

# Package ‘survRM2’

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**Type** Package

**Title** Comparing Restricted Mean Survival Time

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**Maintainer** Hajime Uno <huno@jimmy.harvard.edu>

**Depends** survival

**Description** Performs two-sample comparisons using the restricted mean survival time (RMST) as a summary measure of the survival time distribution. Three kinds of between-group contrast metrics (i.e., the difference in RMST, the ratio of RMST and the ratio of the restricted mean time lost (RMTL)) are computed. It performs an ANCOVA-type covariate adjustment as well as unadjusted analyses for those measures.

**License** GPL-2

**RoxygenNote** 7.2.0.9000

**Suggests** knitr, rmarkdown

**VignetteBuilder** knitr

**NeedsCompilation** no

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**Description**

Performs two-sample comparisons using the restricted mean survival time (RMST) as a summary measure of the survival time distribution. Three kinds of between-group contrast metrics (i.e., the difference in RMST, the ratio of RMST and the ratio of the restricted mean time lost (RMTL)) are computed. The package has a function to perform an ANCOVA-type covariate adjustment as well as unadjusted analyses for those measures.

**Author(s)**

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**References**

Uno H, Claggett B, Tian L, Inoue E, Gallo P, Miyata T, Schrag D, Takeuchi M, Uyama Y, Zhao L, Skali H, Solomon S, Jacobus S, Hughes M, Packer M, Wei LJ. Moving beyond the hazard ratio in quantifying the between-group difference in survival analysis. *Journal of clinical Oncology* 2014, 32, 2380-2385. doi:10.1200/JCO.2014.55.2208.

Tian L, Zhao L, Wei LJ. Predicting the restricted mean event time with the subject's baseline covariates in survival analysis. *Biostatistics* 2014, 15, 222-233. doi:10.1093/biostatistics/kxt050.

**See Also**

survival

**Examples**

```
#--- sample data ---#
D=rmst2.sample.data()
time=D$time
status=D$status
arm=D$arm
tau=NULL
x=D[,c(4,6,7)]
#--- without covariates ----
a=rmst2(time, status, arm, tau=10)
print(a)
plot(a, xlab="Years", ylab="Probability", density=60)
#--- with covariates ----
a=rmst2(time, status, arm, tau=10, covariates=x)
print(a)
```

---

`plot.rmst2`*plot.rmst2*

---

**Description**

S3 method for class 'rmst2'

**Usage**

```
## S3 method for class 'rmst2'  
plot(  
  x,  
  xlab = "",  
  ylab = "",  
  col = "red",  
  col.RMST = "pink",  
  col.RMTL = "orange",  
  density = 80,  
  angle = 85,  
  ...  
)
```

**Arguments**

<code>x</code>	Results of the unadjusted analyses.
<code>xlab</code>	x label.
<code>ylab</code>	y label.
<code>col</code>	Color for line. Default is red.
<code>col.RMST</code>	Color for areas of RMST. Default is pink.
<code>col.RMTL</code>	Color for areas of RMTL. Default is orange.
<code>density</code>	Density of shading lines, in lines per inch. Default is 80.
<code>angle</code>	Slope of shading lines, given as an angle in degrees (counter-clockwise). Default is 85.
<code>...</code>	Further arguments ignored in this function.

**Value**

returns a plot

---

 print.rmst2

*print.rmst2*


---

### Description

S3 method for class 'rmst2'

### Usage

```
## S3 method for class 'rmst2'
print(x, digits = 3, ...)
```

### Arguments

x	Object to be printed.
digits	Integer indicating the number of decimal places.
...	Further arguments ignored in this function.

### Value

returns summary output for class 'rmst2'

---

 rmst2

*Comparing restricted mean survival time*


---

### Description

Performs two-sample comparisons using the restricted mean survival time (RMST) as a summary measure of the survival time distribution. Three kinds of between-group contrast metrics (i.e., the difference in RMST, the ratio of RMST and the ratio of the restricted mean time lost (RMTL)) are computed. The Greenwood plug-in estimator is used for the asymptotic variance. It performs ANCOVA-type adjusted analyses when covariates are passed to it as an argument.

### Usage

```
rmst2(time, status, arm, tau = NULL, covariates = NULL, alpha = 0.05)
```

### Arguments

time	The follow-up time for right censored data.
status	The status indicator, 1=event, and 0=right censored.
arm	The group indicator for comparison. The elements of this vector take either 1 or 0. Normally, 0=control group, 1=active treatment group.

<code>tau</code>	A scalar value to specify the truncation time point for the RMST calculation. When <code>tau = NULL</code> , the default value is used. See Details for the definition of the default <code>tau</code> .
<code>covariates</code>	This specifies covariates to be used for the adjusted analyses. When <code>NULL</code> , unadjusted analyses are performed. When non <code>NULL</code> , the ANCOVA-type adjusted analyses are performed using those variables passed as <code>covariates</code> . This can be one variable (vector) or more than one variables (matrix).
<code>alpha</code>	The default is 0.05. (1-alpha) confidence intervals are reported.

### Details

The definition of the default `tau`. Let  $x_1$  and  $x_0$  be the maximum observed time in Group 1 and Group 0, respectively. Case 1: if the last observations in Group 1 and Group 0 are "event," then  $\tau = \max(x_1, x_0)$ . Case 2-1: if the last observation in Group 1 is "event," the last observation in Group 0 is "censor," and  $x_1 \leq x_0$ ,  $\tau = \max(x_1, x_0) = x_0$ . Case 2-2: if the last observation in Group 0 is "event," the last observation in Group 1 is "censor," and  $x_1 > x_0$ ,  $\tau = \max(x_1, x_0) = x_1$ . Case 3-1: if the last observation in Group 1 is "event," the last observation in Group 0 is "censor," and  $x_1 > x_0$ ,  $\tau = \min(x_1, x_0) = x_0$ . Case 3-2: if the last observation in Group 0 is "event," the last observation in Group 1 is "censor," and  $x_1 \leq x_0$ ,  $\tau = \min(x_1, x_0) = x_1$ . Case 4: the last observations in Group 1 and Group 0 are "censor," then  $\tau = \min(x_1, x_0)$ .

### Value

an object of class `rmst2`.

<code>tau</code>	the truncation time used in the analyses
<code>note</code>	a note regarding the truncation time
<code>RMST.arm1</code>	RMST results in arm 1. This is generated only when <code>covariates</code> is not specified.
<code>RMST.arm0</code>	RMST results in arm 0. This is generated only when <code>covariates</code> is not specified.
<code>unadjusted.result</code>	Results of the unadjusted analyses. This is generated only when <code>covariates</code> is not specified.

The values below are generated when some covariates are passed to the function.

<code>adjusted.result</code>	Results of the adjusted analyses.
<code>RMST.difference.adjusted</code>	Results of the parameter estimates with the model to derive an adjusted difference in RMST.
<code>RMST.ratio.adjusted</code>	Results of the parameter estimates with the model to derive an adjusted ratio of RMST.
<code>RMTL.ratio.adjusted</code>	Results of the parameter estimates with the model to derive an adjusted ratio of RMTL.

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**Examples**

```
#--- sample data ---#
D=rmst2.sample.data()
time=D$time
status=D$status
arm=D$arm
tau=NULL
x=D[,c(4,6,7)]
#--- without covariates ----
a=rmst2(time, status, arm, tau=10)
print(a)
plot(a, xlab="Years", ylab="Probability", density=60)
#--- with covariates ----
a=rmst2(time, status, arm, tau=10, covariates=x)
print(a)
```

---

rmst2.sample.data	<i>Generate a sample data from the pbc data</i>
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**Description**

This is a function to retrieve 312 randomized patients from the pbc data.

**Usage**

```
rmst2.sample.data(t.unit="year")
```

**Arguments**

t.unit                    Specify the time unit. It supports "year" (default), "month", and "day".

**Details**

The function creates a sample dataset to illustrate the usage of the function `rmst2()` in this package. The original pbc data in survival package consists of 418 patients data. This function loads the pbc data, select the 312 patients who were randomized. The status variable is edited, so that 1 indicates death and 0 indicates alive.

*rmst2.sample.data*

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**Value**

returns a data frame

**See Also**

pbcr in survival package

**Examples**

```
D=rmst2.sample.data()  
head(D)
```

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