Title

Firstname Lastname
Affiliation

Abstract

—!!!—an abstract is required—!!!—

Keywords: —!!!—at least one keyword is required—!!!—.

Focused model comparison for covariate selection in multi-state models fitted with m

Example dataset in package, 'psor'. Four state progression-only model.

Wide model: model with two binary covariates associated with different effects for all three transition rates.

```
if (!require("msm")) stop("The `msm` package should be installed to run code in this vi-
gnette")
psor.q <- rbind(c(0,0.1,0,0), c(0,0,0.1,0), c(0,0,0,0.1), c(0,0,0,0))
psor.wide.msm <- msm(state ~ months, subject=ptnum, data=psor, qmatrix = psor.q,  co-
variates = ~ollwsdrt+hieffusn, control=list(fnscale=1))
psor.wide.msm

##
## Call:
## msm(formula = state ~ months, subject = ptnum, data = psor, qmatrix = psor.q,     covar
##
## Maximum likelihood estimates
## Baselines are with covariates set to their means
##
## Transition intensities with hazard ratios for each covariate
##                   Baseline                    ollwsdrt
## State 1 - State 1 -0.1004 (-0.12750,-0.07898)
## State 1 - State 2  0.1004 ( 0.07898, 0.12750) 0.7320 (0.4258,1.2585)
## State 2 - State 2 -0.1623 (-0.20601,-0.12789)
## State 2 - State 3  0.1623 ( 0.12789, 0.20601) 0.4579 (0.2643,0.7932)
## State 3 - State 3 -0.2607 (-0.34952,-0.19453)
## State 3 - State 4  0.2607 ( 0.19453, 0.34952) 1.5757 (0.7776,3.1928)
##                   hieffusn
## State 1 - State 1
## State 1 - State 2 2.338 (1.0937,4.997)
```

```
## State 2 - State 2
## State 2 - State 3 1.681 (0.9500,2.975)
## State 3 - State 3
## State 3 - State 4 1.394 (0.7738,2.511)
##
## -2 * log-likelihood:  1113
## [Note, to obtain old print format, use "printold.msm"]
```

This requires version 1.6.6 of ‘msm‘, available from CRAN since 3 Feb 2017. This version introduced the ‘updatepars.msm‘ function for altering the point estimates from a fitted model a model to a vector of values supplied by the user. This allows functions such as ‘totlos.msm‘ to be used, which define complicated functions of the model parameters.

Here we use this to define a focus function, which returns the expected total time spent in state 4 over 10 years for people without ‘ollwsdrt‘ or ‘hieffusn‘, given a vector of parameters ‘pars‘ in the model structure ‘psor.wide.msm‘.

```
focus_tlos <- function(pars){
    x.new <- updatepars.msm(psor.wide.msm, pars)
    totlos.msm(x.new, covariates=0, t=10)["State 4"]
}
```

We assess the wide model and six further submodels.

```
library(fic)
inds <- rbind(
    c(1,1,1,0,0,0,0,0,0),
    c(1,1,1,0,0,0,0,0,1),
    c(1,1,1,0,0,0,0,1,1),
    c(1,1,1,0,0,0,1,1,1),
    c(1,1,1,0,0,1,1,1,1),
    c(1,1,1,0,1,1,1,1,1),
    c(1,1,1,1,1,1,1,1,1)
)
fic(wide=psor.wide.msm, inds=inds, focus=focus_tlos)

##   vals mods  FIC   rmse rmse.adj      bias  bias.adj     se
## 1    A    1 1.55 0.0809    0.114  5.87e-02  5.87e-02 0.0974
## 2    A    2 1.67 0.0826    0.105  2.20e-02  0.00e+00 0.1054
## 3    A    3 2.27 0.0903    0.109 -2.04e-02  0.00e+00 0.1086
## 4    A    4 4.77 0.1171    0.117 -7.14e-02 -3.84e-02 0.1107
## 5    A    5 9.85 0.1582    0.158 -1.17e-01 -1.07e-01 0.1169
## 6    A    6 5.24 0.1214    0.121 -4.42e-02 -2.05e-02 0.1197
## 7    A    7 5.74 0.1260    0.126 -2.10e-17 -1.46e-17 0.1260
```

Very small biases in all cases. RMSE increases with the variance as covariates are added.

I guess because these covariates are not strongly associated with transition rates.