

# Package ‘nopp’

August 8, 2022

**Type** Package

**Title** Nash Optimal Party Positions

**Version** 1.1.2

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**Description** Estimation of party/candidate ideological positions that correspond to a Nash equilibrium along a one-dimensional space.

**License** GPL (>= 2)

**Depends** R (>= 2.10), mlogit, MASS

**NeedsCompilation** no

**Repository** CRAN

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nopp-package

*Nash Optimal Party Positions*

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### Description

Estimation of party/candidate ideological positions that correspond to a Nash equilibrium along a one-dimensional space

### Details

Package: nopp  
Type: Package  
Version: 1.0  
Date: 2012-06-26  
License: GPL (>= 2)

nopp is a package for R which enables to compute party/candidate ideological positions that correspond to a Nash Equilibrium along a one-dimensional space. It accommodates alternative motivations in (each) party strategy while allowing to estimate the uncertainty around their optimal positions through two different procedures (bootstrap and MC).

### Author(s)

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### References

Adams, James F., Samuel Merrill III, and Bernard Grofman (2005). A Unified Theory of Party Competition. Cambridge: Cambridge University Press

Merrill, Samuel III, and James Adams (2001), Computing Nash Equilibria in Probabilistic, Multi-party Spatial Models with Nonpolicy Components, *Political Analysis*, 9, 347–61

Curini, L., and Iacus, S.M. (2017) Nash Optimal Party Positions: The nopp R Package, *Journal of Statistical Software*, 81(11), 1–25

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equilibrium

*Nash Optimal Party Positions*

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### Description

Nash Optimal Party Positions

**Usage**

```
equilibrium(start, model, data, tolerance = 1e-05, max.iter = 100,
  coal = 0, alpha = 0, margin = NULL, fixed = NULL, gamma = 0,
  boot = 0, MC = 0, self.var = "self", prox.var="prox",
  position=NULL, votes=NULL, quadratic=TRUE, conf.level = 0.95)
```

**Arguments**

start	initial party positions. Numerical vector. Optional.
model	the mlogit model analysis
data	the data set
tolerance	tolerance in the convergence of Nash equilibrium. Default 1e-5
max.iter	max iteration to convergence in Nash equilibrium. Default 100
coal	a list specifying electoral coalitions. See Details.
alpha	the weight of coalition vote-share in party utility function. Default = 0. See Details.
margin	a list specifying the vote share margin to be maximized of a party/coalition against other party/coalition. See Details.
fixed	a list of fixed party positions. See Details.
gamma	the weight among nash and fixed arty position. Default=0. See Details.
boot	number of bootstrap replications. See Details.
MC	number of Monte Carlo replications. See Details.
self.var	character: name of self-placement of respondent. See Details.
prox.var	character: name of party-placement variable. See Details.
position	a named list: of perceived position of parties. See Details.
votes	a named list: of actual vote share at election. See Details.
quadratic	a logical value: if FALSE the linear utility function is used to calculate the proximity. See Details.
conf.level	significant level for empirical Monte Carlo or bootstrap confidence intervals.

**Details**

See vignette.

**Value**

an object of class `nash.eq`

**Note**

See the vignette for detailed explanations and other working examples.

**Author(s)**

Luigi Curini, Stefano M. Iacus

## References

- Adams, James F., Samuel Merrill III, and Bernard Grofman (2005). A Unified Theory of Party Competition. Cambridge: Cambridge University Press
- Merrill, Samuel III, and James Adams (2001), Computing Nash Equilibria in Probabilistic, Multi-party Spatial Models with Nonpolicy Components, *Political Analysis*, 9, 347–61
- Curini, L., and Iacus, S.M. (2017) Nash Optimal Party Positions: The nopp R Package, *Journal of Statistical Software*, 81(11), 1–25

## See Also

See Also as [plot.nash.eq](#)

## Examples

```
## Not run:
data(italy2006)

str(italy2006)
italy2006[1:2,1:14]

election <- set.data(italy2006 , shape="wide", choice="vote",
  varying=c(5:14), sep="_")
str(election)

m <- mlogit(vote~prox+partyID | gov_perf+sex+age+education,
  election, reflevel = "UL")
summary(m)

true.pos <- list(FI=7.59, UL=3.50, RC=1.95, AN=8.08, UDC=5.66)
true.votes <- list(FI=.24, UL=.40, RC=.10, AN=.18, UDC=.08)
# model 1: comparison against true votes and party positions
nash.eq <- equilibrium(model=m, data=election, pos=true.pos,
  votes=true.votes)
nash.eq

par(mfrow=c(3,1))
plot(nash.eq)
par(mfrow=c(1,1))

# model 2: colation behaviours
coal1 <- list(FI=1, UL=2, RC=2, AN=1, UDC=1)
alpha1 <- list(FI=0.5, UL=0.5, RC=0.5, AN=0.5, UDC=0.5)
nash.eq <- equilibrium(model=m, data=election, coal=coal1,
  alpha=alpha1)
nash.eq

# model 3: colation behaviours
coal1 <- list(FI=1, UL=2, RC=2, AN=1, UDC=1)
alpha1 <- list(FI=0.7, UL=0.8, RC=0.1, AN=0.5, UDC=0.9)
nash.eq <- equilibrium(model=m, data=election, coal=coal1,
  alpha=alpha1)
```

```
nash.eq

# model 4: rivals tends to separate each other
nash.eq <- equilibrium(model=m, data=election, margin=list(FI="UL", UL="FI"))
nash.eq

# model 5: fixed position averaged with Nash equilibrium solution
nash.eq <- equilibrium(model=m, data=election, fixed=list(RC=1), gamma=0.2)
nash.eq

# model 6: rivals tends to separate each other with
# fixed position averaged with Nash equilibrium solution
nash.eq <- equilibrium(model=m, data=election,
margin=list(FI="UL", UL="FI"), fixed=list(RC=1), gamma=0.2)
nash.eq

# model 7: coalition and fixed position averaged with
# Nash equilibrium solution
coal1 <- list(FI=1, UL=2, RC=2, AN=1, UDC=1)
alpha1 <- list(FI=0.7, UL=0.8, RC=0.5, AN=0.5, UDC=0.5)
nash.eq <- equilibrium(model=m, data=election, coal=coal1,
alpha=alpha1, fixed=list(RC=1), gamma=0.2)
nash.eq

# model 8: Bootstrap analysis
set.seed(280715)
nash.eq <- equilibrium(model=m, data=election, boot=10)
nash.eq

# model 9: Monte Carlo simulation
set.seed(280715)
nash.eq <- equilibrium(model=m, data=election, MC=10)
nash.eq

## End(Not run)
```

---

italy2006

2006 Italian General Election survey

---

## Description

2006 Italian General Election survey, with quadratic ideological proximity.

## Usage

```
data(italy2006)
```

**Format**

A data frame with 438 observations on the following 18 variables.

country country name

id id of respondent

vote a factor with levels FI UL AN UDC RC for each party voted

self self-placement of respondent on a 0 to 10 left-right scale

prox\_FI see Details.

prox\_UL see Details.

prox\_AN see Details.

prox\_UDC see Details.

prox\_RC see Details.

partyID\_FI see Details.

partyID\_UL see Details.

partyID\_AN see Details.

partyID\_UDC see Details.

partyID\_RC see Details.

sex gender variable 1 = female

age see Details.

education see Details.

gov\_perf see Details.

**Details**

In this survey respondents were asked to indicate which party they voted for in the 2006 Election. The data concerns 5 parties: UL (Ulivo), RC (Communist Refoundation party), FI (Forza Italia), AN (National Alliance) and UDC (Union of Christian Democrats).

prox\_\* quadratic ideological distance between the respondent and a party \* placement

partyID\_\* binary variable equals to 1 if the respondent declares to feel herself close to party \*

age : 1 = "18-24 years", 2 = "25-34", 3 = "35-44", 4 = "45-54", 5 = "55-64", 6 = "65 +"

education : 0 = "up to primary school", 1 = "incomplete secondary", 2 = "secondary completed", 3 = "post-secondary trade", 4 = "university undergraduate degree inc", 5 = "university undergraduate degree comp"

gov\_perf : 1 = "very good job", 2 = "good job", 3 = "bad job", 4 = "very bad job"

**Source**

CSES - Comparative Study of Electoral Systems: <https://cses.org/>).

**Examples**

```
data(italy2006)
```

```
head(italy2006)
```

---

italy2006.lin                      2006 Italian General Election survey

---

**Description**

2006 Italian General Election survey, with linear ideological proximity.

**Usage**

```
data(italy2006.lin)
```

**Format**

A data frame with 438 observations on the following 18 variables.

country country name

id id of respondent

vote a factor with levels FI UL AN UDC RC for each party voted

self self-placement of respondent on a 0 to 10 left-right scale

proxlin\_FI see Details.

proxlin\_UL see Details.

proxlin\_AN see Details.

proxlin\_UDC see Details.

proxlin\_RC see Details.

partyID\_FI see Details.

partyID\_UL see Details.

partyID\_AN see Details.

partyID\_UDC see Details.

partyID\_RC see Details.

sex gender variable 1 = female

age see Details.

education see Details.

gov\_perf see Details.

**Details**

In this survey respondents were asked to indicate which party they voted for in the 2006 Election. The data concerns 5 parties: UL (Ulivo), RC (Communist Refoundation party), FI (Forza Italia), AN (National Alliance) and UDC (Union of Christian Democrats).

prox\_\* linear ideological distance between the respondent and a party \* placement

partyID\_\* binary variable equals to 1 if the respondent declares to feel herself close to party \*

age : 1 = "18-24 years", 2 = "25-34", 3 = "35-44", 4 = "45-54", 5 = "55-64", 6 = "65 +"  
 education : 0 = "up to primary school", 1 = "incomplete secondary", 2 = "secondary completed", 3 = "post-secondary trade", 4 = "university undergraduate degree inc", 5 = "university undergraduate degree comp"  
 gov\_perf : 1 = "very good job", 2 = "good job", 3 = "bad job", 4 = "very bad job"

### Source

CSES - Comparative Study of Electoral Systems: <https://cses.org/>).

### Examples

```
data(italy2006.lin)
head(italy2006.lin)
## maybe str(italy2006.lin) ; plot(italy2006.lin) ...
```

---

italy2006.wide	<i>2006 Italian General Election survey</i>
----------------	---

---

### Description

2006 Italian General Election survey - wide format

### Usage

```
data(italy2006.wide)
```

### Format

A data frame with 524 observations on the following 15 variables.

country country name

id id of respondent

vote a factor with levels FI UL AN UDC RC for each party voted

self self-placement of respondent on a 0 to 10 left-right scale

FI see Details.

DS see Details.

AN see Details.

DL see Details.

UDC see Details.

RC see Details.

pID see Details.

sex gender variable 1 = female

age see Details.

education see Details.

gov\_perf see Details.



## Details

In this survey respondents were asked to indicate which party they voted for in the 2006 Election. The data concerns 5 parties: UL (Ulivo), RC (Communist Refoundation party), FI (Forza Italia), AN (National Alliance) and UDC (Union of Christian Democrats). The dataset is in wide format.

variable from FI to RC identify the placement of those parties, on a 0 to 10 left-right scale, as perceived by the respondent.

pID is a variable that identifies the partisanship of the respondent (where 0=stands for no partyID, 1 = FI partyID, 23 = UL partyID, 3 = AN partyID, 4 = UDC partyID, 6 = RC partyID)

age : 1 = "18-24 years", 2 = "25-34", 3 = "35-44", 4 = "45-54", 5 = "55-64", 6 = "65 +"

education : 0 = "up to primary school", 1 = "incomplete secondary", 2 = "secondary completed", 3 = "post-secondary trade", 4 = "university undergraduate degree inc", 5 = "university undergraduate degree comp"

gov\_perf : 1 = "very good job", 2 = "good job", 3 = "bad job", 4 = "very bad job"

## Source

CSES - Comparative Study of Electoral Systems: <https://cses.org/>).

## Examples

```
data(italy2006.wide)
head(italy2006.wide)
## maybe str(italy2006.wide) ; plot(italy2006.wide) ...
```

---

noppNews

*Show the NEWS file*

---

## Description

Show the NEWS file of the nopp package.

## Usage

```
noppNews()
```

## Value

None.

---

`plot.nash.eq`*Plot function for Nash equilibrium object*

---

**Description**

Plot function for Nash equilibrium object

**Usage**

```
## S3 method for class 'nash.eq'  
plot(x, ...)
```

**Arguments**

<code>x</code>	a <code>nash.eq</code> object
<code>...</code>	additional arguments passed to the inner plot function

**Details**

See vignette.

**Author(s)**

Luigi Curini, Stefano M. Iacus

**References**

Curini, L., and Iacus, S.M. (2017) Nash Optimal Party Positions: The `nopp` R Package, *Journal of Statistical Software*, 81(11), 1–25

**See Also**

See Also as [equilibrium](#)

**Examples**

```
## Not run:  
data(italy2006)  
election <- set.data(italy2006 , shape="wide", choice="vote", varying=c(5:14), sep="_")  
m <- mlogit(vote~prox+partyID | gov_perf+sex+age+education, election, reflevel = "UL")  
  
true.pos <- list(FI=7.59, UL=3.50, RC=1.95, AN=8.08, UDC=5.66)  
true.votes <- list(FI=.24, UL=.40, RC=.10, AN=.18, UDC=.08)  
  
# comparison against true votes and party positions  
nash.eq <- equilibrium(model=m, data=election, pos=true.pos, votes=true.votes)  
nash.eq  
par(mfrow=c(3,1))  
plot(nash.eq)
```

```
# bootstrap confidence intervals
nash.eq <- equilibrium(model=m, data=election, boot=10)
nash.eq
plot(nash.eq)

par(mfrow=c(1,1))

## End(Not run)
```

---

set.data	<i>Prepares data for Nash equilibrium</i>
----------	---

---

## Description

Prepares data for Nash equilibrium

## Usage

```
set.data(data, shape="wide", choice, varying, sep="_")
```

## Arguments

data	the data set
shape	either wide or long. Default wide. See Details.
choice	the variable indicating the choice made: it can be either a logical vector, a numerical vector with 0 where the alternative is not chosen, a factor with level 'yes' when the alternative is chosen.
varying	the indexes of the variables that are alternative specific. See Details.
sep	the separator of the variable name and the alternative name (only relevant for a wide data.frame). See Details.

## Details

For general examples see the vignette. The arguments shape, choice, varying and sep as as in the [mlogit.data](#) function.

## Value

A `mlogit.data` object, which is a `data.frame` in long format, i.e. one line for each alternative. It has a `index` attribute, which is a `data.frame` that contains the index of the choice made ('chid'), the index of the alternative ('alt') and, if any, the index of the individual ('id'). The choice variable is a boolean which indicates the choice made. This function use `reshape` if the `data.frame` is in wide format. It also has the attribute `call` for further data manipulation in the bootstrap task of [equilibrium](#).

**Note**

See the vignette for detailed explanations and other working examples.

**Author(s)**

Luigi Curini, Stefano M. Iacus

**References**

Curini, L., and Iacus, S.M. (2017) Nash Optimal Party Positions: The nopp R Package, *Journal of Statistical Software*, 81(11), 1–25

**Examples**

```
## Not run:
data(italy2006)

str(italy2006)
italy2006[1:2,1:14]

election <- set.data(italy2006 , shape="wide", choice="vote",
  varying=c(5:14), sep="_")
str(election)

m <- mlogit(vote~prox+partyID | gov_perf+sex+age+education,
  election, relevel = "UL")
summary(m)

true.pos <- list(FI=7.59, UL=3.50, RC=1.95, AN=8.08, UDC=5.66)
true.votes <- list(FI=.24, UL=.40, RC=.10, AN=.18, UDC=.08)
# model: comparison against true votes and party positions
nash.eq <- equilibrium(model=m, data=election, pos=true.pos,
  votes=true.votes)
nash.eq

## End(Not run)
```

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