Package 'godley'

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Type Package

Title Stock-Flow-Consistent Model Simulator

Version 0.2.1

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Description

Define, simulate, and validate stock-flow consistent (SFC) macroeconomic models. The godley R package offers tools to dynamically define model structures by adding variables and specifying governing systems of equations. With it, users can analyze how different macroeconomic structures affect key variables, perform parameter sensitivity analyses, introduce policy shocks, and visualize resulting economic scenarios. The accounting structure of SFC models follows the approach outlined in the seminal study by Godley and Lavoie Godley and Lavoie (2007, ISBN:978-1-137-08599-3), ensuring a comprehensive integration of all economic flows and stocks. The algorithms implemented to solve the models are based on methodologies from Kinsella and O'Shea (2010) <doi:10.2139/ssrn.1729205>, Peressini and Sullivan (1988, ISBN:0-387-96614-5), and contributions by Joao Macalos.

URL https://gamrot.github.io/godley/

BugReports https://github.com/gamrot/godley/issues

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Encoding UTF-8

Imports dplyr, stringr, tidyr, igraph, purrr, vctrs, rlang, rootSolve, plotly, magrittr, checkmate, vecsets, lubridate, data.table, tibble, visNetwork

Depends R (>= 4.1.0)

RoxygenNote 7.3.2

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

NeedsCompilation no

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Contents

`add_equation` *Add equations to the model*

Description

Add equations to the model

Usage

```
add_equation(model, ...)
```

Arguments

`model`	SFC model object
`...`	additional arguments passed to the function.

Value

updated SFC model object containing added equation

add_equation_single *Add single equation to the model*

Description

helper for add_equation()

Usage

```
add_equation_single(model, equation, hidden = FALSE, desc = "")
```

Arguments

model	SFC model object
equation	string equation in format: 'x = y + z - a * b + (c + d) / e + f[-1]'
hidden	logical, indicates if equation should be written as hidden, defaults to FALSE
desc	string equation description

add_scenario *Add scenario to the model*

Description

Add scenario to the model

Usage

```
add_scenario(
  model,
  name = "expansion",
  origin = "baseline",
  origin_start = NA,
  origin_end = NA,
  shock
)
```

Arguments

model	SFC model object
name	string name of scenario, defaults to 'expansion'
origin	string name of origin scenario, from which the new scenario will be created, defaults to 'baseline'
origin_start	numeric period number from origin scenario from which the new scenario will begin
origin_end	numeric period number from origin scenario on which the new scenario will end
shock	shock object from `create_shock()` and `add_shock()`

Value

updated SFC model object containing added scenario

`add_shock` *Add shock to shock object*

Description

Add shock to shock object

Usage

```
add_shock(
  shock,
  variable,
  value = NA,
  rate = NA,
  absolute = NA,
  start = NA,
  end = NA,
  desc = ""
)
```

Arguments

`shock`	tibble from `create_shock()`
`variable`	string variable name
`value`	numeric, an explicit value or values for the variable, will be extended with last value
`rate`	numeric, multiplier to influence the original value of the variable
`absolute`	numeric, absolute value to influence the original value of the variable
`start`	numeric or date period number for the shock to take place, defaults to NA
`end`	numeric or date period number for the shock to take place, defaults to NA
`desc`	string variable description

Value

updated shock object containing added shock

add_variable *Add variables to the model*

Description

Add variables to the model

Usage

```
add_variable(model, ...)
```

Arguments

model	SFC model object
...	additional arguments passed to the function.

Value

updated SFC model object containing added variable

add_variable_single *Add single variable to the model*

Description

helper for add_variable()

Usage

```
add_variable_single(model, name, init = NA, desc = "")
```

Arguments

model	SFC model object
name	string name for added variable
init	numeric initial value, defaults to 1e-05
desc	string variable description

change_init *Change initial value of a variable*

Description

Change initial value of a variable

Usage

```
change_init(model, name, value)
```

Arguments

model	SFC model object
name	string variable name
value	numeric value that will replace existing initial value

Value

updated SFC model object with new variable initial value

create_model *Create SFC model object*

Description

Create SFC model object

Usage

```
create_model(name = "SFC model", template)
```

Arguments

name	string name for created SFC model object
template	string name of model template chosen from: 'SIM', 'PC', 'LP', 'REG', 'OPEN', 'BMW', 'BMWK', 'DIS', 'DISINF', 'SIMEX', 'PCEX' or user created SFC model object to be used as a template

Value

SFC model object

create_sensitivity *Create model with sensitivity scenarios*

Description

Create model with sensitivity scenarios

Usage

```
create_sensitivity(model_pass, variable, lower = 0, upper = 1, step = 0.1)
```

Arguments

model_pass	SFC model object that will be used as a baseline for sensitivity calculation
variable	string name of the variable that will be used
lower	numeric lower bound value of the variable
upper	numeric upper bound value of the variable
step	numeric step between upper and lower bounds for the variable to take value

Value

SFC model object with sensitivity scenarios

create_shock *Create shock used in* add_scenario().

Description

Create shock used in add_scenario().

Usage

```
create_shock()
```

Value

shock object

d *Calculate 1 order lag difference of a variable in model*

Description

Calculate 1 order lag difference of a variable in model

Usage

```
d(x)
```

Arguments

x	variable name

Details

this is a special function to be used exclusively in model equation strings e.g. "x = d(y) + z"

Value

difference

plot_cycles *Network plot of the model*

Description

Network plot of the model

Usage

```
plot_cycles(model, save_file = NULL)
```

Arguments

model	SFC model object created with create_model
save_file	name and path to save the plot as html file

Details

This function creates a representation of a model as a directed graph. Additionally it shows cycles in the model including these with lagged variables. Graph can be saved as html file.

Value

visNetwork object

Examples

```
model <- godley::create_model(name = "SFC model", template = "BMW")
plot_cycles(model)
```

`plot_simulation` *Plot simulations of multiple variables in multiple scenarios*

Description

Plot simulations of multiple variables in multiple scenarios

Usage

```
plot_simulation(
  model,
  scenario = "baseline",
  take_all = FALSE,
  from = NA,
  to = NA,
  expressions = "Y"
)
```

Arguments

`model`	SFC model object
`scenario`	vector of strings or single string name of scenario(s) from which take variables values, defaults to 'baseline'
`take_all`	logical indicating whether all scenarios containing the given scenario name string(s) should be used, defaults to FALSE
`from`	numeric period number from which the plot should start, defaults to maximum value
`to`	numeric period number on which the plot should end, defaults to minimum value
`expressions`	vector of strings or single string name of variable(s) expression(s) to plot, defaults to 'Y'

Value

`plotly` plot

prepare *Make initial matrix row for baseline scenario and prepare equations for* simulate_scenario()

Description

Make initial matrix row for baseline scenario and prepare equations for simulate_scenario()

Usage

```
prepare(model, verbose = FALSE)
```

Arguments

model	SFC model object
verbose	logical to tell if additional model verbose should be displayed

Value

verified and prepared SFC model object

simulate_scenario *Simulate scenario of SFC model object*

Description

Simulate scenario of SFC model object

Usage

```
simulate_scenario(
  model,
  scenario,
  periods = NA,
  start_date = NA,
  method = "Gauss",
  max_iter = 350,
  tol = 1e-05,
  hidden_tol = 0.1,
  verbose = FALSE
)
```

Arguments

model	SFC model object
scenario	vector of strings or single string name of scenario(s) to simulate
periods	numeric total number of rows (periods) in the model, defaults to 100
start_date	character date to begin the simulation in the format "yyyy-mm-dd"
method	string name of method used to find solution chosen from: 'Gauss', 'Newton', defaults to 'Gauss'
max_iter	numeric maximum iterations allowed per period, defaults to 350
tol	numeric tolerance accepted to determine convergence, defaults to 1e-05
hidden_tol	numeric error tolerance to accept the equality of hidden equations, defaults to 0.1.
verbose	logical to tell if additional model verbose should be displayed

Value

updated model containing simulated scenario(s)

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