

Title

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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	rmse	rmse.adj	bias	se	FIC
## 1	A	1	0.1137	0.114	5.87e-02	0.0974	1.55
## 2	A	2	0.0826	0.105	0.00e+00	0.1054	1.67
## 3	A	3	0.0903	0.109	0.00e+00	0.1086	2.27
## 4	A	4	0.1171	0.117	-3.84e-02	0.1107	4.77
## 5	A	5	0.1582	0.158	-1.07e-01	0.1169	9.85
## 6	A	6	0.1214	0.121	-2.05e-02	0.1197	5.24
## 7	A	7	0.1260	0.126	-3.30e-17	0.1260	5.74

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.