

# Package ‘zmiop’

August 26, 2022

**Type** Package

**Title** Zero and Middle-Inflated Ordered Probit Models

**Version** 0.0.1

**Description** Contains inflated ordered probit (IOP) models with correlated and uncorrelated inflations in either the "bottom", "middle" or "top" categories. They combine two latent equations: (i) a 'split' probit equation that estimates the effect of covariates on the probability with which the ordered category of interest is inflated, and (ii) an augmented ordered probit equation that estimates the effect of a second set of covariates on the probabilities of observing each ordered choice outcome, conditional on the probability of the inflated ordered category. Models originally presented in Bagozzi, Benjamin E., and Bumba Mukherjee. "A mixture model for middle category inflation in ordered survey responses." *Political Analysis* 20, no. 3 (2012): 369-386. Bagozzi, Benjamin E., Daniel W. Hill Jr, Will H. Moore, and Bumba Mukherjee. "Modeling two types of peace: The zero-inflated ordered probit (ZiOP) model in conflict research." *Journal of Conflict Resolution* 59, no. 4 (2015): 728-752.

**License** GPLv3 + file LICENSE

**Encoding** UTF-8

**LazyData** true

**Depends** R (>= 3.5.0)

**Imports** RcppArmadillo,  
Rcpp,  
mvtnorm,  
optimr

**RoxygenNote** 7.1.2

## R topics documented:

coef . . . . .	2
fitted . . . . .	2
iop . . . . .	3
iop.mod.default . . . . .	4
iop.mod.Est . . . . .	4
miop . . . . .	5
predict . . . . .	5
print.iop.mod . . . . .	6
print.summary.iop.mod . . . . .	6
residuals . . . . .	7

summary.iop.mod . . . . .	7
vcov . . . . .	8
ziop . . . . .	8

<b>Index</b>	<b>9</b>
--------------	----------

---

coef	<i>coef</i>
------	-------------

---

**Description**

A function to extract coefficients from iop model results.

**Usage**

```
coef(object, model = c("full", "cutpoints", "inflation", "ordered"), ...)
```

**Arguments**

object                    an object of class iop.mod (output of [iop](#)).

**Examples**

```
model1 <- iop(Y ~ X1 + X2|Z1 + Z2, data=data, type=c('ziop'))
coef(model1)
```

---

<i>fitted</i>	<i>fitted</i>
---------------	---------------

---

**Description**

A function that extracts fitted values from an object of class iop.mod.

**Usage**

```
fitted(
  object,
  newdata = NULL,
  type = c("response.full", "response.ordered", "response.inflation", "linear"),
  ...
)
```

**Arguments**

object                    an object of class iop.mod (output of [iop](#)).

newdata                   An optional data frame in which to look for variables to use when model fitting.

type                      the tye of equation to be fitted. Options include "response.full" (both inflation and ordered probit stages), "response.ordered" (ordered probit stage only) and "response.inflation" (inflation stage only).

## Examples

```
model1 <- iop(Y ~ X1 + X2|Z1 + Z2, data=data, type=c('ziop'))
fitted(model1, type=c("response.full"))
```

---

iop	<i>iop</i>
-----	------------

---

## Description

iop fits an ordered probit model with inflations in either the "zero (bottom)" or "middle" categories.

## Usage

```
iop(
  formula,
  data = list(),
  weights = NULL,
  offset = NULL,
  na.action = c("na.omit", "na.fail"),
  type = c("ziop", "miop"),
  ...
)
```

## Arguments

formula	a formula in the form $Y \sim X1 + X2 \dots   Z1 + Z2 \dots$ where Y is the ordered probit dependent variable; Xi are the ordered probit stage covariates; and the Zi are the inflation (split population) stage covariates. See <code>link{formula}</code> .
data	list object of data.
weights	an optional vector of weights to be used in the fitting process. Default is NULL.
offset	This can be used to specify an a priori known component to be included in the linear predictor during fitting. The same offset is applied to both stages. See <a href="#">offset</a> .
na.action	a function indicating what should happen when NAs are included in the data. Options are "na.omit" or "na.fail". The default is "na.omit".
type	type of inflation ordered probit model to be used. Options are "ziop" or "miop". The type of the inflation model must be specified.

## Examples

```
model1 <- iop(Y ~ X1 + X2|Z1 + Z2, data=data, type=c('ziop'))
```

---

iop.mod.default	<i>iop.mod.default</i>
-----------------	------------------------

---

### Description

Default method for a [iop](#).

### Usage

```
iop.mod.default(x, z, y, weights, offsetx, offsetz, na.action, type, ...)
```

### Arguments

object	an object of class iop.mod (output of <a href="#">iop</a> ).
--------	--

---

iop.mod.Est	<i>iop.mod.Est</i>
-------------	--------------------

---

### Description

Raw form of the [iop](#) function. For user-friendly formula-oriented command, use [iop](#).

### Usage

```
iop.mod.Est(x, z, y, weights, offsetx, offsetz, na.action, type)
```

### Arguments

x	covariates for the ordered probit stage.
z	covariates for the inflation (split population) stage.
y	the ordinal dependent variable.
weights	an optional vector of weights to be used in the fitting process.
offsetx	offset value for the ordered probit stage covariates (X). This can be used to specify an a priori known component to be included in the linear predictor during fitting. For more information, see <a href="#">offset</a> .
offsetz	offset value for the inflation (split population) stage covariates (Z). This can be used to specify an a priori known component to be included in the linear predictor during fitting. For more information, see <a href="#">offset</a> .
na.action	a function indicating what should happen when NAs are included in the data. Options are "na.omit" or "na.fail". The default is "na.omit".
type	type of inflation ordered probit model to be used. Options are "ziop" or "miop". The type of the inflation model must be specified.

---

miop	<i>miop</i>
------	-------------

---

### Description

Likelihood function for MIOP model.

### Usage

```
miop(est, Y, X, Z, data, weights, offsetx, offsetz)
```

### Arguments

est	starting values for the estimation. Vector of length of the number of parameters.
Y	the ordinal dependent variable.
X	covariates for the ordered probit stage.
Z	covariates for the inflation (split population) stage.
data	dataset that contains the dependent and independent variables.
weights	an optional vector of weights to be used in the fitting process.
offsetx	offset value for the ordered probit stage covariates (X). This can be used to specify an a priori known component to be included in the linear predictor during fitting. For more information, see <a href="#">offset</a> .
offsetz	offset value for the inflation (split population) stage covariates (Z). This can be used to specify an a priori known component to be included in the linear predictor during fitting. For more information, see <a href="#">offset</a> .

### Value

Likelihood of the MIOP model specification.

---

predict	<i>predict</i>
---------	----------------

---

### Description

A function to extract predicted values from the IOP model object.

### Usage

```
predict(
  object,
  newdata = NULL,
  type = c("prob.full", "prob.ordered", "prob.inflation", "response.full",
    "response.ordered", "response.inflation", "linear"),
  ...
)
```

**Arguments**

object	an object of class <code>iop.mod</code> (output of <code>iop</code> ).
newdata	An optional data frame in which to look for variables with which to predict. If omitted, the fitted values are used.
type	

**Examples**

```
model1 <- iop(Y ~ X1 + X2|Z1 + Z2, data=data, type=c('ziop'))
predict(model1, type=c("response.full"))
```

---

<code>print.iop.mod</code>	<i>print.iop.mod</i>
----------------------------	----------------------

---

**Description**

Print method for a `iop` object.

**Usage**

```
## S3 method for class 'iop.mod'
print(object, ...)
```

**Arguments**

object	an object of class <code>iop.mod</code> (output of <code>iop</code> ).
--------	--

---

<code>print.summary.iop.mod</code>	<i>print.iop.mod</i>
------------------------------------	----------------------

---

**Description**

Print method for a `iop` object.

**Usage**

```
## S3 method for class 'summary.iop.mod'
print(object, ...)
```

**Arguments**

object	an object of class <code>iop.mod</code> (output of <code>iop</code> ).
--------	--

---

residuals	<i>residuals</i>
-----------	------------------

---

### Description

A function to extract residuals from iop model results.

### Usage

```
residuals(object, type = c("response"), ...)
```

### Arguments

**object**                    an object of class `iop.mod` (output of [iop](#)).

### Examples

```
model1 <- iop(Y ~ X1 + X2|Z1 + Z2, data=data, type=c('ziop'))
residuals(model1)
```

---

<code>summary.iop.mod</code>	<i>summary.iop.mod</i>
------------------------------	------------------------

---

### Description

Summary method for a [iop](#) object.

### Usage

```
## S3 method for class 'iop.mod'
summary(object, ...)
```

### Arguments

**object**                    an object of class `iop.mod` (output of [iop](#)).

---

<code>vCOV</code>	<i>vCOV</i>
-------------------	-------------

---

### Description

A function to extract variance-covariance matrix from iop model results.

### Usage

```
vcov(object, model = c("full", "cutpoints", "inflation", "ordered"), ...)
```

### Arguments

`object` an object of class `iop.mod` (output of [iop](#)).

### Examples

```
model1 <- iop(Y ~ X1 + X2|Z1 + Z2, data=data, type=c('ziop'))
vcov(model1)
```

---

<code>ziop</code>	<i>ziop</i>
-------------------	-------------

---

### Description

Likelihood function for ZIOP model.

### Usage

```
ziop(est, Y, X, Z, data, weights, offsetx, offsetz)
```

### Arguments

<code>est</code>	starting values for the estimation. Vector of length of the number of parameters.
<code>Y</code>	the ordinal dependent variable.
<code>X</code>	covariates for the ordered probit stage.
<code>Z</code>	covariates for the inflation (split population) stage.
<code>data</code>	dataset that contains the dependent and independent variables.
<code>weights</code>	an optional vector of weights to be used in the fitting process.
<code>offsetx</code>	offset value for the ordered probit stage covariates (X). This can be used to specify an a priori known component to be included in the linear predictor during fitting. For more information, see <a href="#">offset</a> .
<code>offsetz</code>	offset value for the inflation (split population) stage covariates (Z). This can be used to specify an a priori known component to be included in the linear predictor during fitting. For more information, see <a href="#">offset</a> .

### Value

Likelihood of the ZIOP model specification.



# Index

`coef`, [2](#)

`fitted`, [2](#)

`iop`, [2](#), [3](#), [4](#), [6–8](#)

`iop.mod.default`, [4](#)

`iop.mod.Est`, [4](#)

`miop`, [5](#)

`offset`, [3–5](#), [8](#)

`predict`, [5](#)

`print.iop.mod`, [6](#)

`print.summary.iop.mod`, [6](#)

`residuals`, [7](#)

`summary.iop.mod`, [7](#)

`vcov`, [8](#)

`ziop`, [8](#)