Regression Predictions: nagdmc_predict_reg

Purpose

nagdmc_predict_reg gives the linear predictor, standard error of the linear predictor, a back transformed prediction and the standard error of the back transformation calculated from a previously fitted regression model. The regression model must be fitted using one of the following functions: **nagdmc_linear_reg**, **nagdmc_binomial**, **nagdmc_poisson**, **nagdmc_basic_reg**, **nagdmc_logit**, **nagdmc_probit**, **nagdmc_loglinear** or **nagdmc_stepwise_reg**.

Declaration

```
#include <nagdmc.h>
void nagdmc_predict_reg(double model[], double data[], double *eta, double *seeta,
                        double *pred, double *sepred, int vfob, int *info);
```

Parameters

1: **model**[] – `double` *Input*

On entry: information on the fitted model obtained from one of the regression functions described in 'See Also'.

Constraint: **model** must not be 0.

2: **data**[] – `double` *Input*

On entry: the data for a single observation. The data must be in the same format as used in the call to the analysis routine which created the **model** array.

Constraint: **data** must not be 0.

3: **eta** – `double *` *Output*

On exit: if not 0, the estimated linear predictor.

4: **seeta** – `double *` *Output*

On exit: if not 0, then the standard error of the linear predictor.

5: **pred** – `double *` *Output*

On exit: if not 0, then the predicted value.

6: **sepred** – `double *` *Output*

On exit: if not 0, then the standard error of the predicted value.

7: **vfob** – `int` *Input*

On entry: If **vfob** $= 1$ then the variance of future observations is used when calculating the standard errors reported in **sepred**; otherwise the variance of future observations is not used and **vfob** $= 0$.

Constraint: **vfob** $= 0$ or 1.

8: **info** – `int *` *Output*

On exit: **info** gives information on the success of the function call:

- 0: the function successfully completed its task.
- i; $i = 1, 2, 7$: the specification of the ith formal parameter was incorrect.
- 46: information in **model** has been corrupted.
- 99: the function failed to allocate enough memory.

Notation

data	vector of independent variables, $\{X_i : i = 2, \cdots, p\}$.
eta	linear predictor, η.
seeta	standard error of the linear predictor, $\mathrm{se}(\eta)$.
pred	predicted value of the response variable, $\hat{y}$.

sepred standard error of the predicted value, se($\hat{y}$).
vfob indicator variable showing whether to use variance of future observations, I_y.
model all the model information from previous model fit including $\beta, C, g(.)$ and the error structure used.

Description

Let $\beta = \{\beta_i : i = 1, \cdots, p\}$ be a row vector of p parameter estimates, with covariance matrix C, obtained from a generalized linear model with link function $g(.)$ and a known error structure. Then given a row vector of p independent variables, $X = \{X_i : i = 1, \cdots, p, X_1 = 1\}$ the linear predictor, η, and its standard error, se(η), corresponding to X, are given by

$$\eta = \beta X', \ \text{se}(\eta) = \sqrt{XCX'}.$$

and the predicted value of the response variable, $\hat{y}$, and its standard error, se($\hat{y}$), are given by

$$\hat{y} = g^{-1}(\eta), \ \text{se}(\hat{y}) = \sqrt{\left(\left. \frac{dg^{-1}(x)}{dx} \right|_{\eta} \text{se}(\eta) \right)^2 + I_y \sigma_y^2}.$$

Where $I_y = 0$ if the variance of future observations is not taken into account, and one otherwise. The variance of the future observations, σ_y depends on the error structure used, with

(i) Gaussian (Normal) error: $\sigma_y^2 =$ residual mean square error (rms)
(ii) binomial error: $\sigma_y^2 = \hat{y}(1 - \hat{y})$
(iii) poisson error: $\sigma_y^2 = \hat{y}$

References and Further Reading

McCullagh P and Nelder J A (1983) *Generalized Linear Models* Chapman and Hall.

See Also

nagdmc_basic_reg	simplified version of **nagdmc_reg** using a restricted set of parameters.
nagdmc_binomial_reg	generalized linear model with binomial errors.
nagdmc_extr_reg	computes fitted values, residuals and leverages for a regression.
nagdmc_linear_reg	linear model with Normal errors.
nagdmc_logit_reg	simplified version of **nagdmc_binomial_reg** using a logit link and a and a restricted set of parameters.
nagdmc_loglinear_reg	simplified version of **nagdmc_poisson_reg** using a log link and a restricted set of parameters.
nagdmc_poisson_reg	generalized linear model with poisson errors.
nagdmc_probit_reg	simplified version of **nagdmc_binomial_reg** using a probit link and a restricted set of parameters.
nagdmc_stepwise_reg	stepwise linear regression with Normal errors.
binomial_reg_ex.c	the example calling program for a generalized linear model with binomial
linear_reg_ex.c	the example calling program for linear regression.
poisson_reg_ex.c	the example calling program for a generalized linear model with Poisson errors.
stepwise_reg_ex.c	the example calling program for stepwise linear regression. errors.