

Package ‘dynmdl’

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Type Package

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Description An R version of Dynare.

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all.equal	<i>Test if two DynMdl objects are (nearly) equal</i>
-----------	--

Description

`all.equal(x,y)` is a utility to compare R objects `x` and `y` testing near equality. If they are different, comparison is still made to some extent, and a report of the differences is returned. Do not use `all.equal` directly in if expressions - use `isTRUE(all.equal(...))`.

Usage

```
## S3 method for class 'DynMdl'
all.equal(target, current, ...)
```

Arguments

<code>target</code>	and <code>DynMdl</code> object
<code>current</code>	another <code>DynMdl</code> object, to be compared with <code>target</code>
<code>...</code>	Arguments passed to the internal call of all.equal .

Details

The implementation of `all.equal` for `DynMdl` objects first serialized the model using the `DynMdl` method `serialize` and then uses [all.equal](#) of the base package.

Value

Either TRUE or a character vector describing the differences between `target` and `current`.

See Also

[all.equal](#)

Examples

```
mdl <- islm_mdl("2017Q2/2018Q2")
mdl2 <- mdl$copy()
print(all.equal(mdl, mdl2))

# now modify mdl2
mdl2$set_endo_values(600, names = "c")
print(all.equal(mdl, mdl2))
```

change_data-methods *DynMdl methods: changes the endogenous or exogenous model data by applying a function.*

Description

These methods of R6 class [DynMdl](#) changes endogenous and/or exogenous model data by applying a function. If the model has trends, then the change is applied to the trended model variables.

Usage

```
mdl$change_endo_data(fun, names, pattern, period = mdl$get_data_period(), ...)
```

```
mdl$change_exo_data(fun names, pattern, period = mdl$get_data_period(), ...)
```

```
mdl$change_data(fun, names, pattern, period = mdl$get_data_period(), ...)
```

mdl is a [DynMdl](#) object

Arguments

fun a function applied each model variable specified with argument names or pattern. See Details.

names a character vector with variable names

pattern a regular expression

period an [period_range](#) object or an object that can be coerced to a `period_range`: the period for which the function will be applied

... arguments passed to fun

If neither names nor pattern have been specified, then the function is applied to all endogenous or exogenous variables.

Details

The function specified with argument **fun** should be a function with at least one argument, for example `fun = function(x) {x + 0.1}`. The first argument (named **x** in the example) will be the model variable. The function is evaluated for each model variable separately. The values of the model variables for period range **period** are passed as a normal numeric vector (not a timeseries) to the first argument.

An example may help to clarify this. Consider the following statement

```
mdl$change_endo_data(fun = myfun, names = c("c", "y"),
                     period = "2017q1/2017q2"),
```

where **mdl** is a [DynMdl](#) object and **myfun** some function whose details are not relevant here. Method `change_endo_data` evaluates this as

```
data <- mdl$get_endo_data(names = c("c", "y"), period = "2017q1/2017q2")
data[, "c"] <- myfun(as.numeric(data[, "c"]))
data[, "y"] <- myfun(as.numeric(data[, "y"]))
mdl$set_data(data)
```

The function result must be a vector (or timeseries) of length one or with the same length as the number of periods in the period range period.

Methods

`changes_endo_data` Changes endogenous model variables
`change_exo_data` Changes exogenous model variables
`change_data` Changes endogenous and/or exogenous model variables, including fit instruments and Lagrange multipliers used in the fit method (if present).

See Also

[get_data-methods](#), [set_data](#) and [set_values-methods](#)

Examples

```
mdl <- islm_mdl(period = "2017Q1/2017Q3")

# increase y and yd with 10% for the full data period
mdl$change_endo_data(pattern = "^y.?$", fun = function(x) {x * 1.1})
print(mdl$get_endo_data())

# increase ms in 2017Q1 and 2017Q2 with 10 and 20, resp.
mdl$change_exo_data(names = "ms", fun = function(x, dx) {x + dx},
  dx = c(10, 20), period = "2017Q1/2017Q2")
print(mdl$get_exo_data())
```

check	<i>DynMdl method: Compute the eigenvalues of the linearized model around the steady state.</i>
-------	--

Description

This method of R6 class [DynMdl](#) computes the steady state, constructs a linear model around the state steady and finally computes the eigenvalues of the linearized model around the steady state. It also checks if the Blanchard and Kahn conditions are satisfied. The Blanchard and Kahn conditions state that the number of eigenvalues larger than 1 should be equal to the number of forward looking variables (variables with leads).

Usage

```
mdl$check(tol = sqrt(.Machine$double.eps))
mdl is a DynMdl object
```

Arguments

- `tol` The tolerance parameter used to test if an eigenvalue is significantly larger than 1 when checking the Blanchard-Kahn conditions. The default is the square root of the machine precision (typically about $1.5e-8$). See Details.

Details

To test if the Blanchard-Kahn conditions are satisfied, we need to determine the number of eigenvalues larger than 1. If an eigenvalue is exactly equal to 1, the actually calculated eigenvalue may be slightly larger than 1 because of rounding errors. To check the Blanchard-Kahn conditions, we therefore count the number of eigenvalues larger than $1 + \text{tol}$, where `tol` is a small number (by default the square root of the machine precision). Use argument `tol` to change this tolerance parameter.

Warning

Method check is only possible for models with a maximum lag and lead of 1. If the original model has lags or leads greater than 1, use argument `max_lag_lead_1 = TRUE` of function `dyn_md1` to create a transformed model with maximum lag and lead 1.

See Also

[solve_steady](#) and [get_eigval](#)

Examples

```
mdl <- islm_md1()
mdl$check()
print(mdl$get_eigval())
```

`clear_fit`

[DynMd1](#) method: removes fit targets and turns off fit instruments.

Description

This method of R6 class `DynMd1` removes all fit targets, sets the sigma-parameters of the fit-instruments to -1 and sets all Lagrange multipliers to 0, for both the dynamic and static version of the model.

By removing the fit targets (which is equivalent to setting all fit targets to NA), all endogenous variables are calculated according to the equations of the model, while the fit instruments stay fixed at their current value, and are effectively exogenous (even though they are still implemented as endogenous variables).

If the model had been solved before `clear_fit` was called, then the model is still solved after `clear_fit` has been called.

Usage

```
mdl$clear_fit()
mdl is a DynMdl object implementing the fit method. '
```

See Also

[get_data-methods](#), [set_fit](#), [set_fit_steady](#), [set_fit_values](#) and [clear_fit](#).

Examples

```
mdl <- islm_mdl(period = "2016Q1/2017Q3", fit = TRUE)

# create a regts with fit targets
y <- regts(c(1250, 1255, 1260), start = "2016Q1")
t <- regts(c(250, 255), start = "2016Q1")
fit_targets <- cbind(y, t)

# register the fit targets in the DynMdl object
mdl$set_fit(fit_targets)

mdl$solve()
mdl$clear_fit()

# the next statements gives 0 iterations.
mdl$solve()
```

copy

[DynMdl](#) method: Returns a copy of this DynMdl object

Description

This method of R6 class [DynMdl](#) returns a deep copy of a DynMdl object

Usage

```
mdl$copy()

mdl is a DynMdl object
```

Details

`mdl$copy()` is equivalent to `mdl$clone(deep = TRUE)`

Examples

```
mdl <- islm_mdl("2017Q1/2019Q2")
mdl2 <- mdl$copy()
```

DynMdl

An R6 class for a Dynare model

Description

An R6 class for a Dynare model

Format

`R6Class` object.

Value

Object of `R6Class` containing a macro-economic model,

Methods

`get_max_lag` Returns the maximum lag

`get_max_lead` Returns the maximum lead

`get_endo_names` Returns the names of the endogenous variables.

`get_exo_names` Returns the names of the exogenous variables.

`set_labels` Set labels for the model variables

`get_labels` Returns the labels of the model variables and parameters

`get_tex_names` Returns the LaTeX names of the model variables and parameters

`get_par_names` Returns the names of the parameters.

`set_param` Sets the parameters of the model.

`set_param_values` Sets the values of one or more model parameters.

`get_param` Returns the parameters of the model.

`set_static_exos` Sets the static values of the exogenous variables used to compute the steady state.

`set_static_exo_values` Sets the values of one or more static exogenous variables

`get_static_exos` Returns the static values of the exogenous variables.

`set_static_endos` Sets the static values of the endogenous variables.

`get_static_endos` Returns the static values of the endogenous variables.

`set_static_data` Sets the static values of the model variables.

`get_static_data` Returns the static values of the model variables.

`get_all_static_endos` Returns the static values of the endogenous model variables, including fit instruments and lagrange multipliers.

#

`get_all_static_data` Returns the static values of the exogenous and endogenous model variables, including fit instruments and lagrange multipliers.

`init_data` Initializes the model data

`set_period` Sets the model period

`get_period` Returns the model period

`get_data_period` Returns the model data period.

`get_lag_period` Returns the lag period.

`get_lead_period` Returns the lead period

`set_endo_values` Sets the values of endogenous model variables

`set_exo_values` Sets the values of exogenous model variables

`set_data` Transfer timeseries to the model data

`change_endo_data` Changes the values of endogenous model variables by applying a function

`change_exo_data` Changes the values of exogenous model variables by applying a function

`change_data` Changes the values of endogenous and exogenous model variables by applying a function.

`get_data` Returns the model data, including exogenous endogenous variables, fit instruments and trend variables (but excluding Lagrange multipliers).

`get_all_endo_data` Returns all endogenous model variables, including exogenous endogenous variables, fit instruments and trend variables (but excluding Lagrange multipliers).

`get_all_data` Returns all endogenous endogenous model variables, including fit instruments and Lagrange multipliers

`get_endo_data` Returns the endogenous model data

`get_exo_data` Returns the exogenous model data

`get_vars_pars` Returns a list with model variables and parameters

`solve_steady` Solves the steady state

`solve` Solves the model

`solve_steady_dynare` Solves the steady state and eigenvalues with Dynare (employing Matlab or Octave)

`solve_dynare` Solves the model with Dynare (employing Octave or Matlab)

`check` Compute the eigenvalues of the linear system and check if the Blanchard and Kahn conditions are satisfied.

`residual_check` Calculates the residuals of the equations and reports the differences larger than a tolerance parameters

`static_residual_check` Calculates the residuals of the static model equations and reports the differences larger than a tolerance parameters

`solve_perturbation` Solves the model using the perturbation theory used in the Dynare function `stoch_simul`. Only shocks in the first solution period are allowed.

`get_jacob` Returns the Jacobian for the dynamic model

`get_static_jacob` Returns the Jacobian for the static version of the model

`get_back_jacob` Returns the Jacobian for a backward looking model at a specific period

`get_eigval` Returns the eigenvalues computed with method `check` or `solve_perturbation`

[get_equations](#) Returns a character vector with the parsed equations of the model.
[get_original_equations](#) Returns a character vector with the equations of the original model.
[copy](#) Returns a deep copy of the [DynMdl](#) object
[get_solve_status](#) Returns the status of the last model solve attempt
[get_md1def](#) Returns a list with technical details of the model.

Methods for the fit method

[get_instrument_names](#) Returns the names of the fit instruments.
[get_sigma_names](#) Returns the names of the sigma parameters used in the fit procedure.
[set_fit_values](#) Sets the values of the fit targets
[set_fit](#) Sets the targets for the fit procedure
[set_fit_steady](#) Sets the targets for the fit procedure for the steady state.
[get_fit](#) Returns the fit targets used in the fit procedure
[get_fit_steady](#) Returns the fit targets used in the fit procedure for the steady state.
[get_fit_instruments](#) Returns all non-zero fit instruments used in the fit procedure
[set_sigma](#) Sets one or more sigma parameters used in the fit method
[set_sigma_values](#) Sets the values of sigma parameters used in the fit method
[get_sigmas](#) Returns all sigma parameters ≥ 0 used in the fit procedure. If a sigma parameter is negative, then the corresponding fit instrument is not included
[get_lagrange](#) Returns the Lagrange multipliers used in the fit procedure.
[run_initval](#) Run the initval equations to obtain new values for endogenous and exogenous static variables for the current values or parameters.

dyn_md1	<i>Creates a DynMdl object from a mod file</i>
---------	--

Description

Creates a [DynMdl](#) object from a mod file. If the mod file contains a fit block, then the DynMdl object implements the fit procedure (except if argument `fit` is FALSE).

Usage

```

dyn_md1(
  mod_file,
  period,
  data,
  base_period = NULL,
  calc = c("R", "bytecode", "dll", "internal"),
  fit_mod_file,
  debug = FALSE,

```

```

    dll_dir,
    max_laglead_1 = FALSE,
    strict = TRUE,
    warn_uninit_param = TRUE,
    init_param_na = FALSE,
    fit = TRUE,
    fit_fixed_period = FALSE,
    latex = TRUE,
    latex_options,
    nostrict,
    silent = FALSE
)

```

Arguments

<code>mod_file</code>	the name of the model file (including extension <code>.mod</code>)
<code>period</code>	a period_range object specifying the model period, i.e. the period range for which the model will be solved. Thus this period range excludes the lag and lead period.
<code>data</code>	the model data as a regts object with column names
<code>base_period</code>	a period object specifying the base period for the trends. This is used if the model has trend variables. All trend variables will be equal to 1 at the base period.
<code>calc</code>	Method used to evaluate the model equations. Possible values are "R", "bytecode", "dll" and "internal". See details.
<code>fit_mod_file</code>	the name of the generated fit mod file. If not specified, then the fit mod file is destroyed after the model has been parsed. This argument should not be specified if the model contains trends, since in that case the fit mod file cannot be used as an input mod file for function <code>dyn_md1</code> or for Dynare. If you want to check the equations in the fit mod file, use argument <code>DEBUG</code> (see below).
<code>debug</code>	If logical (default FALSE), only used when the model is a fit model. If TRUE, then intermediate files created when preparing the fit model are written to the current directory. By default these files are written in a temporary directory and deleted when the R session terminates.
<code>dll_dir</code>	the directory where the dynamically linked library is stored. Primarily used for testing. Only used if argument <code>use_dll</code> is TRUE.
<code>max_laglead_1</code>	a logical indicating whether the model should be transformed internally to a model with a maximum lag and lead of 1. The default is FALSE. This option has no effect if the maximum lag and lead of the original model is 1. Set this argument to TRUE if you want to analyse the stability of the steady state with method check for models with a maximum lag or lead larger than 1.
<code>strict</code>	A logical. If TRUE (the default), then an error is given when endogenous or exogenous variables are not used in the model block or when an undeclared symbol is assigned in the <code>initval</code> block. If FALSE, then only a warning is issued, unused endogenous variables are removed, and the assignments of undeclared symbols in the <code>initval</code> block are ignored.

warn_uninit_param	A logical. If TRUE (the default) then a warning is given for each parameter that has not been initialized in the mod file. Uninitialized parameters are set to zero or NA, depending on argument <code>init_param_na</code> .
init_param_na	A logical (default FALSE). If TRUE, then the parameters that have not been initialized in the mod file are set to NA. Otherwise these parameters are initialised with zero.
fit	a logical (default TRUE) indicating if the DynMdl object returned by this function should implement the fit procedure if the mod file contains a fit block. Specify FALSE if the mod file has a fit block while you do not want to use the fit procedure.
fit_fixed_period	a logical. If TRUE, then the fit conditions are derived for a fixed period, treating lags and leads as exogenous variables. If FALSE (the default), the fit conditions are derived from the stacked-time equations.
latex	A logical. If TRUE (the default), then LaTeX files are created if the model block contains a <code>write_latex_static_model</code> , <code>write_latex_dynamic_model</code> or <code>write_latex_original_model</code> statement.
latex_options	a list with options for writing LaTeX files. See Details.
nostrict	Obsolete: the logical negation of argument <code>strict</code> . This argument should not be used in new code: use argument <code>strict</code> instead.
silent	A logical (default FALSE). If TRUE, then output of the Dynare parser is suppressed except for warnings.

Details

Latex options: When the mod file contains a `write_latex_static_model`, `write_latex_dynamic_model` or `write_latex_ooriginal_model` statement, then the Dynare parser of package `dynmdl` generates LaTeX files in directory `latex`. Argument `latex_options` can be used to change the format of the LaTeX files. It should be a named list containing one or more of the following components:

`par_as_num` A logical. If TRUE, then the parameters are written as numerical constants to the LaTeX file, using the numerical values as specified in the mod file. The default is FALSE.

`ndigits` The number of significant digits used when parameters are written as numerical values (default 4). This argument is only used if `par_as_num` is TRUE. For example, if `ndigits` is 4, then the number π is printed as 3.142, the number 120.25 as 120.2, and the number 10.1234 as 1.012e+05

Value

A DynMdl object.

Description

These methods of R6 class [DynMdl](#) can be used to retrieve timeseries from the model data.

If the [DynMdl](#) object is also a [DynMdl](#) object, then `get_data` also returns the fit instruments. In contrast, `get_endo_data` does not return these fit instruments. Both `get_data` and `get_endo_data` do not return the Lagrange multipliers used in the fit method. Use method [get_lagrange](#) to obtain these Lagrange multipliers. [get_all_endo_data](#) returns all endogenous variables, fit instruments and Lagrange multipliers, for the complete data period. [get_all_data](#) also returns all exogenous variables. These functions can be useful to save the complete solution of a model that be used as initial values for the endogenous variables in another model.

Usage

```
mdl$get_data(pattern, names, period = mdl$get_data_period(),
             trend = TRUE)

mdl$get_endo_data(pattern, names, period = mdl$get_data_period(),
                  trend = TRUE)

mdl$get_exo_data(pattern, names, period = mdl$get_data_period())

mdl$get_trend_data(pattern, names, period = mdl$get_data_period())

mdl$get_all_endo_data(trend = TRUE)

mdl$get_all_data(trend = TRUE)

mdl is a DynMdl object
```

Arguments

`pattern` a regular expression

`names` a character vector with variable names

`period` an [period_range](#) object or an object that can be coerced to a `period_range`

`trend` a logical. This argument is used for model with trend variables. If TRUE (the default), then the endogenous variables are multiplied with their trends (called deflators in the mod file)

If neither `names` nor `pattern` have been specified, then all variables with the specific type are returned.

Methods

- `get_data`: All model variables: exogenous and endogenous model variables, trends variables, and fit instruments for [DynMdl](#) objects
- `get_endo_data`: Endogenous model variables, excluding fit instruments.
- `get_exo_data`: Exogenous model variables
- `get_trend_data`: Trend variables (variables declared with `trend_var` in the mod file).
- `get_all_endo_data`: All endogenous variables, including fit instruments and lagrange multipliers.
- `get_all_data`: All endogenous and exogenous variables, including fit instruments and lagrange multipliers.

See Also

[get_fit-methods](#), [get_fit](#), [get_fit_instruments](#), [get_lagrange](#) and [get_vars_pars](#).

Examples

```
mdl <- islm_mdl(period = "2017Q1/2017Q3")

mdl$get_data(names = "c", pattern = "y.", period = "2017Q1/2017Q2")
```

get_eigval

[DynMdl](#) method: Return the eigenvalues computed with method `check`

Description

This method of R6 class [DynMdl](#) returns the eigenvalues computed with method `check`, ordered with increasing absolute value

Usage

`DynMdl` method:

```
mdl$get_eigval()
```

`mdl` is a [DynMdl](#) object

See Also

[check](#)

get_equations	<i>DynMdl method: Returns a character vector with the dynamic model equations</i>
---------------	---

Description

These method of R6 class [DynMdl](#) returns a character vector with the model equations (excluding local equations) of the dynamic version of the model. `get_equations` returns the parsed equations, where trends (if present) have been removed. `get_original_equations` returns the equations as defined in the mod file.

Usage

DynMdl method:

```
mdl$get_equations(i)
mdl$get_original_equations(i)
```

mdl is a [DynMdl](#) object

Arguments

- i A numeric vector with the indices of the non-local equations. If not specified, then the function returns all equations

Examples

```
mdl <- islm_mdl(period = "2018Q1/2023Q3")

# print the 4th equation nicely to the screen
cat(mdl$get_equations(4))

# print all equations
print(mdl$get_equations())
```

get_fit-methods	<i>DynMdl methods: get variables used in the fit method.</i>
-----------------	--

Description

These methods of R6 class [DynMdl](#) can be used to retrieve the variables used in the fit method: the fit targets, fit instruments or Lagrange multipliers.

By default, function `get_fit` only returns fit targets with any non-NA value for the period range with any non-NA value. Thus columns with only NA values and leading and trailing rows with only NA values are removed. If all values are NA, then the function returns NULL. If argument `period`

has been specified, then the function always returns a timeseries with the specified period range. If names or pattern has been specified, it always returns a timeseries with the specified variables, except if all values are NA.

For method `get_fit` there are corresponding `set_fit` and `set_fit_values` methods. There are currently no special methods to set or change the fit instruments and Lagrange multipliers. However, since they are internally implemented as endogenous variables you can use methods `set_data`, `set_endo_values`, and `change_endo_data` to change the fit instruments or Lagrange multipliers.

Usage

```
mdl$get_fit(pattern, names, period) # fit targets

mdl$get_fit_instruments(pattern, names, period = mdl$get_period())

mdl$get_lagrange(names, period = mdl$get_period())

mdl is a DynMdl object implementing the fit method.
```

Arguments

`pattern` a regular expression
`names` a character vector with variable names
`period` an [period_range](#) object or an object that can be coerced to a `period_range`

See Also

[get_data-methods](#), [set_fit](#), [set_fit_values](#) and [clear_fit](#).

Examples

```
mdl <- islm_mdl(period = "2016Q1/2017Q3", fit = TRUE)

# create a regts with fit targets
y <- regts(c(1250, 1255, 1260), start = "2016Q1")
t <- regts(c(250, 255), start = "2016Q1")
fit_targets <- cbind(y, t)

# register the fit targets in the DynMdl object
mdl$set_fit(fit_targets)

mdl$solve()

print(mdl$get_fit())
print(mdl$get_fit_instruments())
print(mdl$get_lagrange())
```

get_fit_steady	DynMdl method: <i>get fit targets used in the steady state calculation</i>
----------------	--

Description

This methods of R6 class `DynMdl` returns the static fit targets, i.e. the fit targets used when the steady state is solved.

By default, function `get_fit` only returns fit targets with any non-NA value. If all values are NA, then the function returns NULL. If names or pattern has been specified, it always returns a timeseries with the specified variables.

For method `get_fit_syteady` the is a corresponding `set_fit_steady` method. There are currently no special methods to set or change the fit instruments and Lagrange multipliers. However, since they are internally implemented as endogenous variables you can use methods `set_static_data` to change the static fit instruments or Lagrange multipliers.

Usage

```
mdl$get_fit_steady(pattern, names) # fit targets
```

`mdl` is a [DynMdl](#) object implementing the fit method.

Arguments

`pattern` a regular expression

`names` a character vector with variable names

See Also

[set/get_static_endos/exos](#), [set_fit_steady](#), and [clear_fit](#).

Examples

```
mdl <- islm_mdl(fit = TRUE)

fit_targets <- c(y = 1250, t = 255)

# register the fit targets in the DynMdl object
mdl$set_fit_steady(fit_targets)

mdl$solve_steady()

print(mdl$get_fit_steady())
```

get_instrument_names/get_sigma_names

DynMdl methods: Retrieve the names of the fit instruments or sigma parameters used in the fit method.

Description

These methods of R6 class [DynMdl](#) return the names of the fit instruments or sigma parameters used in the fit method.

Usage

```
mdl$get_instrument_names(all = FALSE)
```

```
mdl$get_sigma_names()
```

mdl is a [DynMdl](#) object implementing the fit method.

Arguments

all A logical (default FALSE). If TRUE, the names of all fit instruments are returned, including the inactive fit instruments.

See Also

[get_fit_instruments](#), [get_sigmas](#)

Examples

```
mdl <- islm_mdl(period = "2017Q1/2018Q3", fit = TRUE)
print(mdl$get_instrument_names())
print(mdl$get_sigma_names())
```

get_jacob

DynMdl methods: Return the Jacobian for the static or dynamic model

Description

These methods of R6 class [DynMdl](#) can be used to retrieve the Jacobian for the static or dynamic model.

The methods return a matrix object which can be further analysed using standard linear algebra functions. This is particularly useful when method [solve](#) complains about (nearly) singular Jacobians. For example, an SVD decomposition using function [svd](#) can be used to identify linearly dependent rows or columns.

Usage

```
mdl$get_static_jacob(sparse = FALSE)

mdl$get_jacob(sparse = FALSE)

mdl$get_back_jacob(period, sparse = FALSE)

mdl is a DynMdl object
```

Arguments

sparse a logical. If TRUE, then the matrix is returned as a sparse matrix
 period an [period](#) object or an object that can be coerced to a period

Methods

- `get_jacob`: The Jacobian for the dynamic model This is the Jacobian used when solving the model with the stacked-time Newton method.
- `get_static_jacob`: The Jacobian for the static version of the model. This Jacobian is used when solving the steady state.
- `get_back_jacob`: The Jacobian at a specific period for backward looking models, treating the lags as exogenous. This Jacobian is used to solve backward looking models.

Examples

```
mdl <- islm_mdl("2018Q1/2019Q4")
print(mdl$get_static_jacob())
print(mdl$get_jacob())

## Not run:
# print the Jacobian for a backward looking model at period 2018Q3
print(backwards_mdl$get_back_jacob("2018Q3"))

## End(Not run)
```

get_labels/get_tex_names

[DynMdl](#) method: Returns the labels or LaTeX names of the model variables and parameters

Description

These methods of R6 class [DynMdl](#) return the labels (long names) or LaTeX names of the model variables and parameters. The return value is a named character vector.

The labels and LaTeX names are defined in the mod file (consult the documentation of Dynare, in Dynare labels are called 'long names'). Method [set_labels](#) can be used to modify these labels. By default the labels are equal to the variable names.

Usage

```
mdl$get_labels()
```

```
mdl$get_tex_names()
```

mdl is a [DynMdl](#) object

Methods

- `get_labels`: Returns the labels (long names), e.g. "Disposable income"
- `get_tex_names`: Returns the LaTeX names (e.g. "Y_d")

See Also

[set_labels](#)

`get_max_lag/get_max_lead`

[DynMdl](#) methods: Returns the maximum lag or lead

Description

Methods `get_max_lag` and `get_max_lead` of R6 class [DynMdl](#) return the maximum lag and lead of the original model, respectively. These are the maximum lag and lead in the equations specified in the mod file. The actual maximum lag or lead will be different if `max_laglead_1 == TRUE` and if there are endogenous lags or leads greater than 1.

Usage

DynMdl methods:

```
mdl$get_max_lag()
```

```
mdl$get_max_lead()
```

mdl is a [DynMdl](#) object

get_mdldf

[DynMdl](#) method: Returns technical details about the model.**Description**

This function returns a list with various components containing technical details of the model, such as the names of the variables, the lead-lag incidence matrix, etc.

Usage

DynMdl method:

```
mdl$get_mdldf()
```

mdl is a [DynMdl](#) object

get_name-methods

[DynMdl](#) methods: Retrieve the names of model variables or parameters**Description**

These methods of R6 class [DynMdl](#) return the names of the model variables or parameters

If the [DynMdl](#) object is also a [DynMdl](#) object, then `get_endo_names` and `get_exo_names` do not include the names of the auxiliary endogenous and exogenous variables used in the fit method. Use [get_instrument_names](#) to obtain the names of the fit instruments.

Usage

```
mdl$get_endo_names(type = c("all", "lags", "leads"))
```

```
mdl$get_exo_names()
```

```
mdl$get_par_names()
```

mdl is a [DynMdl](#) object

Arguments

`type` a character describing the type of the endogenous variables: "lags" or "leads" for endogenous variables with lags or leads, respectively. The default is "all" (all endogenous variables).

Methods

- `get_endo_names`: Names of the endogenous model variables.
- `get_exo_names`: Names of the endogenous model variables.
- `get_par_names`: Names of the model parameters (including the sigma parameters used in the fit method).

See Also

`get_instrument_names` and `get_sigma_names`

<code>get_period-methods</code>	<code>DynMdl</code> method: return the model, data, lead or lag period
---------------------------------	--

Description

These methods of R6 class `DynMdl` return the model period, data period, lag period, lead period, or base period respectively.

The *model period* is the default period for which the model will be solved. The *data period* is the period for which the model contains the values for the endogenous and exogenous variables. If a model has lags, then the data period always include the *lag period*: the period before the model period where the lags needed to solve the model in the model period are stored. For a model with leads the model data period also includes a *lead period*. Thus, the data period always contains the lag period, model period and lead period, but it may also be longer. See the example below.

The *base period* is used when the model has trend variables. All trend variables will be equal to 1 at the base period.

Usage

```
mdl$get_period()
```

```
mdl$get_data_period()
```

```
mdl$get_lag_period()
```

```
mdl$get_lead_period()
```

```
mdl$get_base_period()
```

```
mdl is a DynMdl object
```

Methods

- `get_period`: Returns the model period
- `get_data_period`: Returns the data period
- `get_lag_period`: Returns the lag period, or NULL if the model has no lags
- `get_lead_period`: Returns the lead period or NULL if the model has no leads
- `get_base_period`: Returns the base period.

See Also

[set_period](#) and [init_data](#)

Examples

```
# For this example we first create a model with a data period
# starting many periods before the model period.
mdl <- islm_mdl()
mdl$init_data("1997Q1/2022Q4")
mdl$set_period("2017Q4/2022Q3")

print(mdl$get_period())      # result: "2017Q1/2022Q3"
print(mdl$get_data_period()) # result: "1997Q1/2022Q4"

# This model has a maximum lag and lead of 1, so the lag
# and lag period are simple the period before and after the model period.
print(mdl$get_lag_period())  # result: "2017Q3"
print(mdl$get_lead_period()) # result: "2022Q4"
```

<code>get_solve_status</code>	<i>DynMdl method: Returns the solve status of the last model solve.</i>
-------------------------------	---

Description

This method of R6 class [DynMdl](#) returns the status of the last model solve as a text string. If the last model solve was successful, it returns the string "OK".

Usage

`DynMdl` method:

```
mdl$get_solve_status()
```

`mdl` is a [DynMdl](#) object

Details

The possible return values are:

- NA_character_ (method solve has not yet been called)
- "OK"
- "ERROR" (an error has occurred, check the warnings).

See Also

[solve](#) and [solve_steady](#)

Examples

```
## Not run:
mdl <- islm_mdl(period = "2017Q1/2018Q4")
mdl$set_endo_values(NA, names = "y", period = "2017Q1")
mdl$solve()
if (mdl$get_solve_status() != "OK") {
  stop("Error solving the model. Check the warnings!")
}

## End(Not run)
```

get_vars_pars

[DynMdl](#) methods: Returns a list of all model variables and parameters

Description

This method of R6 class [DynMdl](#) returns a list of all model variables and parameters. This makes it easy to directly evaluate expressions involving both model variables and parameters.

If the DynMdl object is also a [DynMdl](#) object, then the variables do not include the the auxiliary endogenous and exogenous variables used in the fit method.

Usage

```
mdl$get_vars_pars(period = mdl$get_data_period(), trend = TRUE)
```

mdl is a [DynMdl](#) object

Arguments

period an [period_range](#) object or an object that can be coerced to a period_range #'

trend a logical. This argument is used for model with trend variables. If TRUE (the default), then the endogenous variables are multiplied with their trends (called deflators in the mod file)

See Also

[get_data-methods](#), [get_param](#), [get_fit](#), [get_fit_instruments](#) and [get_lagrange](#)

Examples

```
mdl <- islm_mdl(period = "2017Q1/2017Q3")

# create a list of all parameters and model variables for
# period 2017q1/2017q2
vars_pars <- mdl$get_vars_pars(period = "2017Q1/2017Q2")
print(vars_pars)

# evaluate an expression within list vars_pars
with(vars_pars, print(t0 + t1 * y))

# copy all parameters to the global environment, and evaluate
# an expressions in the global environment:
list2env(vars_pars, .GlobalEnv)
print(md - ms)
```

init_data

DynMdl method: initializes the model data.

Description

This method of R6 class [DynMdl](#) sets the model data period and initializes the model variables with static values of the exogenous and endogenous model variables. Also all fit targets are removed. If argument data has been specified then the steady state values are subsequently updated with the timeseries in data.

If the model period has not yet been specified (in function [dyn_mdl](#) or method [set_period](#)), then this method also sets the model period, the standard period for which the model will be solved. The model period is obtained from the data period by subtracting the lag and lead periods.

Usage

```
mdl$init_data(data_period = NULL, data = NULL, upd_mode = c("upd", "updval"))
```

mdl is a DynMdl object

Arguments

data_period [period_range](#) object, or an object that can be coerced to [period_range](#). If not specified, then the data period is based on the period range of argument data (if this argument has been specified) and the model period.

`data` a `ts` or `regts` object with values for endogenous and exogenous model variables, including fit instruments and Lagrange multipliers used in the fit method. If `data` has labels, then these labels are used to update the model labels. If the model has trends, then the timeseries in `data` should include the trends.

`upd_mode` the update mode, a character string specifying how the timeseries in object `data` are transferred to the model data. For "upd" (standard update, default), the timeseries in `data` are used to replace the steady state values of the exogenous and endogenous model variables. For "updval", the static model variables are only replaced by valid (i.e. non-NA) values in `data`).

If neither `data_period` nor `data` have been specified, then the data period is determined from the model period (which in that case must have been specified before `init_data` is called).

Warning

Method `init_data` removes all fit targets.

Examples

```
mdl <- islm_mdl()
mdl$init_data("2017Q2/2021Q3")
```

islm_mdl

Returns an example ISLM model

Description

This function returns an example ISLM model, If argument `period` has been specified, then this function also initializes the model data with the steady state values.

Usage

```
islm_mdl(period, fit = FALSE)
```

Arguments

<code>period</code>	the model period for the ISLM model
<code>fit</code>	a logical indicating whether the dynamical fit procedure should be used

Value

a `DynMdl` object.

Examples

```
mdl <- islm_mdl("2017Q1/2019Q4")
```

put_static_endos	DynMdl method: <i>Transfers the static endogenous variables to the model data.</i>
------------------	--

Description

This method of R6 class [DynMdl](#) transfers the static endogenous variables to the model data.

Usage

[DynMdl](#) method:

```
mdl$put_static_endos(period = mdl$get_data_period())
```

mdl is a [DynMdl](#) object

Arguments

period A [period_range](#) object or an object that can be coerced to a `period_range`, specifying the period for which the endogenous model data will be updated with the static endogenous variables.

See Also

[solve_steady](#), [set_static_endos](#) and [get_static_endos](#).

Examples

```
mdl <- islm_mdl(period = "2018Q1/2040Q3")

# transfer static endogenous variables for the full data period
mdl$put_static_endos()

# now only for the lead period
mdl$put_static_endos(period = mdl$get_lead_period())
```

read_mdl	<i>Reads a model from a RDS file</i>
----------	--------------------------------------

Description

This function reads a model from an RDS file that has been written by method [write_mdl](#) of an [DynMdl](#) object.

Usage

```
read_md1(file, dll_dir, silent = FALSE)
```

Arguments

file	the name of the RDS file
dll_dir	the directory where the dynamically linked library is stored. Primarily used for testing. Only used if the model was created with the dll option (see function dyn_md1).
silent	A logical (default FALSE). If TRUE, then no output is written.

Value

a [DynMd1](#) object.

See Also

[write_md1](#)

Examples

```
mdl <- islm_md1("2017Q1/2019Q2")
mdl$write_md1("islm_mod.rds")
mdl2 <- read_md1("islm_mod.rds")
```

residual_check

[DynMd1](#) method: *Calculates the residuals of the equations*

Description

This method of R6 class [DynMd1](#) calculates the residuals for the full model period and returns the result as a [regts](#) timeseries object.

Usage

```
mdl$residual_check(tol, include_fit_eqs = FALSE)
```

mdl is a [DynMd1](#) object

Arguments

tol	the tolerance parameter. If specified, then the return value does not include columns for the equations whose residuals are smaller than tol
include_all_eqs	a logical value (default FALSE). If TRUE, then the all equations, including fit equations and auxiliary equations (if present), are included in the residual check. The auxiliary equations are extra equations created when the model has lags or leads greater than 1 and if dynmdl was called with max_laglead_1 = TRUE.

`include_fit_eqs` a logical value (default FALSE). If TRUE, then fit equations (if present) are included in the residual check. Ignored if `include_all_eqs` is TRUE.

`debug_eqs` Debug equations (default FALSE). Only used for the internal calculation mode (`calc == "internal"`, see [dyn_md1](#)). If TRUE then numerical problems in evaluation of mathematical functions or operators such a log are reported.

See Also

[static_residual_check](#)

run_dynare

Run a mod file Dynare with Matlab or Octave.

Description

This function runs a mod file with Dynare using either Matlab or Octave. The input files for Dynare and Octave/Matlab are generated automatically. The command octave or matlab should be in the search path.

Usage

```
run_dynare(
    mod_file,
    period,
    data,
    steady = TRUE,
    perfect_foresight = !missing(period) || !missing(data),
    scratch_dir = tempfile(),
    dynare_path = NULL,
    steady_options,
    perfect_foresight_solver_options,
    initval_type = c("m", "xlsx"),
    use_octave = Sys.which("matlab") == "",
    exit_matlab = FALSE
)
```

Arguments

<code>mod_file</code>	The name of a Dynare mod file. For models with trends, this can also be a fit mod file created with function <code>dyn_md1</code> when argument <code>fit_mod_file</code> was specified. However, for model with trends the fit mod file is not a correct Dynare mod file, because the fit equations are already detrended while the original equations still contain trends.
<code>period</code>	A period_range object or object that can be coerced to a <code>period_range</code> . This argument must be specified when the perfect foresight solver is called.

data	a <code>ts</code> or <code>regts</code> object with values for endogenous and exogenous model variables used in the perfect foresight solver. If the model has trends, then the timeseries in data should include the trends.
steady	A logical, indicating whether the steady state should be calculated (default is TRUE). If the steady state is calculated then also the eigenvalues are calculated.
perfect_foresight	A logical, indicating whether the perfect foresight solver should be called. The default is TRUE if argument period or data have been specified and FALSE otherwise.
scratch_dir	Directory where the Matlablab and Dynare scripts are created. By default this is a temporary directory that is automatically deleted when the R session terminates.
dynare_path	Character string specifying the name of the directory of the Dynare installation. On Linux it is usually not necessary to specify this argument. On Windows it is necessary to specify the path of the Dynare installation. In you are running R in the CPB environment the path to Dynare is set automatically.
steady_options	Options passed to the steady command of Dynare. This should be a named list, which names corresponding to the Dynare options. Specify a NULL value if the option has no value. Consult the documentation of Dynare for a list of available options. Example: <code>steady_options = list(tol = 1e-7, nocheck = NULL)</code>
perfect_foresight_solver_options	Options passed to the perfect_foresight_solver command of Dynare. This should be a named list, which names corresponding to the Dynare options. Specify a NULL value if the option has no value. Consult the documentation of Dynare for a list of available options. Example: <code>steady_options = list(tol = 1e-7, no_homotopy = NULL)</code> .
initval_type	A character specifying the type of initval file used in the Matlab/Octave job: "m" for a Matlab file and "xlsx" for an xlsx-file.
use_octave	A logical. If TRUE, then Dynare is invoked with Octave, otherwise Matlab is used. By default Matlab is used if available.
exit_matlab	A logical specifying if Matlab should immediately exit when the calculations have finished. Matlab writes the output to a separate console. If <code>exit_matlab</code> is FALSE (the default), then the R job waits until the user has closed this console, or entered <code>exit</code> in the console. Otherwise the console is automatically closed at the end of the calculation and all output is lost. This argument is ignored if Dynare is run with Octave. Octave does not open a separate console: all output appears in the same console used by R.

Value

A list with the following components

steady_endos	(only if <code>steady == TRUE</code>): a steady state endogenous variables
eigval	(only if <code>steady == TRUE</code>): the eigenvalues of the steady state
endo_data	(only if <code>perfect_foresight_solver == TRUE</code>): the endogenous variables for the solution of the perfect foresight solver

Examples

```
## Not run:
data <- regts(matrix(280, nrow = 1, ncol = 1), names = "g", period = "2017Q1")

result <- run_dynare("mod/islm.mod", period = "2017q1/2019q3", data = data,
  steady_options = list(tolf = 1e-8),
  perfect_foresight_solver_options = list(tolf = 1e-8,
    tolx = 1e-8,
    no_homotopy = NULL))

## End(Not run)
```

run_initval	<i>DynMdl method: Evaluate to initval block to obtain new values for the static endogenous and exogenous variables based on the current parameters.</i>
-------------	---

Description

This function runs the equations in the initval block using the current values of parameters and static model variables. The static values of the exogenous and endogenous variables are updated with the new values calculated using the initval equations. Static endogenous variables are not updated in argument `update_endos = FALSE`.

Variables that do not occur at the left hand side of an equation in the initval block are *not* modified. Thus they are not initialized to zero, in contrast to the evaluation of the initval block by the Dynare parser.

Usage

DynMdl method:

```
mdl$run_initval(update_endos = TRUE)
```

mdl is a [DynMdl](#) object

Arguments

`update_endos` A logical. If TRUE, then the static value of the endogenous variables are updated with the new values computed from the initval equations.

set/get_param

DynMdl methods: Set and get model parameters

Description

[DynMdl](#) methods `set_param` and `set_param_values` can be used to set the model parameters. Method `get_param` returns the model parameters.

All three methods treat the sigma parameters used in the fit procedure the same as ordinary parameters. However, the recommended methods to set or get sigma parameters are [set_sigma](#), [set_sigma_values](#) and [get_sigmas](#).

Usage

```
mdl$set_param(params, names, name_err = c("stop", "warn", "silent"))
```

```
mdl$set_param_values(value, names, pattern)
```

```
mdl$get_param(pattern, names)
```

mdl is a [DynMdl](#) object

Arguments

`params` a named numeric vector with parameter values. The names are the names of the parameters.
`names` a character vector with names of the parameters. For method `set_param`, this argument *must* be specified if `params` is a vector without names.

`name_err` this option specifies the action that should be taken when a specified name is not the name of a model parameter. For "stop" (the default), the execution of this function is stopped. For "warn" and "silent" the names that are no model parameters are skipped. "warn" does, however, give a warning.

`pattern` a regular expression. The action (get or set parameter values) is applied to all parameters with names matching pattern.

If neither `names` nor `pattern` has been specified in methods `set_param_values` or `get_param`, then the action is applied to all model parameters.

Methods

- `set_param`: Set the parameters using a named numeric vector. The names of the vector should be the parameter names.
- `set_param_values`: Give one or more parameter a specified value.
- `get_param`: Returns the parameters.

See Also

[get_par_names](#), [set_sigma](#), [set_sigma_values](#) and [get_sigmas](#)

Examples

```
mdl <- islm_mdl()

# print parameters c0, c1, c2 and c3
print(mdl$get_param(pattern = "^c.*"))

# set parameter i0 to 101 and c0 to 110
mdl$set_param(c(i0 = 101, c0 = 110))

# set all parameters with names ending with "5" to zero:
mdl$set_param_values(0, pattern = "5$")

# print all parameters
print(mdl$get_param())
```

set/get_sigma

[DynMdl](#) methods: Set and get the sigma parameters for the fit method

Description

DynMdl methods `set_sigma` and `set_sigma_values` can be used to set the sigma parameters for the fit instruments used in the fit method. The names of the sigma parameters are the names of the instruments suffixed with `sigma_`. For example, the name of the sigma parameter corresponding to instrument "uc" is "sigma_uc".

If a sigma parameter is smaller than 0, then the corresponding fit instrument is not active, and is kept fixed at the current value, even though it is an endogenous model variable.

Method `get_sigmas` returns all sigma parameters larger than or equal to zero.

Usage

```
mdl$set_sigma(sigmas, names, name_err = c("stop", "warn", "silent"))

mdl$set_sigma_values(value, names, pattern)

mdl$get_sigma(pattern, names)

mdl$get_sigmas()

mdl is a DynMdl object.
```

Arguments

`sigmas` a named numeric vector with values of the sigma parameters. The names are the name of the instruments (not the names of the sigma parameters).

`names` a character vector with names of fit instruments. For method `set_sigma`, this argument *must* be specified if `sigmas` is a vector without names.

name_err this option specifies the action that should be taken when a variable name is not a fit instrument. For "stop" (the default), the execution of this function is stopped. For "warn" and "silent", the names that are no fit instrument names are skipped. "warn" does, however, give a warning.

value a numeric vector of length 1.

pattern a regular expression. The action (get or set sigma parameter values) is applied to all sigma parameters wiht names matching pattern.

If neither names nor pattern has been specified in methods `set_param_values` or `get_param`, then the action is applied to all model parameters.

Methods

- `set_sigmas`: Set the sigma parameters using a named numeric vector. The names of the vector should be the names of the corresponding fit instruments.
- `set_sigma_values`: Give one or more sigma parameters a specified value.
- `get_sigma`: Return sigma parameters.
- `get_sigmas`: Returns all sigma parameters greater than or equal to zero.

See Also

[get_instrument_names](#), [get_sigma_names](#), [set_fit](#) and [clear_fit](#)

Examples

```
mdl <- islm_mdl(fit = TRUE)
mdl$set_sigma(c(umd = 12))

# print the sigma parameter for umd
print(mdl$get_sigma(names = "umd"))

# disable fit instruments umd and umc
mdl$set_sigma_values(-1, names = c("umd", "uc"))

# print all sigma parameters for active fit instruments
print(mdl$get_sigmas())

# print names of all active instruments (sigma >= 0):
print(mdl$get_instrument_names())

# set all sigmas parameters to 1
mdl$set_sigma_values(1)
```

set/get_static_endos/exos

DynMdl methods: set and get the static values of the model variables

Description

set_static_exos, set_static_exo_values, set_static_endos and set_static_data can be used to set one or more static values of the endogenous and/or exogenous model variables. The corresponding get methods can be used to retrieve them.

Each [DynMdl](#) object contains a set of static values for the exogenous and endogenous model variables. The static exogenous values are used to compute the steady state with function methode [solve_steady](#). The static endogenous values are both input and output of solve_steady: they are used as an initial guess for the steady state, and replaced by the steady state solution.

The static values are initialized to the values specified in the initval block of the mod file, or to zero if they are not specified in the initval block. The static values can be modified with methods set_static_endos, set_static_exos, set_static_data or set_static_exo_values.

[get_all_static_endos](#) returns the static values for all endogenous variables, fit instruments and Lagrange multipliers. [get_all_data](#) also returns all static values of exogenous variables. These functions can be useful to save the complete solution of a model that be used as initial values for the endogenous variables in another model.

Usage

DynMdl method:

```
mdl$set_static_endos(endos, names = names(endos), name_err = c("stop", "warn", "silent"))
mdl$set_static_exos(exos, names = names(exos), name_err = c("stop", "warn", "silent"))
mdl$set_static_exo_values(value, names, pattern)
mdl$set_static_data(data, names = names(data), name_err = c("stop", "warn", "silent"))
mdl$get_static_endos(pattern, names)
mdl$get_static_exos(pattern, names)
mdl$get_static_data(pattern, names)
mdl$get_all_static_endos()
mdl$get_all_static_data()
```

mdl is a [DynMdl](#) object

Arguments

endos A (named) numerical vector with new static values of the endogenous variables. If the vector has no names, than argument names must be specified.

exos A (named) numerical vector with new static values of the exogenous variables. If the vector has no names, than argument names must be specified.

data A (named) numerical vector with new static values of both endogenous and exogenous variables. If the vector has no names, than argument names must be specified.

`value` a numeric vector of length 1

`names` a character vector with names of model variables

`pattern` a regular expression

`name_err` this option specifies the action that should be taken when a variable name is not a model variable. For "stop" (the default), the execution of this function is stopped. For "warn" and "silent" the names that are no model variables are skipped. "warn" does however give a warning.

Methods

- `set_static_endos`: Set the static values of one or more endogenous variables (including static fit instruments and static Lagrange multipliers).
- `set_static_exos`: Set the static values of one or more exogenous variables.
- `set_static_exo_values`: Give more than one exogenous variable the same static value.
- `set_static_data`: Set the static values of one or more endogenous or exogenous variable (including static fit instruments and static Lagrange multipliers.)
- `get_static_endos`: Returns the static values of one or more endogenous variables, excluding fit instruments and Lagrange multipliers.
- `get_static_exos`: Returns the static values of one or more exogenous variables.
- `get_static_data`: Returns the static values of the model variables: exogenous and endogenous model variables and static fit instruments.
- `get_all_static_endos`: Returns all static endogenous variables, including fit instruments and lagrange multipliers.
- `get_all_static_data`: Returns all static endogenous and exogenous variables, including fit instruments and lagrange multipliers.

See Also

[solve_steady](#), [check](#)

Examples

```
mdl <- islm_mdl()
mdl$set_static_endos(c(y = 1250))

# set static values of all exogenous variables starting with m
# (for this model only "ms") to zero.
mdl$set_static_exo_values(333, pattern = "^m")

print(mdl$get_static_endos())
```

set_data	<i>DynMdl method: transfers data from a timeseries object to the model data</i>
----------	---

Description

This method of R6 class [DynMdl](#) transfers data from a timeseries object to the model data (both endogenous and exogenous). If the model implements the fit method, then set_data can also be used to modify fit instruments and the Lagrange multipliers.

Usage

```
mdl$set_data(data, names = colnames(data),
             upd_mode = c("update", "updval"), fun,
             name_err = c("stop", "warn", "silent"))
```

mdl is a [DynMdl](#) object

Arguments

data a [ts](#) or [regts](#) object. If data has labels, then set_data will also update the labels of the corresponding model variables. If the model has trends, then the timeseries in data should include the trends.

names a character vector with variable names. Defaults to the column names of data. If data does not have column names, then argument names is mandatory

upd_mode the update mode, a character string specifying how the timeseries are updated: "upd" (standard update, default) or "updval" (update only with valid numbers). See details.

fun a function used to update the model data. This should be a function with two arguments. The original model data is passed to the first argument of the function and data to the second argument. See the examples.

name_err this option specifies the action that should be taken when a variable name is not a model variable. For "stop" (the default), the execution of this function is stopped. For "warn" and "silent" the timeseries that are no model variables are skipped. "warn" does however give a warning.

Details

Method set_data transfers data from a timeseries object to the model data. If data is a multivariate timeseries object, then each column is used to update the model variable with the same name as the column name. If data does not have column names, or if the column names do not correspond to the model variable names, then argument names should be specified.

By default, all values in data are used to update the corresponding model variable. Sometimes it is desirable to skip the NA values in data. This can be achieved by selecting "updval" for argument upd_mode. Other non finite numbers (NaN, Inf, and -Inf) are also disregarded for this update mode. The argument upd_mode controls how the timeseries are updated:

"update" Model variables are updated with the timeseries in data

"updval" Model variables are updated with the non NA values in data

See Also

[get_data-methods](#), [set_values-methods](#) and [change_data-methods](#)

Examples

```
mdl <- islm_mdl(period = "2017Q1/2017Q3")

# create a multivariate regts object for exogenous variables g and md
exo <- regts(matrix(c(200, 210, 220, 250, 260, 270), ncol = 2),
               start = "2017Q1", names = c("g", "ms"))

# set and print data
mdl$set_data(exo)
print(mdl$get_exo_data())

# create a univariate regts object for exogenous variable ms,
# with a missing value in 2017Q2
ms <- regts(c(255, NA, 273), start = "2017Q1")

# update with update mode updval (ignore NA)
# note that here we have to specify argument names,
# because ms does not have column names
mdl$set_data(ms, names = "ms", upd_mode = "updval")
print(mdl$get_exo_data())

# in the next example, we use argument fun to apply an additive shock to the
# exogenous variables g and ms.
shock <- regts(matrix(c(-5, -10, -15, 3, 6, 6), ncol = 2),
                  start = "2017Q1", names = c("g", "ms"))
mdl$set_data(shock, fun = function(x1, x2) {x1 + x2})

# the statement above can be more concisely written as
mdl$set_data(shock, fun = `+`)
#`+` is a primitive function that adds its two arguments.
```

set_fit

[DynMdl](#) method: transfers data from a timeseries object to the fit targets.

Description

The method `set_fit` of R6 class [DynMdl](#) transfers data from a timeseries object to the fit targets.

Usage

```
mdl$set_fit(data, names = colnames(data),
            name_err = c("stop", "warn", "silent"))
```

mdl is a [DynMdl](#) object implementing the fit method.

Arguments

data a [ts](#) or [regts](#) timeseries object

names a character vector with variable names, with the same length as the number of timeseries in data. Defaults to the column names of data. If data does not have column names, then argument names is mandatory

name_err this option specifies the action that should be taken when a variable name is not an endogenous model variable. For "stop" (the default), the execution of this function is stopped. For "warn" and "silent" the timeseries that are no endogenous model variables are skipped. "warn" does however give a warning.

Details

Method `set_fit` transfers data from a timeseries object to the fit targets. It works similarly as method [set_data](#). If data is a multivariate timeseries object, then each column is used to update the fit target with the same name as the column name. If data does not have column names, or if the column names do not correspond to the model variable names, then argument names should be specified.

If data contains NA values, then the variable is not a fit target for the corresponding periods, which implies that the variable will be calculated according to the equations of the model.

Warning

Method [init_data](#) removes all fit targets.

See Also

[get_fit](#), [set_fit_steady](#), [set_sigma](#), [set_sigma_values](#), [get_sigma](#) and [clear_fit](#)

Examples

```
mdl <- islm_mdl(period = "2016Q1/2017Q3", fit = TRUE)

# create a regts with fit targets
y <- regts(c(1250, 1255, 1260), start = "2016Q1")
t <- regts(c(250, 255), start = "2016Q1")
fit_targets <- cbind(y, t)

# register the fit targets in the DynMdl object
mdl$set_fit(fit_targets)

print(mdl$get_fit())
```

set_fit_steady	DynMdl method: set fit targets for the steady state
----------------	---

Description

This method of R6 class [DynMdl](#) sets the static fit targets, i.e. the fit targets used in the steady state calculation.

Usage

```
mdl$set_fit_steady(data, names = names(data),
  name_err = c("stop", "warn", "silent"))
```

mdl is a [DynMdl](#) object implementing the fit method.

Arguments

data a named numeric vector with the fit target values. The names correspond to the names of the endogenous model variables.

names a character vector with variable names, with the same length as the vector data. Defaults to the names of data. If data does not have names, then argument names is mandatory

name_err this option specifies the action that should be taken when a variable name is not an endogenous model variable. For "stop" (the default), the execution of this function is stopped. For "warn" and "silent" the timeseries that are not endogenous model variables are skipped. "warn" does however give a warning.

Details

If data contains NA values, then the corresponding model variable is not a fit target.

Warning

Method [init_data](#) removes all fit targets.

See Also

[get_fit_steady](#) and [clear_fit](#)

Examples

```
mdl <- islm_mdl(fit = TRUE)

# create a regts with fit targets
y <- regts(c(1250, 1255, 1260), start = "2016Q1")
t <- regts(c(250, 255), start = "2016Q1")
fit_targets <- c(y = 1250, t = 250)
```



```
# register the static fit targets in the DynMdl object
mdl$set_fit_steady(fit_targets)

print(mdl$get_fit_steady())

mdl$solve_steady()

print(mdl$get_static_endos())
```

set_fit_values	DynMdl method: Sets the values of the fit targets
----------------	---

Description

This method of R6 class [DynMdl](#) can be used to set the values of the fit targets. See the documentation of function [set_fit](#) for more information about fit targets.

Usage

```
mdl$set_fit_values(value, names, pattern, period = mdl$get_data_period())
```

mdl is a [DynMdl](#) object implementing the fit method.

Arguments

value a numeric vector of length 1 or with the same length as the length of the range of period

names a character vector with variable names

pattern a regular expression

period a [period_range](#) object or an object that can be coerced to a [period_range](#)

See Also

[set_fit](#) and [clear_fit](#)

Examples

```
mdl <- islm_mdl(period = "2017Q1/2018Q3", fit = TRUE)

# set the values of ms in 2017Q1 and 2017Q2
mdl$set_fit_values(c(190, 195), names = "i", period = "2017Q1/2017Q2")

print(mdl$get_fit())
```

set_labels	DynMdl method: Sets labels for the model variables.
------------	---

Description

This method of R6 class [DynMdl](#) sets labels for the model variables.

Usage

```
mdl$set_labels(labels)
```

mdl is a [DynMdl](#) object

Arguments

labels a named character vector. The names are the names of the model variables

See Also

[get_labels](#)

Examples

```
mdl <- islm_mdl()
mdl$set_labels(c(c = "Consumption", i = "investments"))
```

set_period	DynMdl method: sets the model period
------------	--

Description

This method of R6 class [DynMdl](#) sets the model period. This is the default period used when solving the model.

If the model data has not already been initialized with method [init_data](#), then `set_period` also initializes the model data. In that case the model data period is set to the specified model period extended with a lag and lead period. Model timeseries are initialized with the static values of the exogenous and endogenous model variables.

If the model data has already been initialized with method [init_data](#), then the new model period should be compatible with the model data period. In particular, the new model period extended with a lag and lead period should not contain periods outside the model data period.

Usage

```
mdl$set_period(period)
```

mdl is a [DynMdl](#) object

Arguments

period [period_range](#) object, or an object that can be coerced to [period_range](#)

Examples

```
mdl <- islm_mdl()
mdl$set_period("2017Q2/2021Q3")
```

set_values-methods [DynMdl](#) methods: Sets the values of the model data

Description

This method of R6 class [DynMdl](#) can be used to set the values of the model data.

Usage

```
mdl$set_endo_values(value, names, pattern, period = mdl$get_data_period())
```

```
mdl$set_exo_values(value, names, pattern, period = mdl$get_data_period())
```

mdl is a [DynMdl](#) object

Arguments

value a numeric vector of length 1 or with the same length as the length of the range of period. If the model has trends, then the values should include the trends.

names a character vector with variable names

pattern a regular expression

period a [period_range](#) object or an object that can be coerced to a [period_range](#)

If neither names nor pattern have been specified, then all endogenous or exogenous variables are set to the specified value.

Methods

- set_endo_values: Endogenous model variables
- set_exo_values: Exogenous model variables

See Also

[change_data-methods](#) and [set_data](#)

Examples

```
mdl <- islm_mdl(period = "2017Q1/2018Q3")

# set the values of ms in 2017Q1 and 2017Q2
mdl$set_exo_values(c(205, 206), names = "ms", period = "2017Q1/2017Q2")

# set the values for y and yd to 1000 for the full data period
mdl$set_endo_values(1000, pattern = "^yd?$")
```

solve

DynMdl method: Solves the model

Description

This method of R6 class `DynMdl` solves the model.

`solve` does *not* raise an error when the solve was not successful. In that case a warning may be issued. Method `get_solve_status` can be used to check whether the solve was successfully terminated or not.

Usage

`DynMdl` method:

```
mdl$solve(control = list(), mode, solver = c("umfpackr", "nleqslv"),
          start = c("current", "previous"), debug_eqs = FALSE,
          homotopy = TRUE, silent = FALSE, backrep = c("period", "total"),
          ...)
```

`mdl` is a `DynMdl` object

Arguments

control A named list of control parameters passed to function `umf_solve_nl` or `nleqslv`, depending on argument `solver`. If control parameter `trace` has not been specified, then that parameter is set to `TRUE` when the model is solved using the stacked time method and `FALSE` when the model is solved using the backwards method (see also argument `mode`).

mode A character specifying the solve mode. Possible values are `"stacked_time"` and `"backwards"`. By default, models with leads are solved with the stacked time method and models without leads are solved backwards.

solver Specifies the solver employed to solve the model: `"umfpackr"` (sparse linear algebra) or `"nleqslv"` (dense linear algebra). For large models, the `umfpackr` solve can be much faster.

start Method used to initialize starting values when solving the model with the backwards method. For `"current"` (the default) the current values of the endogenous variables are used as starting values. For `"previous"` the solution of the previous period is used to create starting values (except for the first period when the model is solved). This argument is ignored if the model is solved with the stacked time Newton method

- `debug_eqs` Debug equations (default FALSE). Only used for the internal calculation mode (`calc == "internal"`, see `dyn_md1`). If TRUE then numerical problems in evaluation of mathematical functions or operators such a log are reported.
- `homotopy` A logical. If TRUE (the default), then the homotopy approach is used when directly solving the model fails. Consult the documentation of Dynare for more information about the homotopy aproach.
- `silent` A logical. If TRUE then all output is suppressed. In that case control parameters `silent` and `trace` (see argument `control`) are ignored.
- `backrep` A character specifying the type of iteration report when the model is solved using the backwards mode (see argument `mode`). If "period", then the number of iterations per period is printed. If "total", then only the total number of iterations is printed. This argument is ignored if argument `silent` is TRUE.
- ... Other arguments passed to the solver function (`umf_solve_nl` when the solver is "umfpackr"), Useful arguments for `umf_solve_nl` are `global` (select a global strategy) and `umf_control` (this option can be used to specify the UMFPACK ordering method, see the example below). See the documentation of `umf_solve_nl` for more details.

See Also

`solve_steady` and `get_solve_status`

Examples

```
islm <- islm_md1(period = "2018Q1/2023Q3")
islm$set_exo_values(260, period = "2018q1", names = "g")
islm$solve(control = list(trace = TRUE))

# use the METIS ordering method of UMFACK. This method can handle
# larger matrices than the standard AMD ordering, and is therefore
# suitable for larghe models.
# WARNING: The METIS ordering is not available on Windows.
## Not run:
islm$solve(control = list(trace = TRUE),
            umf_control = list(ordering = "METIS"))

## End(Not run)
```

solve_dynare

`DynMd1` method: Solves the model with Dynare

Description

Solve the model with Dynare using Matlab or Octave.

Usage

DynMdl method:

```
mdl$solve_dynare(scratch_dir = tempfile(),
                 dynare_path = NULL, model_options = list(),
                 solve_options = list(tolf = 1e-8, tolx = 1e-8),
                 initval_type = c("m", "xlsx"),
                 use_octave = Sys.which("matlab") == "",
                 exit_matlab = FALSE)
```

mdl is a [DynMdl](#) object

Arguments

scratch_dir Directory where the Matlablab and Dynare scripts are created. By default this is a temporary directory that is automatically deleted when the R session terminates.

dynare_path Character string specifying the name of the directory of the Dynare installation. On Linux it is usually not necessary to specify this argument. On Windows it is necessary to specify the path of the Dynare installation. In you are running R in the CPB environment the path to Dynare is set automatically.

model_options Options passed to the model command of Dynare. This should be a named list, which names corresponding to the Dynare options. Specify a NULL value if the option has no value. Consult the documentation of Dynare for a list of available options. Example: `model_options = list(block = NULL, mfs = 2)`

solve_options Options passed to the perfect_foresight_solver command of Dynare. This should be a named list, which names corresponding to the Dynare options. Specify a NULL value if the option has no value. Consult the documentation of Dynare for a list of available options. Example: `steady_options = list(tolf = 1e-7, no_homotopy = NULL)`. The default options are `list(tolf = 1e-8, tolx = 1e-8)`

initval_type A character specifying the type of initval file used in the Matlab/Octave job: "m" for a Matlab file and "xlsx" for an xlsx-file.

use_octave A logical. If TRUE, then Dynare is invoked with Octave, otherwise Matlab is used. By default Matlab is used if available.

exit_matlab A logical specifying if Matlab should immediately exit when the calculations have finished Matlab writes the output to a separate console. If `exit_matlab` is FALSE (the default), then the R job waits until the user has closed this console, or entered `exit` in the console. Otherwise the console is automatically closed at the end of the calculation and all output is lost. This argument is ignored if Dynare is run with Octave. Octave does not open a separate console: all output appears in the same console used by R.

Examples

```
## Not run:
islm <- islm_mdl(period = "2018Q1/2023Q3")
islm$set_exo_values(260, period = "2018q1", names = "g")
islm$solve_dynare()
```

```
## End(Not run)
```

solve_steady	DynMdl method: <i>Solves the steady state.</i>
--------------	--

Description

This method of R6 class [DynMdl](#) solves the steady state.

This function uses the static exogenous and endogenous variables stored in the [DynMdl](#) object. The static endogenous variables are used as an initial guess for solving the steady state. After creating a [DynMdl](#) object, the static exogenous and endogenous variables are initialized to the values specified in the `initval` block of the `mod` file, or to zero if they are not specified in the `initval` block. The static variables can be modified with methods [set_static_exos](#) and [set_static_endos](#).

The function [get_static_endos](#) can be used to retrieve the steady state solution.

`solve_steady` does *not* raise an error when the solve was not successful. In that case a warning may be issued. Method [get_solve_status](#) can be used to check whether the solve was successfully terminated or not.

Usage

[DynMdl](#) method:

```
mdl$solve_steady(control = list(), solver = c("umfpackr", "nleqslv"),
                 debug_eqs = FALSE, silent = FALSE, ...)
```

`mdl` is a [DynMdl](#) object

Arguments

control A named list of control parameters passed to function [umf_solve_nl](#) or [nleqslv](#), depending on argument `solver`. If control parameter `trace` has not been specified, then that parameter is set to `TRUE`.

solver Specifies the solver employed to solve the model: `umfpackr` (sparse linear algebra) or `nleqslv` (dense linear algebra). For large model, the `umfpackr` solve can be much faster.

debug_eqs Debug equations (default `FALSE`). Only used for the internal calculation mode (`calc == "internal"`, see [dyn_mdl](#)). If `TRUE` then numerical problems in evaluation of mathematical functions or operators such a `log` are reported.

silent A logical. If `TRUE` then all output is suppressed. In that case control parameters `silent` and `trace` (see argument `control`) are ignored.

... Other arguments passed to the solver

See Also

[set_static_endos](#), [set_static_exos](#), [get_static_endos](#), [get_static_exos](#), [put_static_endos](#) and [get_solve_status](#)

Examples

```
mdl <- islm_mdl(period = "2018Q1/2080Q1")
mdl$solve_steady(control = list(trace = 1))

# print the solution
print(mdl$get_static_endos())

# update the model data with steady state values of endogenous variables
mdl$put_static_endos()
```

solve_steady_dynare [DynMdl](#) method: *Solves the steady state with Dynare*

Description

Solve the steady state and calculate the eigenvalues with Dynare using Matlab or Octave.

Usage

DynMdl method:

```
mdl$solve_steady_dynare(scratch_dir = tempfile(), dynare_path = NULL,
                        model_options = list(),
                        solve_options = list(tol = 1e-8),
                        use_octave = Sys.which("matlab") == "",
                        exit_matlab = FALSE)
```

mdl is a [DynMdl](#) object

Arguments

scratch_dir Directory where the Matlablab and Dynare scripts are created. By default this is a temporary directory that is automatically deleted when the R session terminates.

dynare_path Character string specifying the name of the directory of the Dynare installation. On Linux it is usually not necessary to specify this argument. On Windows it is necessary to specify the path of the Dynare installation. In you are running R in the CPB environment the path to Dynare is set automatically.

model_options Options passed to the model command of Dynare. This should be a named list, which names corresponding to the Dynare options. Specify a NULL value if the option has no value. Consult the documentation of Dynare for a list of available options. Example: `model_options = list(block = NULL, mfs = 2)`

solve_options Options passed to the steady command of Dynare. This should be a named list, which names corresponding to the Dynare options. Specify a NULL value if the option has no value. Consult the documentation of Dynare for a list of available options. Example: `steady_options = list(tol = 1e-7, no_homotopy = NULL)`. The default is `list(tol = 1e-8)`

`use_octave` A logical. If TRUE, then Dynare is invoked with Octave, otherwise Matlab is used. By default Matlab is used if available.

`exit_matlab` A logical specifying if Matlab should immediately exit when the calculations have finished. Matlab writes the output to a separate console. If `exit_matlab` is FALSE (the default), then the R job waits until the user has closed this console, or entered `exit` in the console. Otherwise the console is automatically closed at the end of the calculation and all output is lost. This argument is ignored if Dynare is run with Octave. Octave does not open a separate console: all output appears in the same console used by R.

Value

The eigenvalues of the steady state.

Examples

```
## Not run:
islm <- islm_md1()
islm$static_residual_check(solve_options = list(tol = 1e-8))

## End(Not run)
```

`static_residual_check` [DynMd1](#) method: *Calculates the residuals of the equations of the static model*

Description

This method of R6 class [DynMd1](#) calculates the residuals for the static version of the model. The result is a named numeric vector, where the names are the equation numbers.

Usage

```
mdl$static_residual_check(tol, include_fit_eqs = FALSE)
```

`mdl` is a [DynMd1](#) object

Arguments

`tol` the tolerance parameter. If specified, then return value does not include equations whose residuals are smaller than `tol`.

`include_all_eqs` a logical value (default FALSE). If TRUE, then the all equations, including fit equations and auxiliary equations (if present), are included in the residual check. The auxiliary equations are extra equations created when the model has lags or leads greater than 1 and if `dynmdl` was called with `max_laglead_1 = TRUE`.

`include_fit_eqs` a logical value (default FALSE). If TRUE, then fit equations (if present) are included in the residual check. Ignored if `include_all_eqs` is TRUE.

`debug_eqs` Debug equations (default FALSE). Only used for the internal calculation mode (`calc == "internal"`, see [dyn_md1](#)). If TRUE then numerical problems in evaluation of mathematical functions or operators such a log are reported.

See Also[residual_check](#)

svd_analysis

*Perform an SVD analysis of a jacobian matrix.***Description**

Find linear combinations of rows and columns of the jacobian using an Singular Value Decomposition (SVD) of the jacobian.

Usage

```
svd_analysis(jac, sd_tol = 1e-12, coef_tol = 1e-12)
```

Arguments

jac	a square matrix, for example the matrix returned by DynMdl methods get_static_jacob , get_jacob or get_back_jacob .
sd_tol	singular value tolerance. Singular values smaller than this tolerance are ignored.
coef_tol	coefficient tolerance. The returned singular vector matrices do not include rows for which all elements are smaller than coef_tol.

Value

a list with class `svd_analysis`, containing the following components

d	a vector with singular values smaller than <code>sd_tol</code> , in decreasing order.
u	a matrix with the left singular vectors corresponding to the singular values d. Rows for which all elements are smaller than <code>coef_tol</code> have been removed. The columns of this matrix can be interpreted as the (near) linear relations between the rows of the jacobian.
v	a matrix with the right singular vectors corresponding to the singular values d. Rows for which all elements are smaller than <code>coef_tol</code> have been removed. The columns of this matrix can be interpreted as the (near) linear relations between the columns of the jacobian.
svd	the result of the SVD decomposition as returned by function svd .
sd_tol	the value of argument <code>sd_tol</code>
coef_tol	the value of argument <code>coef_tol</code>

See Also

[svd](#) and function [findLinearCombos](#) in package `caret`.

Examples

```
# create a singular matrix with linearly dependend rows
set.seed(123)
x1 <- rnorm(4)
x2 <- rnorm(4)
x3 <- rnorm(4)
mat1 <- rbind(x1, x2, x3, x4 = x2 + x3)
mat1

svd_analysis(mat1)

# function findLinearCombos in package caret is also useful.
# this function resolves linear relations between the columns
# of matrix (therefore we pass the transpose of mat1)
caret::findLinearCombos(t(mat1))

# now example with linearly dependent columns
x1 <- rnorm(4)
x2 <- rnorm(4)
mat2 <- cbind(x1, x2, x3 = x2)
svd_analysis(mat2)
```

write_initval_file	<i>Writes the model data to a Dynare initval file</i>
--------------------	---

Description

This method of R6 class [DynMdl](#) writes all endogenous and exogenous model variables to a so called "initval file" that can be read by Dynare. An initval_file contains the paths of all model variables.

Arguments

file the name of the initval file

Examples

```
mdl <- islm_mdl("2017Q1/2019Q2")

# write initval file as matlab file
mdl$write_initval_file("dynare_input/islsm_initval.xlsx")

# write initval file in xlsx format
mdl$write_initval_file("dynare_input/islsm_initval.xlsx")
```

write_md1	<i>Writes the model to an RDS file</i>
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Description

This method of R6 class [DynMd1](#) serializes the model object and writes it to an RDS file. The model can be read back by function [read_md1](#).

Arguments

`file` the name of the RDS file

`silent` A logical (default FALSE). If TRUE, then no output is written.

See Also

[read_md1](#)

Examples

```
mdl <- islm_md1("2017Q1/2019Q2")
mdl$write_md1("islm_md1.rds")
```

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