

```

/*      Simulations example: lag length

      Three hazard functions scenarios
      *constant      - lambdas(0.1) gammas(1.0)
      *decreasing    - lambdas(0.15) gammas(0.9)
      *increasing    - lambdas(0.07) gammas(1.1)

      Using n=202 for each run
      Decreasing lag to effect; lag time = 3
*/

version 15
set more off
clear

cd "`yourpath'"
*number of simulations
local sims = 100
local trt_eff1 = 0
local trt_eff2 = -0.4

*set seed for reproducibility
set seed 50621

*lag length
local laglen 3

*event rate scenario - decreasing
local lambda_1 0.15
local gamma_1 0.9
local evtype_1 "dec"

local timetot = 50
local time1 = `laglen'
local time2 = `timetot' - `time1'

clear
set obs 202
generate id = _n
*treatment variable, probability of 50% into each arm
generate trt = rbinomial(1,0.5)
*generate a time change
gen tchange1 = cond(trt==1, `laglen', 500)

*user-defined hazard function
survsim survtime died, ///
    hazard( (`lambda_`rate':*`gamma_`rate':*#t:^(`gamma_`rate':-1) ) :*      ///
    ( exp( (`trt_eff1':*trt):*(#t:<tchange1) ) :+      ///
    (`trt_eff2':*trt):*(#t:>=tchange1) ) ) ) maxtime(50) nodes(50)

```

*number of events pre and post lag time

```
count if died==1 & survtime <='laglen'  
local n_pre = r(N)  
count if died==1 & survtime >'laglen' & survtime<='timetot'  
local n_post = r(N)  
*by treatment group  
count if died==1 & survtime <='laglen' & trt==0  
local n_pre_c = r(N)  
count if died==1 & survtime <='laglen' & trt==1  
local n_pre_t = r(N)  
count if died==1 & survtime >'laglen' & survtime<='timetot' & trt==0  
local n_post_c = r(N)  
count if died==1 & survtime >'laglen' & survtime<='timetot' & trt==1  
local n_post_t = r(N)
```

```
stset survtime, failure(died = 1) id(id)
```

*Hazard Ratio from a Cox PH model

```
stcox trt, iterate(200)
```

*p-value from test of PH using Schoenfeld residuals

```
estat phtest
```

*Beta coefficients from a Cox PH model

```
stcox trt, iterate(200) nohr
```

*p-value from the logrank test and fleming-harrington tests

*equal weighting on all events

```
sts test trt, fh(0 0)
```

*early events weighting

```
sts test trt, fh(1 0)
```

*middle events weighting

```
sts test trt, fh(1 1)
```

*later events weighting

```
sts test trt, fh(0 1)
```

*versatile tests for equal, early or late (Karrison, 2016)

```
verswlr trt
```

```
local ver_std_p = r(pval)
```

*Cox model with time interaction for t>3 using stsplot

*includes landmark analyses

```
stsplot time_gt3, at(3)
```

*landmark analysis at t=3

*logrank test

```
sts test trt if time_gt3==3
```

```
stcox trt if time_gt3==3
```

*piecewise exponential model (at t=3)

*one estimate of treatment effect

```
streg trt ibn.time_gt3, dist(exponential) nocons
```

*two estimates of treatment effect

```
streg trt ibn.time_gt3 trt#ibn.time_gt3, dist(exponential) nocons
```

*estimate of treatment effect in interval time>3 (same as trt output)

```
lincom _b[_t:trt] + _b[_t:1.trt#3.time_gt3], hr
```

*estimate of treatment effect when in interval time<=3

```
lincom _b[_t:trt] + _b[_t:1.trt#0.time_gt3], hr
```

```
stjoin
```

*Weibull shape and scale

```
streg trt, distribution(weibull) iterate(200)
```

*Time Ratio from accelerated failure time (AFT) model - Weibull

```
streg trt, distribution(weibull) time tr iterate(200)
```

*Estimate HR from RP model with 5 df - PH model parametric (ie no tvc option)

```
stpm2 trt, scale(hazard) df(5) failconvlininit eform iterate(200)
```

*Estimate diff in RMST from RP model with 5 df - PH model above

using t to be maximum uncensored event time

```
centile _t if _d==1, centile(100)
```

```
predictnl diff = ///
```

```
    predict(rmst at(trt 1) tmax(`t') ) - predict(rmst at(trt 0) tmax(`t') ), ///
```

```
    se(diff_se) p(diff_p) ci(diff_lci diff_uci)
```

*using t=50 to be the event time

```
predictnl diffm = ///
```

```
    predict(rmst at(trt 1) tmax(50) ) - predict(rmst at(trt 0) tmax(50) ), ///
```

```
    se(diffm_se) p(diffm_p) ci(diffm_lci diffm_uci)
```

*Royston-Parmar (RP) test for a generalized treatment effect (p-value)

*using default 5df (and as above) and specifying PH model

```
sttest rp trt, df(5) dftvc(0)
```

*Estimate HR from RP model with 5 df using dftvc(2) option

```
stpm2 trt, scale(hazard) df(5) tvc(trt) dftvc(2) failconvlininit eform
```

*Estimate diff in RMST from RP model with 5 df using tvc(2) option

using t to be maximum uncensored event time

```
centile _t if _d==1, centile(100)
```

```
local t = r(c_1)
```

```
predictnl diff_t = ///
```

```
    predict(rmst at(trt 1) tmax(`t') ) - predict(rmst at(trt 0) tmax(`t') ), ///
```

```
    p(diff_p_t) ci(diff_lci_t diff_uci_t) se(diff_se_t)
```

*using t=50 to be the event time

```
predictnl diffm_t = ///
```

```
    predict(rmst at(trt 1) tmax(50) ) - predict(rmst at(trt 0) tmax(50) ), ///
```

```
    p(diffm_p_t) ci(diffm_lci_t diffm_uci_t) se(diffm_se_t)
```

*Royston-Parmar (RP) test for a generalized treatment effect (p-value)

*using default 5df and using tvc(2) option

```
stctest rp trt, df(5) dftvc(2)
```

```
exit
```