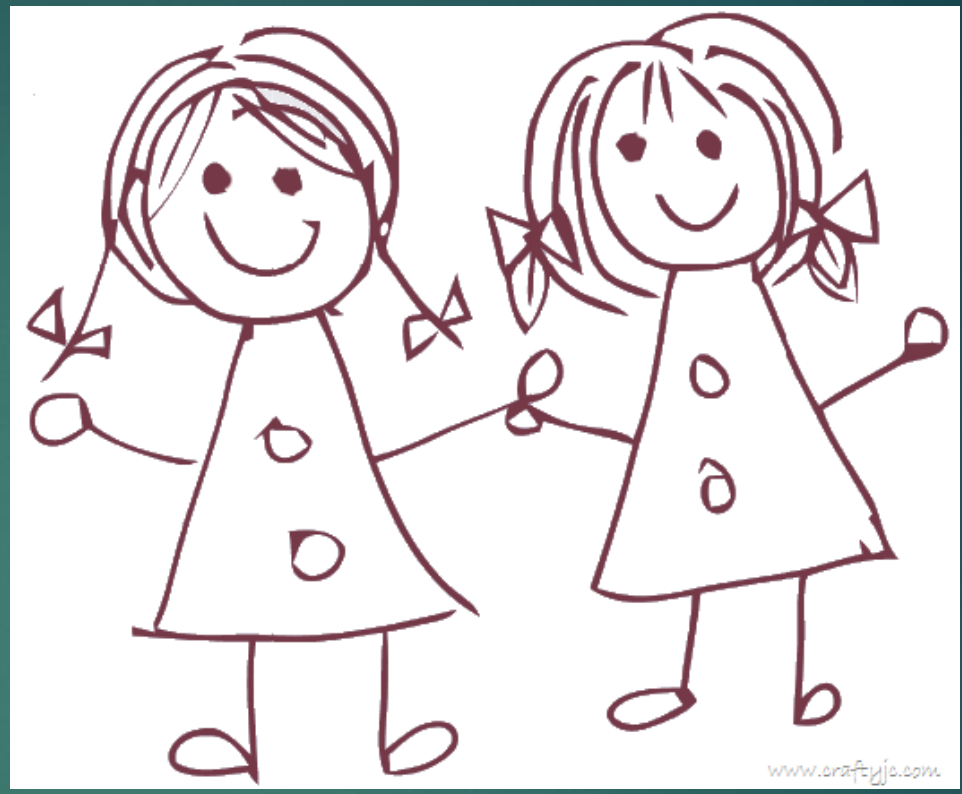
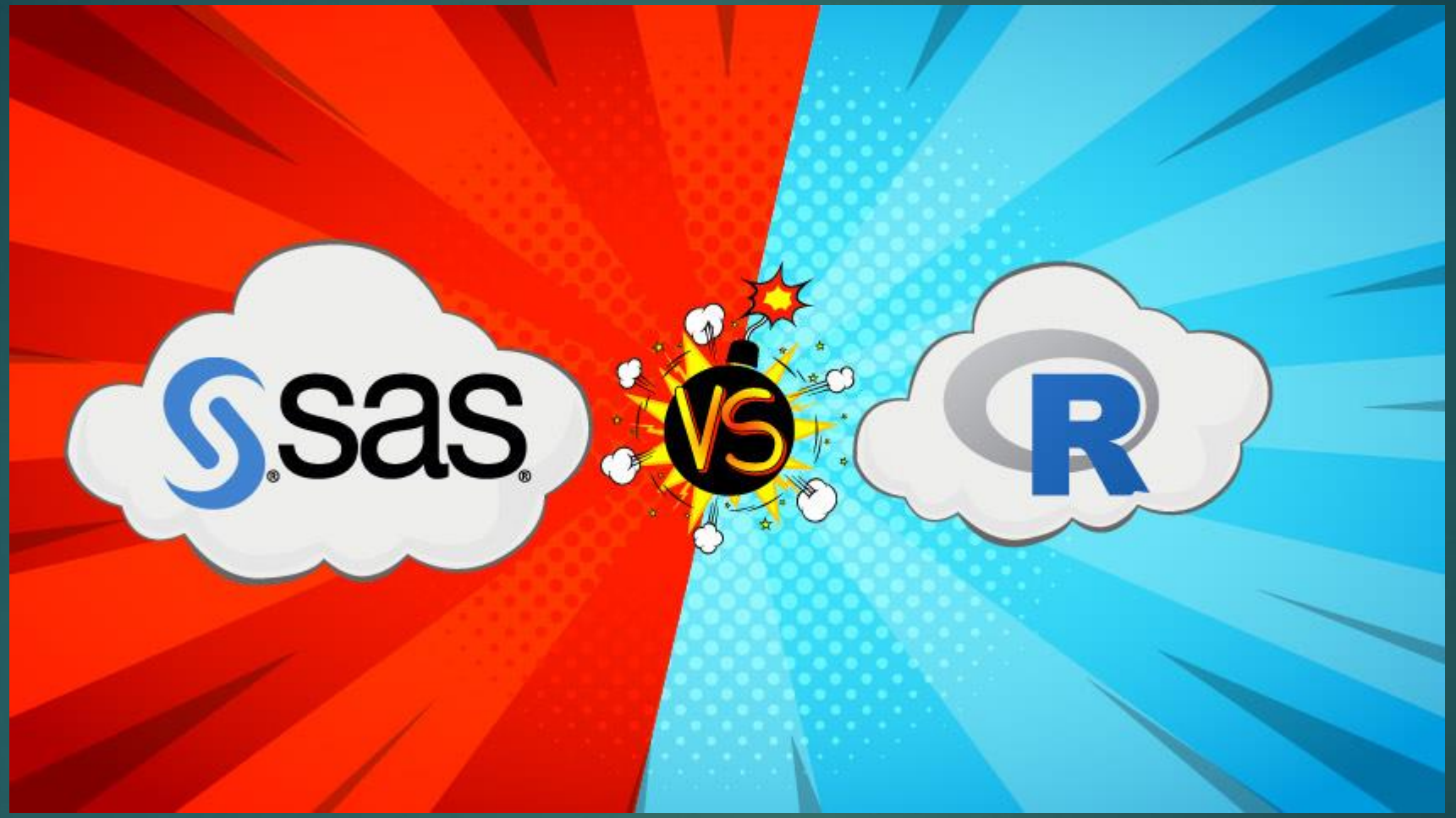
SAS & R



CAN THEY REALLY PLAY NICE TOGETHER?


sas
VS
R

Price Tag

- SAS has a large price tag particularly for smaller companies
- R is free to download for anyone
- SAS now has free University edition
- Not available to small companies, non-profit research organizations

https://www.simplilearn.com/sas-vs-r-which-is-better-rar393-article

Learning

- R has an abrupt learning curve
  - Programming language and straight forward task can require longer code
  - Flexibility and power for a programmer

- SAS viewed as less difficult to learn
  - Utilizes SQL programming

Technical Support

- R has no customer support but does have large online community
  - Nearly 15,000 programs in Comprehensive R Archive Network (CRAN)

- SAS has great customer support, complete instruction manual, and large online communities

https://communities.sas.com/,
http://support.sas.com/software/products/stat/index.html

SAS User groups and User Group websites, http://www.lexjansen.com/

Innovation

- SAS has slower roll out of new techniques
  - New releases are done in managing environment therefore less opportunity for mistakes
- R is open source so latest cutting edge techniques are released faster
  - Potential for more errors in the programming code

Handling of Data

- Server editions of SAS can handle terabytes of data
  - the size of data sets analyzed in SAS are generally bottlenecked by the size of the hard disk
- R allocated and handles memory by loading entire dataset in RAM
  - R are bottlenecked by the size of the RAM
- Both are physical hardware limitations of the machine

Debate Summary

- Both R and SAS are here to stay
- Why not work together to improve quality of analysis, results, etc

BUT: I already know how to use SAS and I am busy

WHY DO I CARE??

- Competing Risk analysis with time dependent variables
  - Cancer relapse and mortality with transplant

    R: Package ‘cmprsk’ – June 2014

    SAS: SAS/STAT 13.1 ver 9.4 Fine and Gray’s sub-distribution

- Joint models of Longitudinal and Survival data
  - Repeated hospital Admissions and mortality of patients

    R: JM (2010), joineR, JMbayes & frailtypack,

    SAS: JMFIT Macro (2016)

- The SAS/IML Studio interface allows you to integrate R functionality with SAS/IML or SAS programs. You can also exchange data between SAS and R as data sets or matrices.

- "This is just the first step," said Radhika Kulkarni, Vice President of Advanced Analytics. "We are busy working on an R interface that can be surfaced in the SAS server or via other SAS clients. In the future, users will be able to interface with R through the IML procedure."

- **R Interface Now Available in SAS/IML® Studio**

- If you already have SAS 9.2 or later (Base SAS®, SAS/STAT®, and SAS/IML®) installed, you can download the latest release of SAS/IML Studio. Installations of SAS 9.2 and later will include SAS/IML Studio 3.3 with SAS/IML from this point forward. Documentation can be found in the chapter "Calling Functions in the R Language" in *SAS/IML Studio 14.2 for SAS/STAT Users*.

Compatbility

Compatibility with R Releases				
SAS Version	PROC IML	SAS/IML Studio	Release Date	R Versions
9.2	N/A	3.2	Jul 2009	2.6.1 - 2.11.1
9.22	9.22	3.3	Nov 2010	2.9.1 - 2.11.1
9.3	9.3	3.4	Jul 2011	2.9.1 - 2.15.3
9.3m2	12.1	12.1	Aug 2012	2.9.1 - 2.15.3
9.4	12.3	12.3	Jul 2013	2.13.0 - 3.0.1
9.4m1	13.1	13.1	Dec 2013	2.13.0 - 3.2.5
9.4m2	13.2	13.2	Aug 2014	2.13.0 - 3.2.5
9.4m3	14.1	14.1	Aug 2015	2.13.0 - 3.2.5
9.4m4	14.2	14.2	Nov 2016	2.13.0 - 3.4.2
9.4m5	14.3	14.3	Sep 2017	2.13.0 - 3.4.2

- Locate your file“sasv9.cfg”
- 9.4 - C:\Program Files\SASHome\SASFoundation\9.4\sasv9.cfg

Step 1:

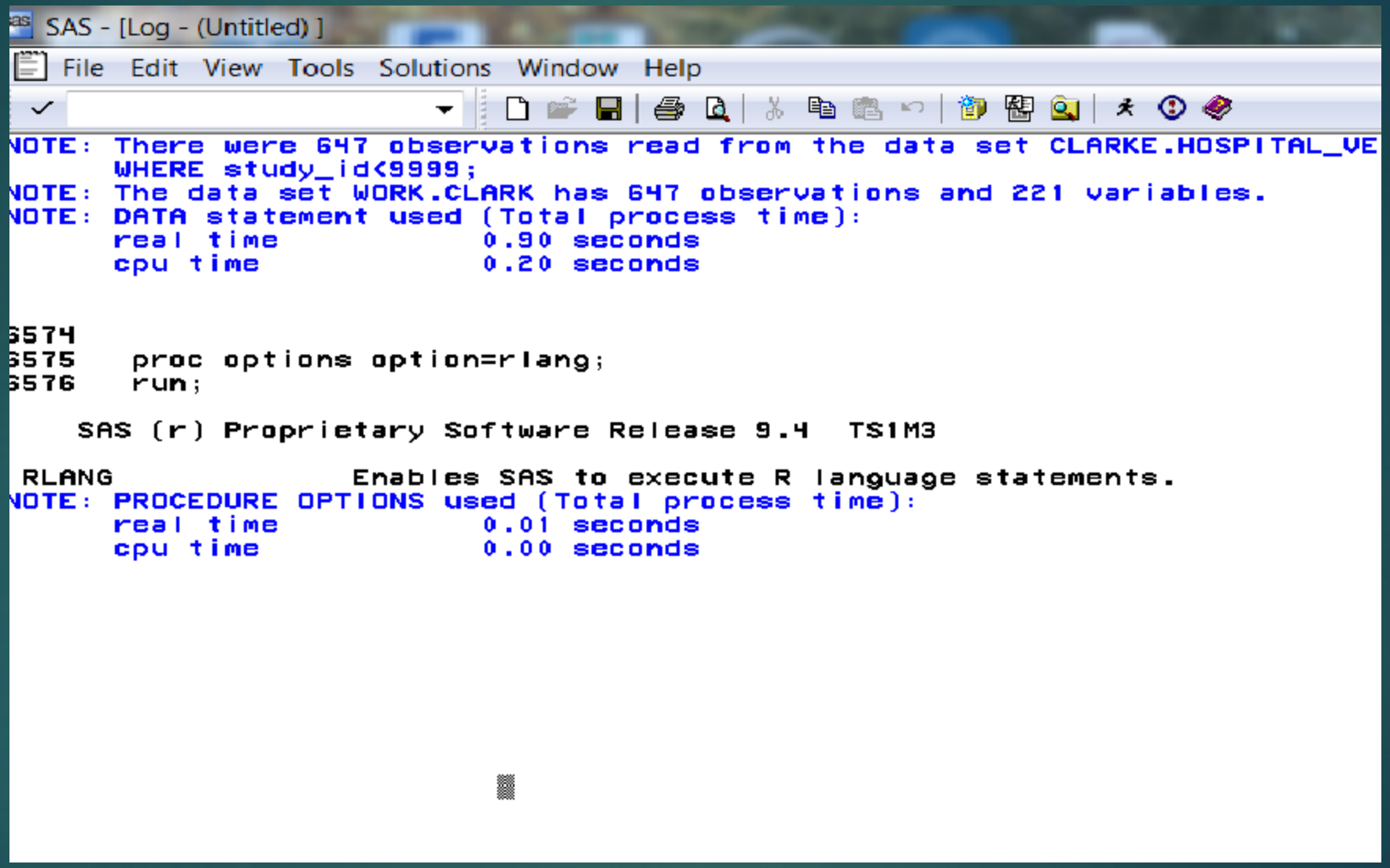
-RLANG

-config "C:\Program Files\SASHome\SASFoundation\9.4\nls\en\sasv9.cfg"

-SET R_HOME "C:\Program Files\R\R-3.1.3"

Step 2:

```
proc options option=rlang;
run;
```


SAS - [Log - (Untitled)]
File Edit View Tools Solutions Window Help
NOTE: There were 647 observations read from the data set CLARKE.HOSPITAL_VE
WHERE study_id<9999;
NOTE: The data set WORK.CLARK has 647 observations and 221 variables.
NOTE: DATA statement used (Total process time):
real time 0.90 seconds
cpu time 0.20 seconds
6574
6575 proc options option=rlang;
6576 run;
SAS (r) Proprietary Software Release 9.4 TS1M3
RLANG Enables SAS to execute R language statements.
NOTE: PROCEDURE OPTIONS used (Total process time):
real time 0.01 seconds
cpu time 0.00 seconds

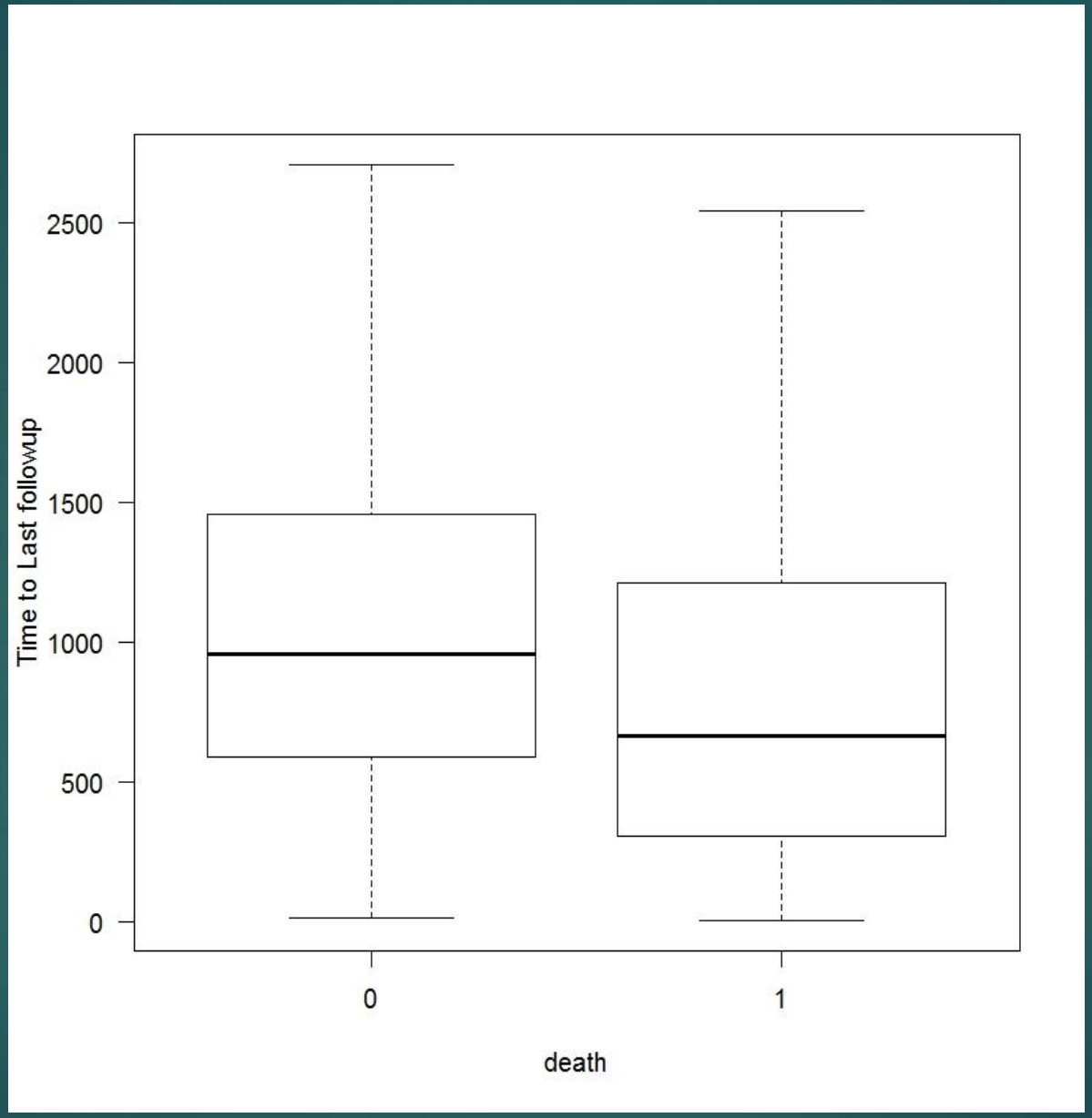
https://www.datacamp.com/courses/r-for-sas-spss-and-stata-users-r-tutorial

Ken Kleinman Nicholas J. Horton . SAS and R: Data Management, Statistical Analysis, and Graphics, Second Edition, Edition 2. July 17, 2014. CRC Press

SAS/IML(R) 13.1 User's Guide: Calling Functions in the R Language

```
proc options option=rlang;
run;
data test;
    set clark;
    keep study_id startage gender death time_risk;
    run;

proc iml;
use work.test;
read all var {study_id startage gender death time_risk};
close  work.test;

run ExportDataSetToR("work.test", "Class");
submit / R;
   Model <- lm(time_risk ~ GENDER, data=Class, na.action="na.exclude")
summary(Model);
boxplot(time_risk ~ death, Class, xlab="death", ylab="Time to Last followup", las=1)
ttResult <- t.test(time_risk ~ death, Class, var.equal=TRUE);
ttResult;
endsubmit;
quit;
```

```
Call:
lm(formula = time_risk ~ GENDER, data = Class, na.action = "na.exclude")

Residuals:
    Min      1Q  Median      3Q     Max
-961.94 -491.53  -88.94  405.27 1744.06

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  963.941     41.848  23.034   <2e-16 ***
GENDERM        3.587     52.634   0.068    0.946
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 645.6 on 645 degrees of freedom
Multiple R-squared:  7.2e-06,   Adjusted R-squared:  -0.001543
F-statistic: 0.004644 on 1 and 645 DF,  p-value: 0.9457


        Two Sample t-test

data:  time_risk by death
t = 5.4487, df = 645, p-value = 7.227e-08
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 177.2345 376.9596
sample estimates:
mean in group 0 mean in group 1
```


Time to Last followup
2500
2000
1500
1000
500
0
0
1
death

Calling a R library

```
submit / R;
install.packages('cmprsk')
library(cmprsk)
```

SAS - [Editor - Untitled2 *]

File Edit View Tools Run Solutions Window Help

```
proc iml;
use work.final;
read all var {study_id tstart tstop status frailtyscale  death time_event gaptime} ;
close  work.final;
run ExportDataSetToR("work.final", "frail");
submit / R;
 install.packages('frailtypack')
install.packages('survival')
library(frailtypack)
library(survival)

modJoint.general <- frailtyPenal(Surv(gapTime,status) ~ cluster(Study_ID) + frailtyscale + terminal(death),
formula.terminalEvent = ~ frailtyscale,
data = frail, jointGeneral = TRUE, n.knots = 8,
kappa = c(2.11e+08, 9.53e+11))
modJoint.general
endsubmit;
quit;
```

SAS - [Results Viewer - sashtml]

File Edit View Go Tools Solutions Window Help

```
        9.53e+11))


  General Joint gamma frailty model for recurrent and a terminal event processes
  using a Penalized Likelihood on the hazard function

Recurrences:
-------------
                coef exp(coef) SE coef (H) SE coef (HIH)       z          p
frailtyscale 0.126375   1.13471   0.0313849     0.0313574 4.02661 5.6588e-05

Terminal event:
---------------
                coef exp(coef) SE coef (H) SE coef (HIH)       z          p
frailtyscale 0.322866   1.38108   0.0535692     0.0532372 6.02709 1.6694e-09

 Frailty parameters:
   theta (variance of u, association between recurrences and terminal event): 0.543441 (SE (H
   eta (variance of v, intra-subject correlation): 0.00500415 (SE (H): 0.000297851 ) p = 0

   penalized marginal log-likelihood = -10055.07
   Convergence criteria:
   parameters = 6.42e-06 likelihood = 2.82e-06 gradient = 6.47e-10

   LCV = the approximate likelihood cross-validation criterion
         in the semi parametric case     = 5.83945

   n observations= 1726  n subjects= 564      ( 255  observation deleted due to missing)
   n recurrent events= 1229
   n terminal events= 214
   n censored events= 497
   number of iterations:  12
```

THANK YOU!

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- However, hard drive capacities have historically grown faster than support for RAM, giving R the bad rap of being limited. Two key developments make this topic moot. With the appearance of 64-bit operating systems that support far more RAM and with R connectivity to databases, R can be made to support any size data set that SAS can support, including those that contain billions of observations.