multipliers.
- **Employment cost effects** The imported Employment cost multipliers.
- **employment_cost_effects** The imported ranking of employment cost multipliers.
- **GVA effects** The imported GVA effects.
- **gva_effects_rank** The imported ranking GVA effects.
- **GVA multiplier** The imported GVA multipliers.
- **gva_multiplier_rank** The imported ranking GVA multipliers.
- **indicator** Indicator names.

#### See Also

Other Validation datasets: `germany_1990`, `netherlands_2006`, `uk_2010_data`
validate_source

---

**validate_source**

**Validate source Parameter**

**Description**

Validate source Parameter

**Usage**

`validate_source(source)`

**Arguments**

- **source**
  
  Possible data sources.

---

`%>%`

**Pipe operator**

**Description**

Pipe operator

**Arguments**

- **lhs, rhs**
  
  A visualisation and a function to apply to it

**Examples**

`mtcars %>% summary`
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