## Welcome to the wonderful world of Open Source!!!

I am assuming you are reading this because you want to attend the C-15 Concurrent Session on "First Steps With Integrating R & RStudio Into Actuarial Workflow" at the 2017 CAS Annual Meeting. The session is designed as an interactive exploration. For an optimal experience, you need to install four software components <u>before coming</u> to the session:

- 1. R (the programming language)
- 2. RStudio (an integrated development environment for the R language)
- 3. Additional R packages (using RStudio) (libraries of R programs that will be used for our demo)
- 4. TeX Live (a version of LaTeX, that is used for creating pdf documents)

Please make sure that you have an excellent internet connection and about 2GB of free hard disk space before attempting the installations.

Depending on the speed of your computer and your <u>internet connection</u>, this may take <u>an hour or longer</u> (especially the TeX Live installation), so please plan accordingly. To avoid it taking that long, do the installation while you are connected to the internet using an Ethernet connection (not WiFi). Also note that the bottleneck is the TeX Live installation. If you don't install this, you will still be able to run all but the last line of the session script (i.e. you won't be able to create a pdf).

The following instructions assume that you have 64-bit Windows computer. Please let me know if that does not work for you. Also note that some of the screenshots show earlier versions of the software components, but the menus should still be all the same.

Here are the step-by-step installation instructions (if you run into any issues, please let me know right away):

- 1. Download and install R 3.4.2 for Windows (64 bit)
  - a) Download self-extracting installer: <u>https://cran.r-project.org/bin/windows/base/R-3.4.2-win.exe</u> (click here, if you want to see the official download page)
  - b) Once downloaded, double click (or otherwise run) "R-3.4.2-win.exe"
  - c) Select "English" (or your preferred language) and click on "OK"
  - d) Click on "Next >" to get to next pop-up
  - e) Click on "Next >" (acknowledging license information)
  - f) Click on "Next >" (accept default path)

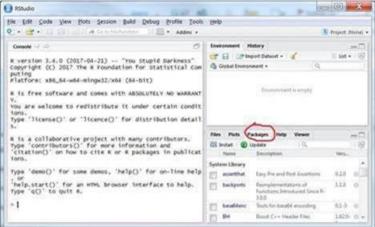
g) In the "Select Components" pop-up, I recommend that you select "Core Files" and "64-bit Files" (OK to select everything if you don't care about minimizing disk space)

Select Components	-	
Which components should be installed?	R	
Select the components you want to install; clear the con install. Click Next when you are ready to continue.	ponents you do not want to	
Custom installation	•	
Core Files	72.5 MB	
32-bit Files	45.7 MB	
64-bit Files	46.8 MB	
Message translations.	7.3 MB	
Current selection requires at least 120.4 MB of disk space	<b>1</b>	

- h) Click on "Next >" (accept default startup options)
- i) Click on "Next >" (accept default start menu folder)
- j) Click on "Next >" (accept default additional tasks)
- k) R should start installing; click on "Finish" to close pop-up
- 2. Download and install RStudio Desktop 1.0.153 for Windows
  - a) Download self-extracting installer: <u>https://download1.rstudio.org/RStudio-1.0.153.exe</u> (click here, if you want to see the official download page)
  - b) Once downloaded, double click (or otherwise run) "RStudio-1.0.153.exe"
  - c) Click on "Next >" to get to next pop-up
  - d) Click on "Next >" (accept default path)
  - e) Click on "Install" (accept default start menu folder)
  - f) R Studio should start installing; click on "Finish" to close pop-up
- 3. Download and install R packages
  - a) Start RStudio Start -> All Programs -> RStudio -> RStudio (look for the following icon):



b) Find the "Packages" tab within the bottom right panel:



c) Click on "Install" to download and install the packages:

	Viewer		P
💽 Install) 💿 Update	Q,		3
N Install R packages In		Vers	

 Paste the following string (without quotes) into the input box and click on "Install" "data.table ggplot2 kableExtra knitr matrixStats"

Install from:	Configuring Repositories
Repository (CRAN, CRANe	extra) 🔻
Packages (separate multipl	e with space or comma):
data.table ggplot2 kableEx	tra knitr matrixStats
Install to Library:	
C:/Program Files/R/R-3.4.0	)/library [Default]
☑ Install dependencies	Install

 e) The packages should install; <u>this is going to take some time</u>, since it will install a number of other packages that are required;

If you are watching closely, you will see some activity in the console pane (bottom left of the RStudio window), but often it may look like nothing is happening.

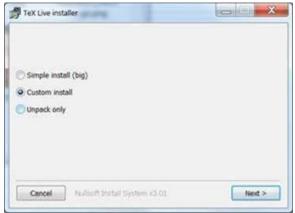
Console 1:/115PBC01/2017/Calcs/ @ -> lbl54 <- newLabellingFunction("54 Net SL ") rownames(simSummary)<-c("P N","G N","R N" > "P N, G N, K N, "P Unlimited", lblP(LimsP), "G Unlimited", lblG(LimsG), "R Unlimited", lblR(LimsR), + + + "S1 Net bsL", lbls1(LimssL), "S2 Net bsL", lbls2(LimssL), "S3 Net bsL", lbls3(LimssL), + + ÷ "54 Net b5L", 1b154(LimsSL)) + > simSummary <- t(simSummary)</pre> write.csv(simSummary, file = "Simulation Summary.csv") > > simResults <- as.data.table(t(simResults))</pre> > colnames(simResults)<-colnames(simSummary)</pre> > fwrite(simResults, file = "Simulation Detail.csv", col.names = TRUE) > numSims <- 100000 > simResults <- vapply(rep(0,numSims),`iRes`,numeric(35))</pre>

- f) Once there is not further activity in the console pane (i.e. nothing is happening, and there is no red "STOP" icon), you can guit RStudio (no saving necessary).
- 4. Download and install TeX Live 2017 for Windows (if at all possible, install this while connected to the internet via Ethernet [not WiFi])
  - a. Download self-extracting installer: <u>http://mirror.ctan.org/systems/texlive/tlnet/install-tl-windows.exe</u> (click here, if you want to see the official download page)
  - b. Once downloaded, double click (or otherwise run) "install-tl-windows.exe"
     You may get a security warning (may look different depending on how you download and then attempt to run the file) please ignore and confirm that you want to run the file anyway:

the pul		not be verified. Are you sure you want to run this
	Name:	C:\Users\thomash\Downloads\install-tl-windows.exe
	Publisher:	Unknown Publisher
	Type:	Application
	From	C:\Users\thomash\Downloads\install-ti-windows.exe
2 Alway	ys ask before o	Run Cancel
8	You should a	a not have a valid digital signature that verifies its publisher. nly run software from publishers you trust. <u>How can</u>

There is a "STOP" icon (DON'T CLICK IT) that tells you that R is still busy:

c. Select "Custom install" and click on "Next >"



- d. Make sure you have a fast internet connection, and click on "Install"
- e. Click on "Continue" (ignore the notice that disabling virus scan may be necessary [it isn't])
- f. You will get the following pop-up (red circles indicate where customizations are recommended; see steps below):

	TeX Live 2017	Installation				
	Basic Infor	mation				
	Selected scheme	scheme-full	Change			
		Further Customization				
25001	Installation collections		Change			
53	41 collections out of 41 (disk s					
America	Portable setup	setup No	Toggle			
- 3 W						
	TEXDIR (the main TeX directory)	C:\textive\2017	Chang			
	TEXMFLOCAL (directory for site-wide local files)	C:\textive\texmf-local	Chang			
	TEXMFSYSVAR (directory for autogenerated data)	C:\textive\2017\texmf-var	Chang			
$\bigcirc$	TEXMFSYSCONFIG (directory for local config)	C:\textive\2017\texmf-config	Chang			
$\sim$	TEXMFHOME (directory for user-specific files)	~~\texmf	Chang			
	Option	ns	_			
<b>9</b>	Default paper size	A4	Toggl			
2	Allow execution of restricted list of programs via \write18	Yes	Toggl			
	Create all format files	Yes	Toggle			
	Install font/macro doc tree	Yes	Toggle			
$\succ$	Install font/macro source tree	Yes	Toggle			
EX Live 2017	Adjust PATH setting in registry	Yes	Toggle			
	Add menu shortcuts	TeX Live menu	Chang			
	Change file associations	Only new	Chang			
	Installation for all users	Yes	Toggle			
	Install TeXworks front end	Yes	Toggle			
	About Install Te	1				

g. Click on "Change" for "Selected scheme", select "basic scheme (plain and latex)", and click on "Ok":

	Selected scheme
C	full scheme (everything)
С	medium scheme (small + more packages and languages)
e	small scheme (basic + xetex, metapost, a few languages)
œ	basic scheme (plain and latex)
e	minimal scheme (plain only)
С	ConTeXtscheme
e	GUST TeX Live scheme
С	infrastructure-only scheme (no TeX at all)
Q	teTeX scheme (more than medium, but nowhere near full)
С	custom selection of collections
	Ok Cancel

- h. Click on "Change" for "Installation collections", select
  - Essential programs and files
  - Recommended fonts
  - LaTeX fundamental packages
  - LaTeX additional packages
  - LaTeX recommended packages
  - Windows-only support programs
    - ... [continued on next page]

## ... and click on "OK"

	Select the collections to b	e installed
<ul> <li>Essential programs and files</li> <li>BibTeX additional styles</li> <li>TeX auxiliary programs</li> <li>ConTeXt and packages</li> <li>Additional fonts</li> <li>Recommended fonts</li> <li>Graphics and font utilities</li> <li>Additional formats</li> <li>Games typesetting</li> <li>Humanities packages</li> <li>Arabic</li> <li>Chinese</li> <li>Chinese/Japanese/Korean (base)</li> <li>Cyrillic</li> </ul>	<ul> <li>☐ Czech/Slovak</li> <li>☐ US and UK English</li> <li>☐ Other European languages</li> <li>☐ French</li> <li>☐ German</li> <li>☐ Greek</li> <li>☐ Italian</li> <li>☐ Japanese</li> <li>☐ Korean</li> <li>☐ Other languages</li> <li>☐ Polish</li> <li>☐ Portuguese</li> <li>☐ Spanish</li> </ul>	<ul> <li>✓ LaTeXtundamental packages</li> <li>✓ LaTeX additional packages</li> <li>✓ LaTeX recommended packages</li> <li>✓ LuaTeX packages</li> <li>✓ Mathematics and science packages</li> <li>✓ MetaPost and Metafont packages</li> <li>✓ Music packages</li> <li>✓ Graphics, pictures, diagrams</li> <li>✓ Plain (La)TeX packages</li> <li>✓ PSTricks</li> <li>✓ Publisher styles, theses, etc.</li> <li>✓ TeXworks editor, TL includes only the Windows binary</li> <li>✓ Windows-only support programs</li> <li>✓ XeTeX and packages</li> </ul>
Select All Des	electAll	Ok Cancel

i. Click on "Toggle" for "Default paper size" to select "letter"; the pop-up should now look like this:

244 2271 202	TeXLive 201	51	11		
	TeX Live 201 ——Basic Info				
	Selected scheme	scheme-custom	Change		
	Further Cus	tomization —	-		
1000	Installation collections		Change		
\$39	6 collections out of 41 (disk space required: 1343 MB)				
Amile	Director		145 V		
1 m	Portable setup	No	Toggle		
	TEXDIR (the main TeX directory)	C:\textive\2017	Change		
X Live 2017	TEXMFLOCAL (directory for site-wide local files)	C:\textive\texmHocal	Change		
	TEXMFSYSVAR (directory for autogenerated data)	C:\textive\2017\texmf-var	Change		
$\bigcirc$	TEXMFSYSCONFIG (directory for local config)	C:\textive\2017\texmf-config	Change		
$\sim$	TEXMFHOME (directory for user-specific files)	~\texmf	Change		
-	Opti	ons ——			
<b>9</b>	Default paper size	letter	Toggle		
2	Allow execution of restricted list of programs via \write18	Yes	Toggle		
	Create all format files	Yes	Toggle		
	Install font/macro doc tree	Yes	Toggle		
$\times$	Install font/macro source tree	Yes	Toggle		
Ш.	Adjust PATH setting in registry	Yes	Toggle		
	Add menu shortcuts	TeX Live menu	Change		
	Change file associations	Only new	Change		
	Installation for all users	Yes	Toggle		
	Install TeXworks front end	No	Toggle		
	About Install ]	rex.Live Quit			

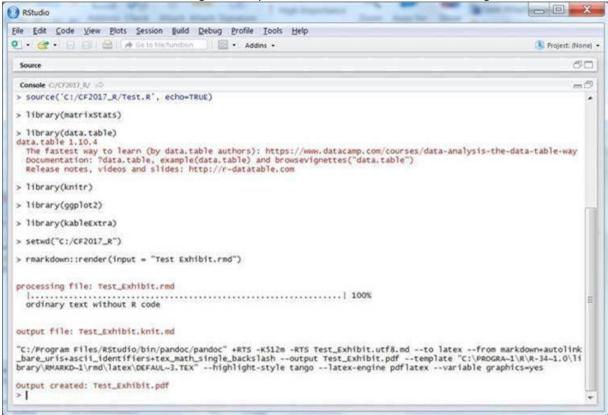
- j. Click on "Install TeX Live" and <u>wander off</u> to get a cup of coffee (i.e. this may take a while, but no active input is required once it starts)
- k. Close pop-up once everything has been installed

Congratulations! Almost done – if you want, you can test your installation by running the attached test script. To do so, please follow these instructions:

- A. Use the paper clip icon on the left to open the attachment "AnnualMeetingC15\_Test.zip". Note that this will likely prompt some sort of warning about the dangers of opening attachments downloaded from the internet. Please contact me at the email address given at the end of this document if your security settings do not allow you to access the attached zip archive.
  - B. Unzip the files "Test.R" and "Test Exhibit.rmd", making sure that they end up in the folder C:\AnnualMeetingC15
  - C. Sorry to belabor this, but make sure that the files end up in the folder C:\AnnualMeetingC15
     Double check the path! The way WinZip works, it is very easy for the files to end up in
     C:\AnnualMeetingC15\_Test\AnnualMeetingC15; i.e. in an extra subdirectory; if that happens, just move
     the files one level up and rename the top-level directory as needed.
  - D. Start RStudio, and use File -> Open File to open "Test.R" (which by now should be in C:\AnnualMeetingC15). Your screen should look like this:

Elle Edit Code View Plots Session Build Debug Profile Tools	elp			
	ep	🔳 Proj	ect: (None)	
Ø)Test.R ×	Environment History		-0	
2 Source on Save 9 2 . D	🚰 🔒 🔐 Import Dataset + 🧹		List • (6	
1 Dibrary(matrixstats) 2 library(data.table) 3 library(knitr)	🚳 Global Environment -	(Q.		
<pre>4 library(ggplot2) 5 library(kableExtra) 6 7 setwd("C:/CF2017_R") 8 9 rmarkdown::render(input = "Test Exhibit.rmd")</pre>	Environm	neot is empty		
1:1 (Top Level) = R Script =				
Console -/ 🕫 📩 🗂				
Platform: x86_64-w64-mingw32/x64 (64-bit)				
R is free software and comes with ABSOLUTELY NO WARRAN	Files Plots Packages Help Viewer			
TY. You are welcome to redistribute it under certain condi	🔯 Install 🕜 Update	( Q,		
You are welcome to redistribute it under certain condi- tions.	Mame Description	Q, Version	6	
you are welcome to redistribute it under certain condi	the state of the s		6	
You are welcome to redistribute it under certain condi- tions. Type 'license()' or 'licence()' for distribution detai ls.	Name Description	Version	6	
You are welcome to redistribute it under certain condi- tions. Type 'license()' or 'licence()' for distribution detai 15. R is a collaborative project with many contributors. Type 'contributors()' for more information and	Name Description System Library assertthat Easy Pre and Post Ass	Version		
<pre>vou are welcome to redistribute it under certain condi tions. Type 'license()' or 'licence()' for distribution detai ls. R is a collaborative project with many contributors.</pre>	Name Description System Library asserthat Easy Pre and Post Ass backports Reimplementations o	Version ertions 0.2.0 f Functions Introduced Since R- 1.1.0	•	
<pre>vou are welcome to redistribute it under certain condi tions. Type 'license()' or 'licence()' for distribution detai ls. R is a collaborative project with many contributors. Type 'contributors()' for more information and 'citation()' on how to cite R or R packages in publica tions.</pre>	Name Description System Library assertthat Easy Pre and Post Ass backports Reimplementations of 3.0.0	Version entions 0.2.0 If Functions Introduced Since R- 0.1-3	0	
<pre>vou are welcome to redistribute it under certain condi tions. Type 'license()' or 'licence()' for distribution detai ls. R is a collaborative project with many contributors. Type 'contributors()' for more information and 'citation()' on how to cite R or R packages in publica tions. Type 'demo()' for some demos, 'help()' for on-line hel p, or</pre>	Name         Description           System Library	Version entions 0.2.0 If Functions Introduced Since R- 0.1-3	0	
<pre>You are welcome to redistribute it under certain condi tions. Type 'license()' or 'licence()' for distribution detai ls. R is a collaborative project with many contributors. Type 'contributors()' for more information and 'citation()' on how to cite R or R packages in publica tions. Type 'demo()' for some demos, 'help()' for on-line hel</pre>	Name         Description           System Library	ertions 0.2.0 (Functions Introduced Since R- ding 0.1-3 es 1.62.0-1	0000	

E. Click on the "Source" icon – if all goes well your console should have the following content:



- F. You should be able to view the pdf file "Test\_Exhibit.pdf" in the C:\AnnualMeetingC15 folder
- G. If you don't end up with the file "Test\_Exhibit.pdf" in your C:\AnnualMeetingC15 folder, don't hesitate to make a screen shot of your console output (copying and pasting the text should also work) and send it to me via email

OK, now you are done with the installation. Note that there is a separate document with the R scripts for the actual session and a pre-session check list (see "C15 Session R Scripts.pdf").

Let me know if you run into any issues, or have any questions. Here is my contact information:

Thomas Hartl <thomas.hartl@milliman.com>.