Package ‘JointRegBC’

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Title Joint Modelling of Mixed Correlated Binary and Continuous Responses: A Latent Variable Approach
Author Ehsan Bahrami Samani and Zhale Tahmasebinejad
Maintainer Ehsan Bahrami Samani <ehsan_bahrami_samani@yahoo.com>
Description A joint regression model for mixed correlated binary and continuous responses is presented. In this model binary response can be dependent on the continuous response. With this model, the dependence between responses can be taken into account by the correlation between errors in the models for binary and continuous responses.
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JointRegBC-package


Description

A joint regression model for mixed correlated binary and continuous responses is presented. In this model binary response can be dependent on the continuous response. With this model, the dependence between responses can be taken into account by the correlation between errors in the models for binary and continuous responses.

Details

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Author(s)

Ehsan Bahrami Samani and Zhale Tahmasebinejad
Maintainer: Bahrami Samani <ehsan_bahrami_samani@yahoo.com>

References


Examples

data("Bahrami1")
gender<-Bahrami1$ GENDER
age<-Bahrami1$AGE
duration <-Bahrami1$ DURATION
y<-Bahrami1$ STEATOS
z<-Bahrami1$ BMI
sbp<-Bahrami1$ SBP
X=cbind(gender, age, duration, sbp)
P<-lm(z~X)[[1]]
names(P)<-paste("Con",names(P),sep="")
Q<-clogit(y~X)[[1]]
names(Q)<-paste("Binary",names(Q),sep="")
W=c(cor(y,z),var(z))
Body Mass Index and Steatosis Data

Description

The medical data set is obtained from an observational study in the Taleghani hospital in Tehran. These data record the Steatosis and BMI for 61 diabetic patients. Steatosis is the process describing the abnormal retention of lipids within a cell. It reflects an impair of the normal process of synthesis and breakdown of triglyceride fat. Excess lipid accumulates in vesicles that displace the cytoplasm. BMI is a statistical measure of the weight of body mass index. A person scaled height body mass index may be accurately calculated using any of the formulas such as BMI=w/H^2 where W is weight and H is height. As explanatory variable for both Steatosis and BMI, the systolic blood pressure (SBP) is defined as the peak pressure in the arteries, which occurs near the beginning of the cardiac cycle. The normal rate, in adult humans, for systolic is near but less than 120 mmHg. As another explanatory variable, duration of diabetes is an amount of time or a particular time interval which a person take diabet (a metabolic disorder characterized by high blood sugar and other signs). Two more explanatory variables are age and gender.

Usage

data(Bahrami1)

Format

A data frame with 10 observations on the following 6 variables: AGE, DURATION, SBP, STEATOS, BMI, GENDER

Source

The medical data set is obtained from an observational study in the Taleghani hospital in Tehran.

References


Description

A joint regression model for mixed correlated binary and continuous responses is presented. In this model binary response can be dependent on the continuous response. With this model, the dependence between responses can be taken into account by the correlation between errors in the models for binary and continuous responses.

Usage

JointRegBC(ini = NA, X, y, z, p, q, ...)

Arguments

ini Initial values
X Design matrix
z Continuous responses
y Binary responses
p Order of dimension of Binary responses
q Order of dimension of continuous responses
... Other arguments

Details

Models for JointRegBC are specified symbolically. A typical model has the form response1 ~ terms and response2 ~ terms where response1 and response2 are the (numeric) binary and continuous responses vector and terms is a series of terms which specifies a linear predictor for responses. A terms specification of the form first + second indicates all the terms in first together with all the terms in second with duplicates removed. A specification of the form first:second indicates the set of terms obtained by taking the interactions of all terms in first with all terms in second. The specification first*second indicates the cross of first and second. This is the same as first + second + first:second.

Value

Binary response Coefficient of ordinal response
Continuous Response Coefficient of continuous response
Variance of Continuous Response Variance of continuous response
Correlation Coefficient of continuous response
Hessian Hessian matrix
convergence An integer code. 0 indicates successful convergence.

Description

A joint regression model for mixed correlated binary and continuous responses is presented. In this model binary response can be dependent on the continuous response. With this model, the dependence between responses can be taken into account by the correlation between errors in the models for binary and continuous responses.
Usage

```r
# Default S3 method:
JointRegBC(ini = NA, X, y, z, p, q, ...)```

Arguments

- `ini` Initial values
- `X` Design matrix
- `z` Continuous responses
- `y` Binary responses
- `p` Order of dimension of Binary responses
- `q` Order of dimension of continuous responses
- `...` Other arguments

Details

Models for JointRegBC are specified symbolically. A typical model has the form `response1 ~ terms` and `response2 ~ terms` where `response1` and `response2` are the (numeric) binary and continuous responses vector and `terms` is a series of terms which specifies a linear predictor for responses. A terms specification of the form `first + second` indicates all the terms in `first` together with all the terms in `second` with duplicates removed. A specification of the form `first:second` indicates the set of terms obtained by taking the interactions of all terms in `first` with all terms in `second`. The specification `first*second` indicates the cross of `first` and `second`. This is the same as `first + second + first:second`.

Value

- **Binary response**
  - Coefficient of ordinal response
- **Continuous Response**
  - Coefficient of continuous response
- **Variance of Continuous Response**
  - Variance of continuous response
- **Correlation**
  - Coefficient of continuous response
- **Hessian**
  - Hessian matrix
- **convergence**
  - An integer code. 0 indicates successful convergence.
- **objective**
  - `-loglikelihood`.

Note

Supported by Shahid Beheshti University

Author(s)

Ehsan Bahrami Samani and Zhale Tahmasebinejad
References

See Also
nlminb,fdHess,clogit

Examples

```r
function (ini = NA, X, y, z, p, q, ...) {
  options(warn = -1)
  f <- function(ini, X, y, z, p, q) {
    X = cbind(1, X)
    y <- as.vector(y)
    z <- as.vector(z)
    ini <- as.vector(ini)
    X <- as.matrix(X)
    n = nrow(X)
    mu = mu = muygivenx = q2 = q1 = l1 = l2 = l3 = muygivenx = as.vector(0)
    sez <- ini[p + q + 2]
    seygivenx <- (1 - (ini[p + q + 1])^2)
    mz=matrix(0,n,p)
    my=matrix(0,n,q)
    for(i in 1:n){
      for(j in 1:p){
        mz[i,j]=ini[p][j]*X[i, ][j]
      }
      for(i in 1:n){
        for(k in 1:p){
          my[i,k]=ini[p][k]*X[i, -1][k]
        }
      }
      for (i in 1:n) {
        muz[i] <- sum(mz[i,])
        muy[i] <- sum(my[i,])
        muygivenx[i] <- muy[i] + (ini[p + q + 1] * (z[i] - mu[i]))/sez
        q1[i] <- ( - muygivenx[i])/sqrt(seygivenx)
        l1[i] <- log(dnorm(q1[i])) + log(dnorm(z[i], muy[i], sez))
        l2[i] <- log(1 - pnorm(q1[i])) + log(dnorm(z[i], muy[i], sez))
      }
    }
  }
  data0 <- cbind(y, l1)
  data1 <- cbind(y, l2)
  data0[, 1] = 1, 2] <- 0
  data1[, 1] = 0, 2] <- 0
  t0 <- sum(data0[, 2])
  t1 <- sum(data1[, 2])
```
t <- c(t0, t1)
Tfinal <- sum(t)
return(-Tfinal)
}

n = nlm(b, f, X = X, y = y, z = z, p = p, q = q, lower = c(rep(-Inf, p+q), -0.999, 0), upper = c(rep(Inf, p+q), 0.999, Inf), hessian = T)

h = fdHess(n$par, f, z = z, y = y, X, p, q)
h1 = h$Hessian

ih = ginv(h1)
se = sqrt(abs(diag(ih)))

Hessian <= h1
n$p <- p
n$q <- q
n$se <- as.vector(se)
n$call <- match.call()

class(n) <- "JointRegBC"

Co.Re <- data.frame(Parameter = object$par[1:p], S.E = object$se[1:p],
  'Confidence Interval' = paste("", round(object$par[1:p] -
    2 * object$se[1:p], 3), ",", round(object$par[1:p] +
    2 * object$se[1:p], 3), ")", sep = " "))

Binary.Re <- data.frame(Parameter = object$par[(p + 1):(p + q)],
  S.E = object$se[(p + 1):(p + q)], 'Confidence Interval' = paste("",
    round(object$par[(p + 1):(p + q)] - 2 * object$se[(p +
    1):(p + q)], 3), ",", round(object$par[(p + 1):(p +
    q)] + 2 * object$se[(p + 1):(p + q)], 3), ")", sep = " "))

Cor <- data.frame(Parameter = object$par[p + q + 1], S.E = object$se[p +
  q + 1], 'Confidence Interval' = paste("",
    round(object$par[p +
    q + 1] - 2 * object$se[p + q + 1], 3), ",", round(object$par[p +
    q + 1] + 2 * object$se[p + q + 1], 3), ")", sep = " "))

Var <- data.frame(Parameter = object$par[p + q + 2], S.E = object$se[p +
  q + 2], 'Confidence Interval' = paste("",
    round(object$par[p +
    q + 2] - 2 * object$se[p + q + 2], 3), ",", round(object$par[p +
    q + 2] + 2 * object$se[p + q + 2], 3), ")", sep = " "))

res <- list(call = object$call, 'Continous Response' = Co.Re,
  'Variance Of Countinous Response' = Var, 'Binary Response' = Binary.Re,
  Correlation = Cor)

res$Hessian <- h1
res$convergence <- n$convergence
res$objective <- n$objective
res$call <- match.call()

class(res) <- "JointRegBC"
res
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