rms Package Reference Card

Notation
d : a data frame with nice label(s), level(s), and units(s) for variables
y : an uncensored response variable
x1,x2,x3 : predictor variables (binary, factor, character, continuous)
f : a fit from an rms fitting function
Help : tells how to get detailed documentation on individual functions from the R command line. When there is no Help comment for a function below, type FunctionName to obtain documentation.

Setting Up the Package
install.packages("rms")  # one-time only
require(rms)  # automatically attaches Hmisc

Data From a Fully Prepared Data Frame
dd ← datadist(d)  # compute data distribution summary
options(datadist='dd')  # for plotting
f ← ols(y ~ x1 + x2*x3, data=d)

Data from a Collection of Vectors
dd ← datadist(x1, x2, x3)
options(datadist='dd')
f ← lrm(y ~ rcs(x1,4)*x2)

Special Model Fitting Functions
ols : ordinary and penalized least squares
lrn : binary and ordinal logistic regression with optional penalization

Transformations of Predictors
rcs(x, 4) : restricted cubic spline with 4 default knots
rcs(x, c(1,2,6,9)) : rcs with user-specified knot locations
lap(x, c(1,2,6)) : linear spline (knot locations mandatory for lap)
pol(x, p) : ordinary polynomial of degree p
score(x) : expand categorical predictor having k numeric levels into linear term and k-2 dummy variables

Data from a Data Frame with Some Changes or Additions Needed
d ← upData(d, rename=c(smoking='smoke'), drop=c('var1','var2'), sex.factor(0:1), c('non-current smoker', 'current smoker')), units=c(age='years', fev1='l', height='inches'), labels=c('forced Expiratory Volume'))
options(datadist='dd')

Functions Operating on Fit Objects
print : print model fit
coef : print coefficient vector
fitted : extract predicted values
resid : extract residuals and do goodness of fit tests

Modeling the Covariance Matrix with Optional Allowance for Intra-Cluster Correlation
bootcov : bootstrap "nonparametric" covariance matrix
robcov : Huber-White robust covariance matrix
f ← update(f, x=T, y=T)
f2 ← bootcov(f, subject.id, B=100)

Partial Wald χ² and F (for ols) Statistics
f ← lrm(y ~ x1 + x2+rcs(x2,4))

Factors Operating on Fit Objects

Basic Generic Functions & Predictions
print : print coefficient vector
fitted : extract predicted values
residuals : extract residuals and do goodness of fit tests

Wald Tests
x1 drug placebo 1
x1 placebo 0 0.5034
x1 category drug placebo 1
x1 x3 x2
All Interactions 16.81 3 0.0008
x2,x2',x2'',x3 * x2,x3 * x2',x3 * x2''x2',x2'',x3 * x2',x3 * x2''x3,x3 * x2,x3 * x2',x3 * x2''x3 * x2,x3 * x2',x3 * x2''

Predict : predicted values and confidence limits easily

Transformations of Predictors
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**Predictor Shape Plots**

- `f ← lrm(y ~ rcs(x1,4)*rcs(x2,4) + x3)`
- Plot showing effect of `x1` (continuous) on log odds
- A curve for 3 values of `x2`, set to make or median
- `p ← Predict(f, x1=., x2=2:4:6)`
- `plot(p)`
- Use `summary(f)` to see a table of results
- `plot(f)`
- `plot(f, psw=TRUE)`
- `plot(f, psw=TRUE, ref=TRUE)`
- `plot(f, psw=TRUE, conf.int=FALSE)`

**Charts Depicting Odds Ratios**

- `summary(f)`
- `summary(f, type='bootstrap', B=1000)`
- `summary(f, type='bootstrap', B=1000, bw=TRUE)`
- `summary(f, type='bootstrap', B=1000, bw=TRUE, n.boot=100)`
- `summary(f, type='bootstrap', B=1000, bw=TRUE, n.boot=100, plot=TRUE)`

**Nomogram**

- `nom ← nomogram(f, x2=c(1,3,5,7,9), x1=5, x3=2, conf.int=TRUE)`
- `plot(nom)`
- `plot(nom, x1=x1s, x2=x2)`

**Model Validation**

- `f ← lrm(y ~ rcs(x1,4)*rcs(x2,4) + x3)`
- `plot(f)`
- `plot(f, psw=TRUE)`
- `plot(f, psw=TRUE, ref=TRUE)`
- `plot(f, psw=TRUE, conf.int=FALSE)`

**Survival Estimates and Curves**

- `f ← lrm(y ~ rcs(x1,4)*rcs(x2,4) + x3)`
- `plot(f)`
- `plot(f, psw=TRUE)`
- `plot(f, psw=TRUE, ref=TRUE)`
- `plot(f, psw=TRUE, conf.int=FALSE)`

**For More Information**

Please communicate corrections and improvements to Frank Harrell at f.harrell@vanderbilt.edu.

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