Package 'CGE'

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Type Package

Title Computing General Equilibrium

Version 0.3.3

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Description Developing general equilibrium models, computing general equilibrium and simulating economic dynamics with structural dynamic models in LI (2019, ISBN: 9787521804225) ``General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press''. When developing complex general equilibrium models, GE package should be used in addition to this package.

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Encoding UTF-8

LazyData true

BugReports https://github.com/LiWuR/CGE/issues

RoxygenNote 7.1.0

NeedsCompilation no

Repository CRAN

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R topics documented:

CD_A *Cobb-Douglas Demand Structure Matrix*

Description

This function computes the Cobb-Douglas demand structure matrix.

Usage

```
CD_A(alpha, Beta, p)
```

Arguments

alpha	a nonnegative numeric m-vector or m-by-1 matrix.
Beta	a nonnegative numeric n-by-m matrix whose each column sum equals 1.
p	a nonnegative numeric n-vector or n-by-1 matrix.

Value

A demand coefficient n-by-m matrix is computed which indicates the demands of agents (firms or consumers) for obtaining unit product or utility with Cobb-Douglas production functions or utility functions under the price vector p.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
CD_A(1, c(0.5, 0.5), c(1, 2))

#####
alpha <- c(5, 3, 1)
Beta <- matrix(c(
  0.6, 0.4, 0.2,
  0.1, 0.4, 0.7,
  0.3, 0.2, 0.1
), 3, 3, TRUE)
p <- 1:3
CD_A(alpha, Beta, p)
```

CD_mA *Cobb-Douglas Monetary Demand Structure Matrix*

Description

This function computes a Cobb-Douglas monetary demand structure matrix in a monetary economy.

Usage

```
CD_mA(alpha, Beta, p)
```

Arguments

alpha	a nonnegative numeric m-vector or m-by-1 matrix.
Beta	nonnegative numeric n-by-m matrix whose each column sum equals 1.
p	a nonnegative numeric n-vector or n-by-1 matrix.

Details

Some elements of Beta corresponding to money equal -1.

Value

A n-by-m matrix is computed which indicates the (monetary) demand structure of agents (firms or consumers) with Cobb-Douglas production functions or utility functions under the price vector p.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
alpha <- c(1, 1, 1)
Beta <- matrix(c(
  0.5, 0.5, 0.5,
  0.5, 0.5, 0.5,
  -1,  -1,  -1
), 3, 3, TRUE)
p <- c(1, 2, 0.1)
CD_mA(alpha, Beta, p)
```

CES_A *CES Demand Coefficient Matrix*

Description

This function computes the CES demand coefficient matrix.

Usage

```
CES_A(sigma, alpha, Beta, p, Theta = NULL)
```

Arguments

sigma	a numeric m-vector or m-by-1 matrix.
alpha	a nonnegative numeric m-vector or m-by-1 matrix.
Beta	a nonnegative numeric n-by-m matrix.
p	a nonnegative numeric n-vector or n-by-1 matrix.
Theta	null or a positive numeric n-by-m matrix.

Value

A demand coefficient n-by-m matrix is computed which indicates the demands of agents (firms or consumers) for obtaining unit product or utility with CES production functions or utility functions (e.g. alpha*(beta1*x1^sigma+beta2*x2^sigma)^(1/sigma) or alpha*(beta1*(x1/theta1)^sigma+beta2*(x2/theta2)^sigma)^(1
under the price vector p.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
CES_A(-1, 2, c(0.2, 0.1), c(1, 2))

#####
sigma <- c(-1, -1, -1)
alpha <- c(1, 1, 1)
Beta <- matrix(c(
  0, 1, 1,
  1, 0, 0,
  1, 0, 0
), 3, 3, TRUE)
p <- 1:3
CES_A(sigma, alpha, Beta, p)

#####
sigma <- -1e-10
alpha <- 1
Beta <- c(0.8, 0.2)
Theta <- c(2, 1)
p <- c(1, 1)
CES_A(sigma, alpha, Beta, p, Theta)
CD_A(alpha * prod(Theta^(-Beta)), Beta, p)

CES_A(sigma, alpha, Beta, p, Beta)
CD_A(alpha * prod(Beta^(-Beta)), Beta, p)
```

```
CES_A(-1e5, alpha, Beta, p, Theta)
```

CES_mA *CES Monetary Demand Coefficient Matrix*

Description

This function computes a CES monetary demand coefficient matrix in a monetary economy.

Usage

```
CES_mA(sigma, alpha, Beta, p, Theta = NULL)
```

Arguments

sigma	a numeric m-vector or m-by-1 matrix.
alpha	a nonnegative numeric m-vector or m-by-1 matrix.
Beta	a nonnegative numeric n-by-m matrix whose each column sum equals 1.
p	a nonnegative numeric n-vector or n-by-1 matrix.
Theta	null or a positive numeric n-by-m matrix.

Details

Some elements of Beta corresponding to money equal -1.

Value

A n-by-m matrix is computed which indicates the (monetary) demand structure of agents (firms or consumers) with CES production functions or utility functions under the price vector p.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
alpha <- matrix(1, 6, 1)
Beta <- matrix(c(
  0,   1,  1,   0,   1,   1,
  0.5, 0,  0,   0,   0,   0,
  -1, -1, -1,   0,   0,   0,
  0.5, 0,  0,   0.5, 0,   0,
  0,   0,  0,   0.5, 0,   0,
  0,   0,  0,  -1,  -1,  -1
), 6, 6, TRUE)
p <- c(1, 2, 0.1, 4, 5, 0.1)
CES_mA(rep(-1, 6), alpha, Beta, p)
```

`ChinaCGE2012` *A CGE Model of China based on the Input-Output Table of 2012 (Unit: Ten Thousand RMB)*

Description

This data set gives parameters of a CGE model of China based on the input-output table of 2012.

Usage

```
ChinaCGE2012
```

Format

A list containing the following components:

A(state)	function	a function which returns a demand structure 41-by-38 matrix under a given price 41-vector.
B	numeric	a supply structure 41-by-38 matrix.
S0Exg	numeric	an exogenous supply 41-by-38 matrix.
z0	numeric	an initial exchange levels (i.e. activity levels, production levels or utility levels) 38-vector.
subject.names	character	names of 41 subjects (or commodities).
sector.names	character	names of 38 sectors.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ChinaCGE2012$A(list(p = rep(1, 41)))

#####
cge <- function(GRExg = 0) {
  sdm(
    A = ChinaCGE2012$A,
    B = ChinaCGE2012$B,
    S0Exg = ChinaCGE2012$S0Exg,
    GRExg = GRExg,
    z0 = ChinaCGE2012$z0,
    priceAdjustmentVelocity = 0.03
  )
}

#####
ge0 <- cge()
names(ge0$p) <- ChinaCGE2012$subject.names
ge0$p

names(ge0$z) <- ChinaCGE2012$sector.names
ge0$z

#####
ge6 <- cge(GRExg = 0.06)
names(ge6$p) <- ChinaCGE2012$subject.names
ge6$p

names(ge6$z) <- ChinaCGE2012$sector.names
ge6$z
```

---

dg *A Modified diag Function*

Description

This function works in the way analogous to the diag function of Matlab.

Usage

```
dg(x)
```

Arguments

x	a number, vector or square matrix.

Value

If x is a number, dg returns itself. If x is a vector, a one-row matrix or a one-column matrix, dg returns a matrix with x as the main diagnol. Otherwise dg returns diag(x).

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

Examples

```
diag(matrix(2, 3))
dg(matrix(2, 3))
```

Example.MWG.15.B.1 *Example 15.B.1 in MWG (1995)*

Description

This is Example 15.B.1 in MWG (1995, P519), which is a pure exchange Cobb-Douglas 2-by-2 economy.

Usage

```
Example.MWG.15.B.1(
  a = 0.1,
  S0Exg = matrix(c(
    1, 2,
    2, 1
  ), 2, 2, TRUE)
)
```

Arguments

a	Each consumer has the Cobb-Douglas utility function x1^a*x2^(1-a).
S0Exg	exogenous supply matrix which will be passed to the function sdm.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Mas-Colell, Andreu and Whinston, Michael Dennis and Green, Jerry R. (1995, ISBN: 0195073401) Microeconomic Theory. Oxford University Press (New York).

Examples

```
Example.MWG.15.B.1()

#####
Example.MWG.15.B.1(a = 0.2)

#####
S <- matrix(c(
  18, 72,
  40, 20
), 2, 2, TRUE)
ge <- Example.MWG.15.B.1(a = 0.2, S0Exg = S)
ge$p / ge$p[1]
```

`Example.MWG.15.B.2` *Example 15.B.2 in MWG (1995)*

Description

This is Example 15.B.2 in MWG (1995, P521), which is a pure exchange 2-by-2 economy with quasilinear utility functions.

Usage

```
Example.MWG.15.B.2(p0 = c(1, 0.3))
```

Arguments

`p0`	an initial price 2-vector, which will be passed to the function sdm.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Mas-Colell, Andreu and Whinston, Michael Dennis and Green, Jerry R. (1995, ISBN: 0195073401) Microeconomic Theory. Oxford University Press (New York).

Examples

```
ge <- Example.MWG.15.B.2()
ge$p

#####
```

```
ge <- Example.MWG.15.B.2(p0 = c(0.3, 1))
ge$p

#####
ge <- Example.MWG.15.B.2(p0 = c(1, 1))
ge$p
```

`Example.MWG.Exercise.15.B.6`
Exercise 15.B.6 in MWG (1995)

Description

This is Exercise 15.B.6 in MWG (1995, P541), which is a pure exchange CES 2-by-2 economy.

Usage

```
Example.MWG.Exercise.15.B.6(p0 = c(1, 2))
```

Arguments

`p0`	an initial price 2-vector, which will be passed to the function sdm.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Mas-Colell, Andreu and Whinston, Michael Dennis and Green, Jerry R. (1995, ISBN: 0195073401) Microeconomic Theory. Oxford University Press (New York).

Examples

```
ge <- Example.MWG.Exercise.15.B.6()
ge$p / ge$p[2] # (3/4)^3

#####
ge <- Example.MWG.Exercise.15.B.6(p0 = c(2, 1))
ge$p / ge$p[2] # (4/3)^3

#####
ge <- Example.MWG.Exercise.15.B.6(p0 = c(1, 1))
ge$p
```

`Example.MWG.Exercise.15.B.9` *Exercise 15.B.9 in MWG (1995)*

Description

This is Exercise 15.B.9 in MWG (1995, P541), which is a pure exchange 2-by-2 economy.

Usage

```
Example.MWG.Exercise.15.B.9(
  S0Exg = matrix(c(
    30, 0,
    0, 20
  ), 2, 2, TRUE)
)
```

Arguments

`S0Exg`	an exogenous supply matrix, which will be passed to the function sdm.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Mas-Colell, Andreu and Whinston, Michael Dennis and Green, Jerry R. (1995, ISBN: 0195073401) Microeconomic Theory. Oxford University Press (New York).

Examples

```
Example.MWG.Exercise.15.B.9()

#####
S <- matrix(c(
  5, 0,
  0, 20
), 2, 2, TRUE)
Example.MWG.Exercise.15.B.9(S0Exg = S)
```

`Example.Section.3.1.2.corn`
Example in Section.3.1.2 of Li (2019)

Description

This is the example in Section.3.1.2 of Li (2019), which is a Leontief-type two-sector corn economy.

Usage

```
Example.Section.3.1.2.corn()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

`Example.Varian.Exercise.18.2`
Exercise 18.2 in Varian (1992)

Description

This is Exercise 18.2 in Varian (1992, P357), which is a Cobb-Douglas 3-by-4 economy.

Usage

```
Example.Varian.Exercise.18.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Varian, Hal R. (1992, ISBN: 0393957357) Microeconomic Analysis. W. W. Norton & Company.

Examples

```
ge <- Example.Varian.Exercise.18.2()
ge$A %*% diag(ge$z)  #input matrix
```

Example.Varian.P352 *Example on Page 352 in Varian (1992)*

Description

This is the example on page 352 in Varian (1992) (see also Example 15.C.2. in MWG, 1995, P542), which is a decreasing-returns-to-scale Cobb-Douglas 3-by-2 economy and can be transformed into a constant-returns-to-scale 3-by-3 (or 3-by-2) economy.

Usage

```
Example.Varian.P352(agent.number = 3)
```

Arguments

agent.number	agent.number can be set to 3 or 2.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Mas-Colell, Andreu and Whinston, Michael Dennis and Green, Jerry R. (1995, ISBN: 0195073401) Microeconomic Theory. Oxford University Press (New York).

Varian, Hal R. (1992, ISBN: 0393957357) Microeconomic Analysis. W. W. Norton & Company.

Examples

```
Example.Varian.P352()

#####
Example.Varian.P352(agent.number = 2)
```

Example2.2 *Example 2.2 in Li (2019)*

Description

This is Example 2.2 in Li (2019), which is a Cobb-Douglas pure production economy.

Usage

```
Example2.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example2.3 *Example2.3 in Li (2019)*

Description

This is Example 2.3 in Li (2019), which is a von Neumann economy.

Usage

```
Example2.3()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example3.1 *Example 3.1 in Li (2019)*

Description

This is Example 3.1 in Li (2019),which is a two-sector corn economy with a non-homothetic utility function.

Usage

```
Example3.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example3.10 *Example 3.10 in Li (2019)*

Description

This is Example 3.10 in Li (2019),which is a Leontief corn economy with three primary factors.

Usage

```
Example3.10()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example3.12 *Example 3.12 in Li (2019)*

Description

This is Example 3.12 in Li (2019),which is an economy with decreasing returns to scale.

Usage

```
Example3.12()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example3.14 *Example 3.14 in Li (2019)*

Description

This is Example 3.14 in Li (2019),which illustrates the relationship between a regular economy and a pure exchange economy.

Usage

```
Example3.14()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example3.2 *Example 3.2 in Li (2019)*

Description

This is Example 3.2 in Li (2019),which is a Cobb-Douglas two-sector corn economy.

Usage

```
Example3.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example3.4 *Example 3.4 in Li (2019)*

Description

This is Example 3.2 in Li (2019),which is a Lontief three-sector economy with one primary factor.

Usage

```
Example3.4()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example3.8 *Example 3.8 in Li (2019)*

Description

This is Example 3.8 in Li (2019),which is a Cobb-Douglas three-sector economy with one primary factor.

Usage

```
Example3.8()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example3.9 *Example 3.9 in Li (2019)*

Description

This is Example 3.9 in Li (2019),which is a Cobb-Douglas three-sector economy with two primary factors.

Usage

```
Example3.9()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.10 *Example 4.10 in Li (2019)*

Description

This is Example 4.10 in Li (2019),which illustrates the tax.

Usage

```
Example4.10()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.11.1 *First Part of Example 4.11 in Li (2019)*

Description

This is the first part of Example 4.11 in Li (2019),which illustrates the tax.

Usage

```
Example4.11.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.11.2 *Second Part of Example 4.11 in Li (2019)*

Description

This is the second part of Example 4.11 in Li (2019),which illustrates the tax.

Usage

```
Example4.11.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.12 *Example 4.12 in Li (2019)*

Description

This is Example 4.12 in Li (2019),which illustrates the tax.

Usage

```
Example4.12()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.13 *Example 4.13 in Li (2019)*

Description

This is Example 4.13 in Li (2019),which illustrates the divident.

Usage

```
Example4.13()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.15 *Example 4.15 in Li (2019)*

Description

This is Example 4.15 in Li (2019),which illustrates over-investment.

Usage

```
Example4.15()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.16 *Example 4.16 in Li (2019)*

Description

This is Example 4.16 in Li (2019),which illustrates technology monopoly.

Usage

```
Example4.16()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.2 *Example 4.2 in Li (2019)*

Description

This is Example 4.2 in Li (2019), which illustrates the non-sufficient supply of the primary factor.

Usage

```
Example4.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.8 *Example 4.8 in Li (2019)*

Description

This is Example 4.8 in Li (2019),which illustrates the increasing returns to scale.

Usage

```
Example4.8()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example4.9 *Example 4.9 in Li (2019)*

Description

This is Example 4.9 in Li (2019),which illustrates the price signal.

Usage

```
Example4.9()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.1 *Example 5.1 in Li (2019)*

Description

This is Example 5.1 in Li (2019),which illustrates fixed assets.

Usage

```
Example5.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.10 *Example 5.10 in Li (2019)*

Description

This is Example 5.10 in Li (2019),which illustrates pollution.

Usage

```
Example5.10()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.11.1 *First Part of Example 5.11 in Li (2019)*

Description

This is the first part of Example 5.11 in Li (2019),which illustrates pollution.

Usage

```
Example5.11.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.11.2 *Second Part of Example 5.11 in Li (2019)*

Description

This is the second part of Example 5.11 in Li (2019),which illustrates pollution.

Usage

```
Example5.11.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.2 *Example 5.2 in Li (2019)*

Description

This is Example 5.2 in Li (2019),which illustrates fixed assets.

Usage

```
Example5.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.3.1 *First Part of Example 5.3 in Li (2019)*

Description

This is the first part of Example 5.3 in Li (2019),which illustrates fixed assets.

Usage

```
Example5.3.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.3.2 *Second Part of Example 5.3 in Li (2019)*

Description

This is the second part of Example 5.3 in Li (2019),which illustrates fixed assets.

Usage

```
Example5.3.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.4 *Example 5.4 in Li (2019)*

Description

This is Example 5.4 in Li (2019),which illustrates fixed assets.

Usage

```
Example5.4()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.5 *Example 5.5 in Li (2019)*

Description

This is Example 5.5 in Li (2019),which illustrates fixed assets.

Usage

```
Example5.5()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example5.6 *Example 5.6 in Li (2019)*

Description

This is Example 5.6 in Li (2019),which illustrates fixed assets.

Usage

```
Example5.6()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.10 *Example 6.10 in Li (2019)*

Description

This is Example 6.10 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.10()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.11 *Example 6.11 in Li (2019)*

Description

This is Example 6.11 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.11()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.13 *Example 6.13 in Li (2019)*

Description

This is Example 6.13 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.13()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge <- Example6.13()
matplot(ge$ts.p, type = "l")
matplot(ge$ts.z, type = "l")
```

Example6.2.1 *First Part of Example 6.2 in Li (2019)*

Description

This is the first part of Example 6.2 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.2.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.2.2 *Second Part of Example 6.2 in Li (2019)*

Description

This is the second part of Example 6.2 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.2.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.3 *Example 6.3 in Li (2019)*

Description

This is Example 6.3 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.3()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.4 *Example 6.4 in Li (2019)*

Description

This is Example 6.4 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.4()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.5 *Example 6.5 in Li (2019)*

Description

This is Example 6.5 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.5()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.6.1 *First Part of Example 6.6 in Li (2019)*

Description

This is the first part of Example 6.6 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.6.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.6.2 *Second Part of Example 6.6 in Li (2019)*

Description

This is the second part of Example 6.6 in Li (2019),which illustrates the first country of a two-country economy.

Usage

```
Example6.6.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.6.3 *Third Part of Example 6.6 in Li (2019)*

Description

This is the third part of Example 6.6 in Li (2019),which illustrates the second country of a two-country economy.

Usage

```
Example6.6.3()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.7 *Example 6.7 in Li (2019)*

Description

This is Example 6.7 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.7()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example6.9 *Example 6.9 in Li (2019)*

Description

This is Example 6.9 in Li (2019),which illustrates a two-country economy.

Usage

```
Example6.9()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.1 *Example 7.1 in Li (2019)*

Description

This is Example 7.1 in Li (2019),which illustrates a monetary pure exchange economy.

Usage

```
Example7.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.10 *Example 7.10 in Li (2019)*

Description

This is Example 7.10 in Li (2019), which illustrates fiat money and representative money.

Usage

```
Example7.10()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.10.2 *Extra Part of Example 7.10 in Li (2019)*

Description

This is an extra part of Example 7.10 in Li (2019), which illustrates fiat money and representative money.

Usage

```
Example7.10.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.11 *Example 7.11 in Li (2019)*

Description

This is Example 7.11 in Li (2019), which illustrates bond.

Usage

```
Example7.11()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.12 *Example 7.12 in Li (2019)*

Description

This is Example 7.12 in Li (2019), which illustrates the foreign exchange rate and international credit.

Usage

```
Example7.12()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.13 *Example 7.13 in Li (2019)*

Description

This is Example 7.13 in Li (2019), which illustrates indirect financing based on commercial banks.

Usage

```
Example7.13()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.14 *Example 7.14 in Li (2019)*

Description

This is Example 7.14 in Li (2019), which illustrates shadow prices.

Usage

```
Example7.14()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.15 *Example 7.15 in Li (2019)*

Description

This is Example 7.15 in Li (2019), which illustrates shadow prices and international trade.

Usage

```
Example7.15()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.2 *Example 7.2 in Li (2019)*

Description

This is Example 7.2 in Li (2019),which illustrates a monetary Cobb-Douglas zero-growth corn economy.

Usage

```
Example7.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
## Another way to compute this equilibrium, i.e. treating money as tax receipt.
r <- 0.25
ge <- sdm(
  A = function(state) {
    alpha <- rbind(1, 1, 1)
    Beta <- matrix(c(
      0.5, 0.5, 0.5,
      0.5, 0.5, 0.5
    ), 2, 3, TRUE)
    tmp.A <- CD_A(alpha, Beta, state$p[1:2])
    tmp <- apply(tmp.A, 2, function(x) sum(x * state$p[1:2]))

    rbind(tmp.A, r * tmp / state$p[3])
  },
  B = diag(3),
  S0Exg = {
    tmp <- matrix(NA, 3, 3)
    tmp[2, 2] <- 100
    tmp[3, 3] <- 100
    tmp
  }
)

ge$p / ge$p[3] * r

p <- ge$p
p[3] <- p[3] / r
```

```
p / p[3]
```

`Example7.3` *Example 7.3 in Li (2019)*

Description

This is Example 7.3 in Li (2019),which illustrates a monetary Leontief corn economy.

Usage

```
Example7.3()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

`Example7.4` *Example 7.4 in Li (2019)*

Description

This is Example 7.4 in Li (2019),which illustrates a monetary Cobb-Douglas positive-growth corn economy.

Usage

```
Example7.4()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.5.1 *First Part of Example 7.5 in Li (2019)*

Description

This is the first part of Example 7.5 in Li (2019),which illustrates a monetary Cobb-Douglas corn economy including dividend.

Usage

```
Example7.5.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.5.2 *Second Part of Example 7.5 in Li (2019)*

Description

This is the second part of Example 7.5 in Li (2019), which illustrates a monetary Cobb-Douglas corn economy including dividend.

Usage

```
Example7.5.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.6 *Example 7.6 in Li (2019)*

Description

This is Example 7.6 in Li (2019), which illustrates foreign exchange rates.

Usage

```
Example7.6()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.7 *Example 7.7 in Li (2019)*

Description

This is Example 7.7 in Li (2019), which illustrates foreign exchange rates.

Usage

```
Example7.7()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.8 *Example 7.8 in Li (2019)*

Description

This is Example 7.8 in Li (2019), which illustrates commodity money.

Usage

```
Example7.8()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example7.9X *Example 7.9 in Li (2019)*

Description

This is Example 7.9 in Li (2019), which illustrates commodity money and representative money.

Usage

```
Example7.9X()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example8.1 *Example 8.1 in Li (2019)*

Description

This is Example 8.1 in Li (2019), which expounds the equilibrium coffee problem.

Usage

```
Example8.1()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example8.2 *Example 8.2 in Li (2019)*

Description

This is Example 8.2 in Li (2019), which expounds a Cobb-Douglas market-clearing exchange process.

Usage

```
Example8.2()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Example8.7 *Example 8.7 in Li (2019)*

Description

This is Example 8.7 in Li (2019), which discusses price changes in the coffee economy.

Usage

```
Example8.7()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge <- Example8.7()
matplot(ge$ts.p, type = "l")
matplot(ge$ts.z, type = "l")
```

Example8.8 *Example 8.8 in Li (2019)*

Description

This is Example 8.8 in Li (2019), which illustrates a dynamic exchange model with one type of money.

Usage

```
Example8.8()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge <- Example8.8()
matplot(ge$ts.p, type = "l")
matplot(ge$ts.z, type = "l")
```

`Example8.9` *Example 8.9 in Li (2019)*

Description

This is Example 8.9 in Li (2019), which illustrates a dynamic exchange model with multiple types of money.

Usage

```
Example8.9()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge <- Example8.9()
matplot(ge$ts.p, type = "l")
matplot(ge$ts.z, type = "l")
```

`Example9.10` *Example 9.10-9.14 in Li (2019)*

Description

This is Example 9.10-14 in Li (2019), which illustrates economic cycles in a monetary economy and economic policies ironing economic cycles.

Usage

```
Example9.10(
  policy = NULL,
  pExg = rbind(NA, NA, 0.25),
  p0 = rbind(0.625, 0.375, 0.25),
  priceAdjustmentVelocity = 0.3,
  ts = TRUE
)
```

Arguments

	Those arguments will be passed to the function sdm. See sdm.
	a policy function
pExg	an n-vector indicating the exogenous prices (if any).
p0	an initial price n-vector.
priceAdjustmentVelocity	the price adjustment velocity.
ts	if TRUE, the time series of the last iteration are returned.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

See Also

sdm; Example9.10.policy.interest.rate; Example9.10.policy.money.supply; Example9.10.policy.deflation; Example9.10.policy.quantitative.easing; Example9.10.policy.tax; Example9.10.policy.deficit.fiscal

Examples

```
##### no policy
ge <- Example9.10()
matplot(ge$ts.p, type = "l")
matplot(ge$ts.z, type = "l")

##### interest rate policy (Fig. 9.12)
Example9.10(policy = Example9.10.policy.interest.rate)

##### monetary supply policy (Fig. 9.13)
Example9.10(policy = Example9.10.policy.money.supply)

##### deflation policy (Fig. 9.14)
ge <- Example9.10(
  policy = Example9.10.policy.deflation,
  pExg = rbind(NA, NA, 0),
  p0 = rbind(0.625, 0.375, 0), ts = TRUE
)
plot(ge$ts.S[3, 3, ], type = "l")
plot(ge$ts.q[, 3], type = "l")

##### quantitative easing policy (Fig. 9.15)
ge <- Example9.10(
  policy = Example9.10.policy.quantitative.easing,
  pExg = rbind(NA, NA, 0),
```

```
  p0 = rbind(0.625, 0.375, 0),
  ts = TRUE
)
plot(log(ge$ts.S[3, 3, ]), type = "l")
plot(ge$ts.q[, 3], type = "l")
plot(log(ge$ts.p[, 1]), type = "l")
lines(log(ge$ts.p[, 2]), col = "blue")

##### deficit fiscal policy (Fig. 9.17; Fig. 9.18)
ge <- Example9.10(
  policy = Example9.10.policy.deficit.fiscal,
  priceAdjustmentVelocity = 0.5, ts = TRUE
)
plot(ge$ts.S[3, 3, ], type = "l")
plot(ge$ts.q[, 1], type = "l")

deficit.Example9.10 <- ge$policy.data
plot(deficit.Example9.10, type = "l")
plot(deficit.Example9.10[, 1], cumsum(deficit.Example9.10[, 2]), type = "l")
plot(deficit.Example9.10[, 1],
  cumsum(deficit.Example9.10[, 2]) /
    (tail(ge$ts.z[, 1] * ge$ts.p[, 1], -399)),
  type = "l"
)

##### tax policy (Fig. 9.16)
ge <- Example9.10(policy = Example9.10.policy.tax)
plot(ge$policy.data, type = "l")
```

`Example9.10.policy.deficit.fiscal` *Deficit Fiscal Policy for Example 9.10 in Li (2019)*

Description

This is the deficit fiscal policy for the economy of Example 9.10 in Li (2019), which is discussed in Example 9.14.

Usage

```
Example9.10.policy.deficit.fiscal(time, state, state.history)
```

Arguments

`time`	the current time.
`state`	a list indicating the current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.
`state.history`	the history of economic states.

Value

Example9.10.policy.deficit.fiscal returns a list indicating the modified current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels), supplies and current policy data.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

See Also

Example9.10; Example9.10.policy.interest.rate; Example9.10.policy.money.supply; Example9.10.policy.def
Example9.10.policy.quantitative.easing; Example9.10.policy.tax

---

Example9.10.policy.deflation

Deflation Policy for Example9.10 in Li (2019)

Description

This is the deflation policy for the economy of Example 9.10 in Li (2019), which is discussed in Example 9.12.

Usage

```
Example9.10.policy.deflation(time, state, state.history)
```

Arguments

time	the current time.
state	a list indicating the current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.
state.history	the history of economic states.

Value

Example9.10.policy.deflation returns a list indicating the modified current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

See Also

Example9.10; Example9.10.policy.interest.rate; Example9.10.policy.money.supply; Example9.10.policy.qua
Example9.10.policy.tax; Example9.10.policy.deficit.fiscal

`Example9.10.policy.interest.rate`

Interest Rate Policy for Example9.10 in Li (2019)

Description

This is the interest rate policy for the economy of Example 9.10 in Li (2019), which is discussed in Example 9.11.

Usage

```
Example9.10.policy.interest.rate(time, state, state.history)
```

Arguments

`time`	the current time.
`state`	a list indicating the current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.
`state.history`	the history of economic states.

Value

Example9.10.policy.interest.rate returns a list indicating the modified current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

See Also

Example9.10; Example9.10.policy.money.supply; Example9.10.policy.deflation; Example9.10.policy.quantit
Example9.10.policy.tax; Example9.10.policy.deficit.fiscal

`Example9.10.policy.money.supply` *Money Supply Policy for Example9.10 in Li (2019)*

Description

This is the money supply policy for the economy of Example 9.10 in Li (2019), which is discussed in Example 9.12.

Usage

```
Example9.10.policy.money.supply(time, state, state.history)
```

Arguments

`time`	the current time.
`state`	a list indicating the current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.
`state.history`	the history of economic states.

Value

Example9.10.policy.money.supply returns a list indicating the modified current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

See Also

`Example9.10`; `Example9.10.policy.interest.rate`; `Example9.10.policy.deflation`; `Example9.10.policy.quanti`
`Example9.10.policy.tax`; `Example9.10.policy.deficit.fiscal`

`Example9.10.policy.quantitative.easing` *Quantitative Easing Policy for Example 9.10 in Li (2019)*

Description

This is the deflation policy for the economy of Example 9.10 in Li (2019), which is discussed in Example 9.12.

Usage

```
Example9.10.policy.quantitative.easing(time, state, state.history)
```

Arguments

`time`	the current time.
`state`	a list indicating the current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.
`state.history`	the history of economic states.

Value

Example9.10.policy.quantitative.easing returns a list indicating the modified current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

See Also

`Example9.10`; `Example9.10.policy.interest.rate`; `Example9.10.policy.money.supply`; `Example9.10.policy.def`
`Example9.10.policy.tax`; `Example9.10.policy.deficit.fiscal`

`Example9.10.policy.tax` *Tax Policy for Example9.10 in Li (2019)*

Description

This is the tax policy for the economy of Example 9.10 in Li (2019), which is discussed in Example 9.13.

Usage

```
Example9.10.policy.tax(time, state, state.history)
```

Arguments

`time`	the current time.
`state`	a list indicating the current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels) and supplies.
`state.history`	the history of economic states.

Value

Example9.10.policy.tax returns a list indicating the modified current economic state including prices, exchange levels (i.e. activity levels, production levels or utility levels), supplies and current policy data.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

See Also

`Example9.10`; `Example9.10.policy.interest.rate`; `Example9.10.policy.money.supply`; `Example9.10.policy.def`
`Example9.10.policy.quantitative.easing`; `Example9.10.policy.deficit.fiscal`

Example9.3 *Example 9.3 in Li (2019)*

Description

This is Example 9.3 in Li (2019), which illustrates economic cycles in a pure production economy.

Usage

```
Example9.3()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge<-Example9.3()
matplot(ge$ts.p, type="l")
matplot(ge$ts.z, type="l")
```

Example9.4 *Example 9.4 in Li (2019)*

Description

This is Example 9.4 in Li (2019), which illustrates economic cycles in a corn economy.

Usage

```
Example9.4()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge<-Example9.4()
matplot(ge$ts.p, type="l")
matplot(ge$ts.z, type="l")
```

`Example9.5` *Example 9.5 in Li (2019)*

Description

This is Example 9.5 in Li (2019), which illustrates the price-control equilibrium.

Usage

```
Example9.5()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge<-Example9.5()
matplot(ge$ts.p, type="l")
matplot(ge$ts.z, type="l")
```

`Example9.6` *Example 9.6 in Li (2019)*

Description

This is Example 9.6 in Li (2019), which illustrates the technological progress and capital accumulation in the corn economy.

Usage

```
Example9.6()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge<-Example9.6()
matplot(ge$ts.p, type="l")
matplot(ge$ts.z, type="l")
```

`Example9.7` *Example 9.7 in Li (2019)*

Description

This is Example 9.7 in Li (2019), which illustrates fixed assets and economic cycles.

Usage

```
Example9.7()
```

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
ge<-Example9.7()
matplot(ge$ts.p, type="l")
matplot(ge$ts.z, type="l")
```

F_Z *Exchange Function*

Description

Given a price vector, a demand coefficient matrix and a supply matrix, this function computes the (disequilibrium) exchange results of an exchange process. There are n commodities and m agents in the exchange process.

Usage

```
F_Z(A, p, S)
```

Arguments

A	a n-by-m demand coefficient matrix.
p	a price n-vector.
S	a n-by-m supply matrix.

Value

F_Z returns a list containing the following components:

z	an exchange amount m-vector.
q	a sales rate n-vector.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
A <- matrix(c(
  0.05, 0.05, 0.1,
  0.1, 0, 0.1,
  0, 0.15, 0.05
), 3, 3, TRUE)
S <- diag(3)

# a market-clearing price vector
p <- c(0.6, 0.9, 1)
result <- F_Z(A, p, S)
# Each sales rate is equal to 1
```

```
result$q
# the purchase matrix
A %*% diag(result$z)

# a non-market-clearing price vector
p <- c(1, 1, 1)
result <- F_Z(A, p, S)
# Some sales rates don't equal 1
result$q
# the purchase matrix
A %*% diag(result$z)
```

---

iep *Compute Instantaneous Equilibrium Path (alias Market Clearing Path)*

Description

This function computes the instantaneous equilibrium path (alias market clearing path).

Usage

```
iep(A.iep = NULL, A = NULL,  B.iep = NULL, B = NULL,
    SExg.iep, InitialEndowments, nPeriods.iep, ...)
```

Arguments

A.iep	A.iep(state.iep) is a function which returns a demand coefficient matrix or a function A(state). state.iep is a list consisting of time (the iep time), p (the price vector at the iep time), z (output and utility vector at the iep time).
A	a demand coefficient matrix or a function A(state) which returns a demand coefficient matrix. If A.iep is not NULL, A will be ignored.
B.iep	B.iep(state.iep) is a function which returns a supply coefficient matrix or a function B(state) at the iep time.
B	a supply coefficient matrix or a function B(state) which returns a supply coefficient matrix. If B.iep is not NULL, B will be ignored.
SExg.iep	an exogenous supply matrix or a function SExg.iep(state.iep) which returns an exogenous supply matrix at the iep time.
InitialEndowments	a matrix indicating the initial endowments.
nPeriods.iep	number of periods of the instantaneous equilibrium path.
...	parameters of the function sdm.

Details

This function computes the instantaneous equilibrium path (alias market clearing path) of a dynamic economy with the structural dynamic model (the sdm function).

Value

a list of general equilibria.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

Acemoglu, D. (2009, ISBN: 9780691132921) Introduction to Modern Economic Growth. Princeton University Press.

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

LI Wu (2010) A Structural Growth Model and its Applications to Sraffa's System. http://www.iioa.org/conferences/18th/pape

Torres, Jose L. (2016, ISBN: 9781622730452). Introduction to Dynamic Macroeconomic General Equilibrium Models (Second Edition). Vernon Press.

See Also

sdm; Example7.2

Examples

```
## example 6.4 of Acemoglu (2009, page 206)
discount.factor <- 0.97
return.rate <- 1 / discount.factor - 1

A <- function(state) {
  a1 <- CD_A(
    1, rbind(0.35, 0.65, 0),
    c(state$p[1] * (1 + return.rate), state$p[2:3])
  )
  a2 <- c(1, 0, 0)
  a1[3] <- state$p[1] * a1[1] * return.rate / state$p[3]
  cbind(a1, a2)
}

B <- matrix(c(
  1, 0,
  0, 1,
  0, 1
), 3, 2, TRUE)


SExg.iep <- {
  tmp <- matrix(NA, 3, 2)
  tmp[2, 2] <- tmp[3, 2] <- 1
  tmp
}
```

```
InitialEndowments <- {
  tmp <- matrix(0, 3, 2)
  tmp[1, 1] <- 0.01
  tmp[2, 2] <- tmp[3, 2] <- 1
  tmp
}

ge.list <- iep(
  A = A, B = B, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = 50
)

z <- t(sapply(ge.list, function(x) x$z))
matplot(z, type = "l")

z[1:49, 1] * (1 - 0.97 * 0.35) # the same as z[-1,2] (i.e. consumption)

# stochastic (instantaneous) equilibrium path (SEP) in the economy above.
nPeriods.iep <-  150
set.seed(1)
alpha.SEP <- rep(1, 50)
for (t in 51:nPeriods.iep) {
  alpha.SEP[t] <- exp(0.95 * log(alpha.SEP[t - 1]) +
    rnorm(1, sd = 0.01))
}

A.iep <- function(state.iep) {
  A <- function(state) {
    a1 <- CD_A(
      alpha.SEP[state.iep$time],
      rbind(0.35, 0.65, 0),
      c(state$p[1] * (1 + return.rate), state$p[2:3])
    )
    a2 <- c(1, 0, 0)
    a1[3] <- state$p[1] * a1[1] * return.rate / state$p[3]
    cbind(a1, a2)
  }

  return(A)
}

ge.list <- iep(
  A.iep = A.iep, B = B, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = nPeriods.iep
)

z <- t(sapply(ge.list, function(x) x$z))
matplot(z, type = "l")

## an example with two firms
```

```
sigma <- 0 # 0 implies Cobb-Douglas production functions
gamma1 <- 0.01
gamma2 <- 0.01
gamma3 <- 0.01
beta1 <- 0.35
beta2 <- 0.4

A.iep <- function(state.iep) {
  A <- function(state) {
   a1 <- CES_A(sigma, exp(gamma1 * (state.iep$time - 1)), rbind(beta1, 0, 1 - beta1), state$p)
   a2 <- CES_A(sigma, exp(gamma2 * (state.iep$time - 1)), rbind(beta2, 0, 1 - beta2), state$p)
    a3 <- c(0, 1, 0)
    cbind(a1, a2, a3)
  }

  return(A)
}

B <- diag(3)

SExg.iep <- function(state.iep) {
  tmp <- matrix(NA, 3, 3)
  tmp[3, 3] <- exp(gamma3 * (state.iep$time - 1))
  tmp
}

InitialEndowments <- {
  tmp <- matrix(0, 3, 3)
  tmp[1, 1] <- 0.01
  tmp[2, 2] <- 0.02
  tmp[3, 3] <- 1
  tmp
}

ge.list <- iep(
  A.iep = A.iep, B = B, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = 100, trace = FALSE
)

z <- t(sapply(ge.list, function(x) x$z)) # outputs and utility
matplot(z, type = "l")

diff(log(z)) # logarithmic growth rate

## an example with heterogeneous firms
A <- function(state) {
  a1 <- CD_A(1, rbind(0.35, 0.65), state$p)
  a2 <- CD_A(1.3, rbind(0.9, 0.1), state$p)
  a3 <- c(1, 0)
  cbind(a1, a2, a3)
}
```

```
B <- matrix(c(
  1, 1, 0,
  0, 0, 1
), 2, 3, TRUE)

SExg.iep <- {
  tmp <- matrix(NA, 2, 3)
  tmp[2, 3] <- 1
  tmp
}

InitialEndowments <- {
  tmp <- matrix(0, 2, 3)
  tmp[1, 1] <- tmp[1, 2] <- 0.01
  tmp[2, 3] <- 1
  tmp
}

ge.list <- iep(
  A = A, B = B, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = 200, trace = FALSE
)

z <- t(sapply(ge.list, function(x) x$z))
matplot(z, type = "l")

## an iep of the example (see Table 2.1 and 2.2) of the canonical dynamic
## macroeconomic general equilibrium model in Torres (2016).
discount.factor <- 0.97
return.rate <- 1 / discount.factor - 1
depreciation.rate <- 0.06

A <- function(state) {
  a1 <- CD_A(1, rbind(0, 0.65, 0.35, 0), state$p)
  a2 <- CD_A(1, rbind(0.4, 1 - 0.4, 0, 0), state$p)
  a3 <- c(1, 0, 0, state$p[1] * return.rate / state$p[4])
  cbind(a1, a2, a3)
}

B <- matrix(c(
  1, 0, 1 - depreciation.rate,
  0, 1, 0,
  0, 0, 1,
  0, 1, 0
), 4, 3, TRUE)

SExg.iep <- {
  tmp <- matrix(NA, 4, 3)
  tmp[2, 2] <- tmp[4, 2] <- 1
  tmp
}
```

```
InitialEndowments <- {
  tmp <- matrix(0, 4, 3)
  tmp[1, 1] <- 0.01
  tmp[2, 2] <- tmp[4, 2] <- 1
  tmp[3, 3] <- 0.01
  tmp
}

ge.list <- iep(
  A = A, B = B, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = 200, trace = FALSE
)

z <- t(sapply(ge.list, function(x) x$z))
matplot(z, type = "l")

## another iep of the economy above
discount.factor <- 0.97
return.rate <- 1 / discount.factor - 1
depreciation.rate <- 0.06

A <- function(state) {
  a1 <- CD_A(
    1, rbind(0.35, 0.65, 0),
    c(state$p[1] * (return.rate + depreciation.rate), state$p[2:3])
  )
  a2 <- CD_A(1, rbind(0.4, 1 - 0.4, 0), state$p)
  a1[3] <- state$p[1] * a1[1] * return.rate / state$p[3]
  cbind(a1, a2)
}

B <- function(state) {
  tmp <- matrix(c(
    1, 0,
    0, 1,
    0, 1
  ), 3, 2, TRUE)

  tmp[1] <- tmp[1] + A(state)[1, 1] * (1 - depreciation.rate)
  tmp
}

SExg.iep <- {
  tmp <- matrix(NA, 3, 2)
  tmp[2, 2] <- tmp[3, 2] <- 1
  tmp
}

InitialEndowments <- {
  tmp <- matrix(0, 3, 2)
  tmp[1, 1] <- 0.01
  tmp[2, 2] <- tmp[3, 2] <- 1
```

```
  tmp
}

ge.list <- iep(
  A = A, B = B, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = 100, n = 3, m = 2, trace = FALSE
)

z <- t(sapply(ge.list, function(x) x$z))
matplot(z, type = "l")

## TFP shock in the economy above (see Torres, 2016, section 2.8).
nPeriods.iep <- 200

discount.factor <- 0.97
return.rate <- 1 / discount.factor - 1
depreciation.rate <- 0.06

set.seed(1)
alpha.shock <- rep(1, 100)
alpha.shock[101] <- exp(0.01)
for (t in 102:nPeriods.iep) {
  alpha.shock[t] <- exp(0.95 * log(alpha.shock[t - 1]))
}

A.iep <- function(state.iep) {
  A <- function(state) {
    a1 <- CD_A(
      alpha.shock[state.iep$time],
      rbind(0.35, 0.65, 0),
      c(state$p[1] * (return.rate + depreciation.rate), state$p[2:3])
    )
    a2 <- CD_A(1, rbind(0.4, 1 - 0.4, 0), state$p)
    a1[3] <- state$p[1] * a1[1] * return.rate / state$p[3]
    cbind(a1, a2)
  }

  return(A)
}

B.iep <- function(state.iep) {
  B <- function(state) {
    tmp <- matrix(c(
      1, 0,
      0, 1,
      0, 1
    ), 3, 2, TRUE)

    a1 <- CD_A(
      alpha.shock[state.iep$time],
      rbind(0.35, 0.65, 0),
      c(state$p[1] * (return.rate + depreciation.rate), state$p[2:3])
```

```
    )

    tmp[1] <- tmp[1] + a1[1] * (1 - depreciation.rate)
    tmp
  }

  return(B)
}

SExg.iep <- {
  tmp <- matrix(NA, 3, 2)
  tmp[2, 2] <- tmp[3, 2] <- 1
  tmp
}

InitialEndowments <- {
  tmp <- matrix(0, 3, 2)
  tmp[1, 1] <- tmp[2, 2] <- tmp[3, 2] <- 1
  tmp
}

ge.list <- iep(
  A.iep = A.iep, B.iep = B.iep, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = nPeriods.iep, n = 3, m = 2, trace = FALSE
)

z <- t(sapply(ge.list, function(x) x$z))
c <- sapply(ge.list, function(x) x$A[1,2]*x$z[2]) #consumption

par(mfrow = c(2, 2))
matplot(z, type = "l")
x <- 100:140
plot(x, z[x, 1] / z[x[1], 1], type = "b", pch = 20)
plot(x, z[x, 2] / z[x[1], 2], type = "b", pch = 20)
plot(x, c[x] / c[x[1]], type = "b", pch = 20)

## an iep of example 7.2 (a monetary economy) in Li (2019).
A <- function(state) {
  alpha <- rbind(1, 1, 1)
  Beta <- matrix(c(
    0.5, 0.5, 0.5,
    0.5, 0.5, 0.5,
    -1, -1, -1
  ), 3, 3, TRUE)
  CD_mA(alpha, Beta, state$p)
}

B <- diag(3)

SExg.iep <- {
  tmp <- matrix(NA, 3, 3)
  tmp[2, 2] <- 100
```

```
  tmp[3, 3] <- 100
  tmp
}

InitialEndowments <- {
  tmp <- matrix(0, 3, 3)
  tmp[1, 1] <- 10
  tmp[2, 2] <- tmp[3, 3] <- 100
  tmp
}

ge.list <- iep(
  A = A, B = B, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = 20,
  moneyIndex = 3,
  moneyOwnerIndex = 3,
  pExg = rbind(NA, NA, 0.25)
)

par(mfrow = c(1, 2))
z <- t(sapply(ge.list, function(x) x$z))
matplot(z, type = "b", pch = 20)
p <- t(sapply(ge.list, function(x) x$p))
matplot(p, type = "b", pch = 20)

## an example of structural transition policy
A.iep <- function(state.iep) {
  a <- 15
  b <- 25
  A <- function(state) {
    alpha1 <- 5
    alpha2 <- 15

    if (state.iep$time == 1 || state.iep$z[1] <= a) {
      alpha <- alpha1
    } else if (state.iep$z[1] > b) {
      alpha <- alpha2
    } else {
      alpha <- (b - state.iep$z[1]) / (b - a) * alpha1 +
        (state.iep$z[1] - a) / (b - a) * alpha2
    }

    return(cbind(
      CD_A(alpha, c(0.5, 0.5), state$p),
      c(1, 0)
    ))
  }

  return(A)
}

B <- matrix(c(
```

```
  1, 0,
  0, 1
), 2, 2, TRUE)

SExg.iep <- function(state.iep) {
  if (state.iep$time >= 15 && state.iep$z[1] < 30) {
    result <- matrix(c(
      NA, NA,
      0.6, 0.4
    ), 2, 2, TRUE)
  } else {
    result <- matrix(c(
      NA, NA,
      0, 1
    ), 2, 2, TRUE)
  }

  return(result)
}

InitialEndowments <- {
  tmp <- matrix(0, 2, 2)
  tmp[1, 1] <- 1
  tmp[2, 2] <- 1
  tmp
}

ge.list <- iep(
  A.iep = A.iep, B = B, SExg.iep = SExg.iep,
  InitialEndowments = InitialEndowments,
  nPeriods.iep = 30, trace = FALSE
)

z <- t(sapply(ge.list, function(x) x$z))
matplot(z, type = "b", pch = 20)
```

Leontief_mA *Leontief Monetary Demand Coefficient Matrix*

Description

This function computes a Leontief monetary demand coefficient matrix in a monetary economy.

Usage

```
Leontief_mA(A.pre, p)
```

Arguments

A.pre	a numeric n-by-m matrix.
p	a nonnegative numeric n-vector or n-by-1 matrix.

Details

Some elements of A corresponding to money equal -1.

Value

A n-by-m matrix is computed which indicates the (monetary) demand structure of agents (firms or consumers) with Leontief production functions or utility functions under the price vector p.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

LI Wu (2019, ISBN: 9787521804225) General Equilibrium and Structural Dynamics: Perspectives of New Structural Economics. Beijing: Economic Science Press. (In Chinese)

Examples

```
A.pre <- matrix(c(
  0.5, 1, 1,
  0.1, 0, 0,
  -1, -1, -1
), 3, 3, TRUE)
p <- c(1, 2, 0.1)
Leontief_mA(A.pre, p)
```

PF_eig *P-F (i.e. Perron-Frobenius) Eigenvalue and Eigenvector*

Description

This function computes the P-F (i.e. Perron-Frobenius) eigenvalue and eigenvector of an indecomposable nonnegative square matrix.

Usage

```
PF_eig(M)
```

Arguments

M	an indecomposable nonnegative square matrix.

Value

PF_eig returns a list containing the following components:

val	the P-F eigenvalue of M.
vec	the normalized P-F eigenvector of M.

Author(s)

LI Wu <liwu@staff.shu.edu.cn>

References

Horn, R. A., Johnson, C. R. (2012, ISBN: 0521548233) Matrix Analysis. Cambridge University Press.

Examples

```
M<-matrix(c(0.5,1,
            1,  0),2,2,TRUE)
PF_eig(M)
```

---

sdm *Structural Dynamic Model (alias Structural Growth Model)*

Description

This function computes the general equilibrium and simulates the economic dynamics. The key part of this function is an exchange function (see F_Z), which is expounded in Li (2010, 2019).

Usage

```
sdm(
  A,
  B = diag(nrow(A)),
  n = nrow(B),
  m = ncol(B),
  S0Exg = matrix(NA, n, m),
  p0 = matrix(1, nrow = n, ncol = 1),
  z0 = matrix(100, nrow = m, ncol = 1),
  GRExg = NA,
  moneyOwnerIndex = NULL,
  moneyIndex = NULL,
  pExg = NULL,
  tolCond = 1e-5,
  maxIteration = 200,
  numberOfPeriods = 300,
  depreciationCoef = 0.8,
```

```
  thresholdForPriceAdjustment = 0.99,
  priceAdjustmentMethod = "variable",
  priceAdjustmentVelocity = 0.15,
  trace = TRUE,
  ts = FALSE,
  policy = NULL,
  exchangeFunction = F_Z
)
```

Arguments

A	a demand coefficient n-by-m matrix (alias demand structure matrix) or a function A(state) which returns an n-by-m matrix.
B	a supply coefficient n-by-m matrix (alias supply structure matrix) or a function which returns an n-by-m matrix. If (i,j)-th element of S0Exg is not NA, the value of the (i,j)-th element of B will be useless and ignored.
n	the number of commodities.
m	the number of economic agents (or sectors).
S0Exg	an initial exogenous supply n-by-m matrix. This matrix may contain NA, but not zero.
p0	an initial price n-vector.
z0	an m-vector consisting of the initial exchange levels (i.e. activity levels, production levels or utility levels).
GRExg	an exogenous growth rate of the exogenous supplies in S0Exg. If GRExg is NA and some commodities have exogenous supply, then GRExg will be set to 0.
moneyOwnerIndex	a vector consisting of the indices of agents supplying money.
moneyIndex	a vector consisting of the commodity indices of all types of money.
pExg	an n-vector indicating the exogenous prices (if any).
tolCond	the tolerance condition.
maxIteration	the maximum iteration count. If the main purpose of running this function is to do simulation instead of calculating equilibrium, then maxIteration should be set to 1.
numberOfPeriods	the period number in each iteration.
depreciationCoef	the depreciation coefficient (i.e. 1 minus the depreciation rate) of the unsold products.
thresholdForPriceAdjustment	the threshold for the fixed percentage price adjustment method.
priceAdjustmentMethod	the price adjustment method. Normally it should be set to "variable". If it is set to "fixed", a fixed percentage price adjustment method will be used.
priceAdjustmentVelocity	the price adjustment velocity.

trace	if TRUE, information is printed during the running of sdm.
ts	if TRUE, the time series of the last iteration are returned.
policy	a policy function.
exchangeFunction	the exchange function.

Details

The parameters A may be a function A(state) wherein state is a list consisting of p (the price vector), z (the output and utility vector), w (the wealth vector), t (the time) and e (the foreign exchange rate vector if any). state indicates the states at time t.

The parameters B also may be a function B(state) wherein state is a list consisting of p (the price vector), z (the output and utility vector) and t (the time).

Value

sdm returns a list containing the following components:

tolerance	the tolerance of the results.
p	equilibrium prices.
z	equilibrium exchange levels (i.e. activity levels, output levels or utility levels).
S	the equilibrium supply matrix at the initial period.
e	equilibrium foreign exchange rates in a multi-money economy.
growthRate	the endogenous equilibrium growth rate in a pure production economy.
A	the equilibrium demand coefficient matrix.
B	If B is a function, the equilibrium supply coefficient matrix is returned.
ts.p	the time series of prices in the last iteration.
ts.z	the time series of exchange levels (i.e. activity levels, production levels or utility levels) in the last iteration.
ts.S	the time series of supply matrix in the last iteration.
ts.q	the time series of sales rates in the last iteration.
ts.e	the time series of foreign exchange rates in the last iteration.
policy.data	the policy data.

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References

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Torres, Jose L. (2016, ISBN: 9781622730452) Introduction to Dynamic Macroeconomic General Equilibrium Models (Second Edition). Vernon Press.

Varian, Hal R. (1992, ISBN: 0393957357) Microeconomic Analysis. W. W. Norton & Company.

See Also

iep; Example2.2; Example2.3; Example.Section.3.1.2.corn; Example3.1; Example3.2; Example3.4; Example3.8; Example3.9; Example3.10; Example3.12; Example3.14; Example4.2; Example4.8; Example4.9; Example4.10; Example4.11.1; Example4.11.2; Example4.12; Example4.13; Example4.15; Example4.16; Example5.1; Example5.2; Example5.3.2; Example5.4; Example5.5; Example5.6; Example5.10; Example5.11.1; Example5.11.2; Example6.2.1; Example6.2.2; Example6.3; Example6.4; Example6.5; Example6.6.1; Example6.6.2; Example6.6.3; Example6.7; Example6.9; Example6.10; Example6.11; Example7.1; Example7.2; Example7.3; Example7.4; Example7.5.1; Example7.5.2; Example7.6; Example7.7; Example7.8; Example7.9X; Example7.10; Example7.10.2; Example7.11; Example7.12; Example7.13; Example7.14; Example7.15; Example8.1; Example8.2; Example8.7; Example8.8; Example8.9; Example9.3; Example9.4; Example9.5; Example9.6; Example9.7; Example9.10;

Examples

```
## the example on page 352 in Varian (1992)
ge <- sdm(
  A = function(state) {
    a <- 0.5

    alpha <- rep(1, 3)
    Beta <- matrix(c(0,   a,   a,
                     0.5, 0,   0,
                     0.5, 1 - a, 1 - a), 3, 3, TRUE)

    #the demand coefficient matrix.
    CD_A(alpha, Beta, state$p)
  },
  B = diag(3),
  S0Exg = matrix(c(NA, NA, NA,
                   NA, 1, NA,
                   NA, NA, 1), 3, 3, TRUE),
  GRExg = 0,
  tolCond = 1e-10
)

ge$p/ge$p[1]


## the example (see Table 2.1 and 2.2) of the canonical dynamic
## macroeconomic general equilibrium model in Torres (2016).
discount.factor <- 0.97
return.rate <- 1 / discount.factor - 1
depreciation.rate <- 0.06

ge <- sdm(
  n = 4, m = 3,
  A = function(state) {
    a1 <- CD_A(1, rbind(0, 0.65, 0.35, 0), state$p)
    a2 <- CD_A(1, rbind(0.4, 1 - 0.4, 0, 0), state$p)
    a3 <- c(1, 0, 0, state$p[1] * return.rate / state$p[4])
```

```
    cbind(a1, a2, a3)
  },
  B = matrix(c(
    1, 0, 1 - depreciation.rate,
    0, 1, 0,
    0, 0, 1,
    0, 1, 0
  ), 4, 3, TRUE),
  S0Exg = {
    tmp <- matrix(NA, 4, 3)
    tmp[2, 2] <- 1
    tmp[4, 2] <- 1
    tmp
  },
  priceAdjustmentVelocity = 0.03,
  maxIteration = 1,
  numberOfPeriods = 5000,
  ts = TRUE
)

ge$A %*% diag(ge$z) # the demand matrix
ge$p / ge$p[1]

plot(ge$ts.z[, 1], type = "l")
```

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