# Package 'ImpactIV'

February 19, 2015

**Type** Package

**Title** Identifying Causal Effect for Multi-Component Intervention Using Instrumental Variable Method

**Version** 1.0

**Date** 2010-12-12

**Author** Peng Ding <dingyunyiqiu@163.com>

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**Description** In this package, you can find two functions proposed in Ding, Geng and Zhou (2011) to estimate direct and indirect causal effects with randomization and multiple-component intervention using instrumental variable method.

**Depends** nnet

**License** GPL (>= 2)

**LazyLoad** yes

**Repository** CRAN

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**NeedsCompilation** no

## R topics documented:

ImpactIV-package *Identifying Causal Effect for Multi-Component Intervention Using IV*

## Description

In this package, you can find two functions proposed in Ding, Geng and Zhou (2011) to estimate direct and indirect causal effects with randomization and multiple-component intervention using instrumental variable method.

## Details

| | |
|---|---|
| Package: | ImpactIV |
| Type: | Package |
| Version: | 1.0 |
| Date: | 2010-12-12 |
| License: | GPL (>=2) |
| LazyLoad: | yes |

## Author(s)

Maintainer: Peng Ding <dingyunyiqiu@163.com>

## References

Ding, P., Geng, Z. and Zhou, X. H. (2011). Identifying Causal Effect for Multi-Component Intervention Using Instrumental Variable Method: with A Case Study of IMPACT Data. Technical Report.

## See Also

homo_IV1, heter_IV2

## Examples

```
data(impact)
Z=impact$Z
A=impact$A
M=impact$M
Y=scale(impact$Y)
X=as.matrix(impact[,5:12])
##continuos variables of X
Xcon = X[, c(1,4,6,8)]
##discrete variables of X
```

```
Xdis = X[, c(2,3,5,7)]
##X^2
X2 = cbind(X, poly(Xcon, degree = 2, raw = TRUE),
           Xcon*Xdis[,1], Xcon*Xdis[,2], Xcon*Xdis[,3], Xcon*Xdis[,4])

method1 = homo_IV1(Z = Z,A = A,M = M,Y = Y,X = X)
method2 = heter_IV2(Z = Z,A = A,M = M,Y = Y,X = X2,
                    polydegree = 1, step1 = method1,
                    truncate = 0.25, select ="AIC")
```

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heter_IV2 *Estimation causal effect under Assumption 7 in Ding et al. (2011)*

---

## Description

Estimation causal effect under Assumption 6 in Ding et al. (2011) when the second order moment of the error term is not constant.

## Usage

```
heter_IV2(Z, A, M, Y, X, polydegree = 2, step1 = NULL,
          truncate = 0.25, select = NULL)
```

## Arguments

| | |
|---|---|
| Z | A vector of the randomization variable. |
| A | A vector of the first mediator: whether a patient receives antidepressant medication. |
| M | A vector of the second mediator: whether a patient receives mental health therapy. |
| Y | A vector of the outcome of interest. |
| X | A matrix of all the covariates. |
| polydegree | The order of the polynomial function. |
| step1 | The result of the first step estimation from homo_IV1. |
| truncate | Truncate the estimated Omega using a positive constant. |
| select | Using AIC or BIC for variable selection in the polynomial regression, the default is null. |

## Details

For background of the problem, see Ding et al. (2011).

## Value

| | |
|---|---|
| beta | beta coefficients of Z, A, M and AM. |
| phat | proportion of randomization to the treatment group. |
| residual | residuals of the first step regression. |
| se | standard errors of beta coefficients. |
| zvalue | z-vlues of the beta coefficients. |
| pvalue | p-values of the beta coefficients. |
| CI | confidence intervals of the beta coefficients. |
| COV | covariance matrix of the beta coefficients. |
| ser | robust version of standard errors of beta coefficients. |
| zvaluer | robust version of z-vlues of the beta coefficients. |
| pvaluer | robust version of p-values of the beta coefficients. |
| CIr | robust version of confidence intervals of the beta coefficients. |
| COVr | robust version of covariance matrix of the beta coefficients. |
| N | sample size |
| G | G is defined in Ding et al. (2010). |
| W | W is defined in Ding et al. (2010). |
| Omegahat | Omegahat is is defined in Ding et al. (2010). |

## Author(s)

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## References

Ding, P., Geng, Z. and Zhou, X. H. (2011). Identifying Causal Effect for Multi-Component Intervention Using Instrumental Variable Method: with A Case Study of IMPACT Data. Technical Report.

## Examples

```
##See help for "ImpactIV"
```

homo_IV1 *Estimation causal effect under Assumption 6 in Ding et al. (2011)*

## Description

Estimation causal effect under Assumption 6 in Ding et al. (2011) when the second order moment of the error term is constant.

## Usage

```
homo_IV1(Z, A, M, Y, X)
```

## Arguments

| | |
|---|---|
| Z | A vector of the randomization variable. |
| A | A vector of the first mediator: whether a patient receives antidepressant medication. |
| M | A vector of the second mediator: whether a patient receives mental health therapy. |
| Y | A vector of the outcome of interest. |
| X | A matrix of all the covariates. |

## Details

For background of the problem, see Ding et al. (2011).

## Value

| | |
|---|---|
| beta | beta coefficients of Z, A, M and AM. |
| phat | proportion of randomization to the treatment group. |
| residual | residuals of the regression. |
| se | standard errors of beta coefficients. |
| zvalue | z-vlues of the beta coefficients. |
| pvalue | p-values of the beta coefficients. |
| CI | confidence intervals of the beta coefficients. |
| COV | covariance matrix of the beta coefficients. |
| ser | robust version of standard errors of beta coefficients. |
| zvaluer | robust version of z-vlues of the beta coefficients. |
| pvaluer | robust version of p-values of the beta coefficients. |
| CIr | robust version of confidence intervals of the beta coefficients. |
| COVr | robust version of covariance matrix of the beta coefficients. |
| N | sample size |
| G | G is defined in Ding et al. (2010). |
| W | W is defined in Ding et al. (2010). |
| Omega | Omega is is defined in Ding et al. (2010). |

## Author(s)

Peng Ding <dingyunyiqiu@163.com>

## References

Ding, P., Geng, Z. and Zhou, X. H. (2011). Identifying Causal Effect for Multi-Component Intervention Using Instrumental Variable Method: with A Case Study of IMPACT Data. Technical Report.

## Examples

```
##See help for "ImpactIV"
```

---

`impact` *The data for IMPACT program.*

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## Description

The data for IMPACT program used in Ding et al. (2011).

## Usage

```
data(impact)
```

## Format

A data frame with 1783 observations on the following 12 variables.

`Z` randomization

`A` whether taking antidepressant medications

`M` whether taking mental health therapy

`Y` outcome of interest

`age` age

`gender` gender

`race` race

`edu` education

`marry` married or not

`scl0` baseline SCL score

`work0` work or not

`inc` income/10000

## Details

See Ding et al. (2011) for more details of IMPACT program.

## References

Ding, P., Geng, Z. and Zhou, X. H. (2011). Identifying Causal Effect for Multi-Component Intervention Using Instrumental Variable Method: with A Case Study of IMPACT Data. Technical Report.

## Examples

```
data(impact)
```

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