

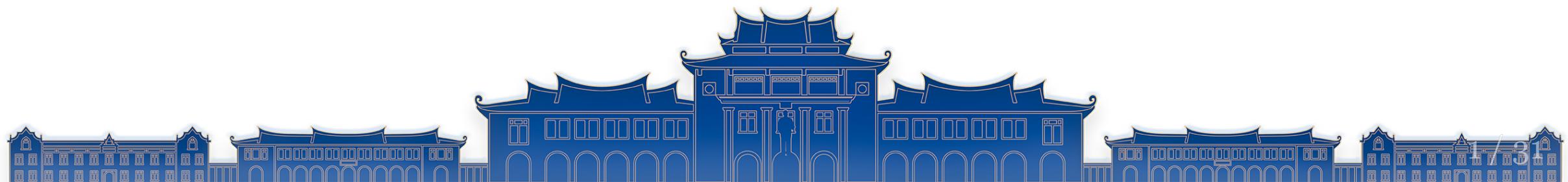
量化金融与金融编程

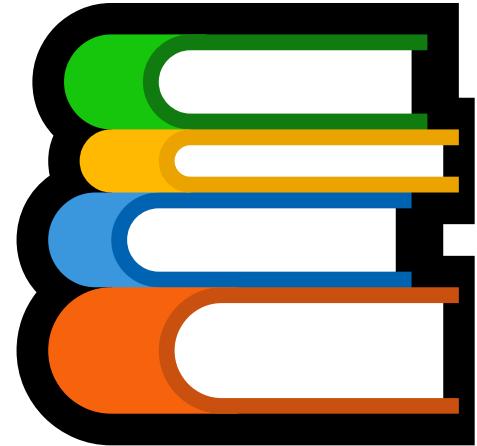
L01 开课啦 

曾永艺

厦门大学管理学院

2023-09-15





• 课程简介

- 量化金融与金融编程 
- 学好这门课的正确方式 
- 谁该选这门课? 

• RStudio 概览

-   

1. 课程简介





{知乎神回复}



Q: 考上好大学学 IT 是不是当今中国穷人家孩子晋级中产唯一的出路？

A: 对，就4条路：写代码；搞金融；在代码圈搞金融；在金融圈写代码



{{清华大学计算机与金融双学士学位}}

当计算机遇上金融

会碰撞出什么样的火花?

2020年高考季

如果你既想学计算机科学与技术改变世界

又想学经济与金融经世济民

你不必再遗憾于鱼和熊掌不可兼得

也不必再纠结未来何时弥补“曲线救国”

清华大学计算机与金融双学士学位

启动本科招生

为你的梦想提出了完美解决方案



计算机+金融=?

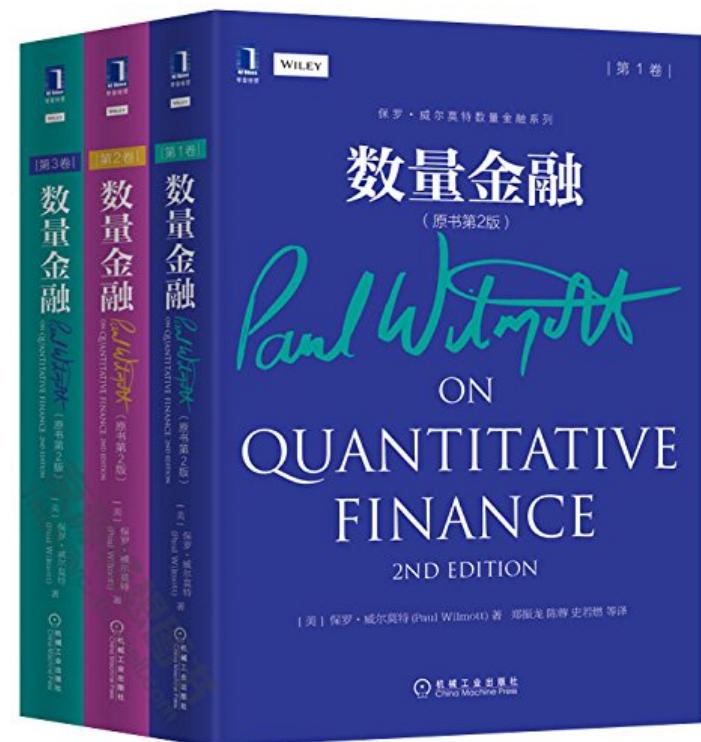
清华大学计算机与金融双学士学位招生项目

{{“状元收割神器”}}



1.1 量化金融 与 金融编程

- Paul Wilmott著，郑振龙 等译，机械工业出版社，2015年
- 83章，1200+页！
 - 第一部分 数理与金融基础、衍生品基本理论、风险与收益
 - 第二部分 奇异合约及路径依赖
 - 第三部分 固定收益的建模和衍生品
 - 第四部分 信用风险
 - 第五部分 进阶主题



1.1 量化金融 与 **金融编程 R 语言编程**

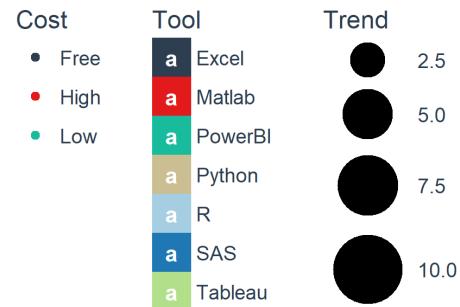
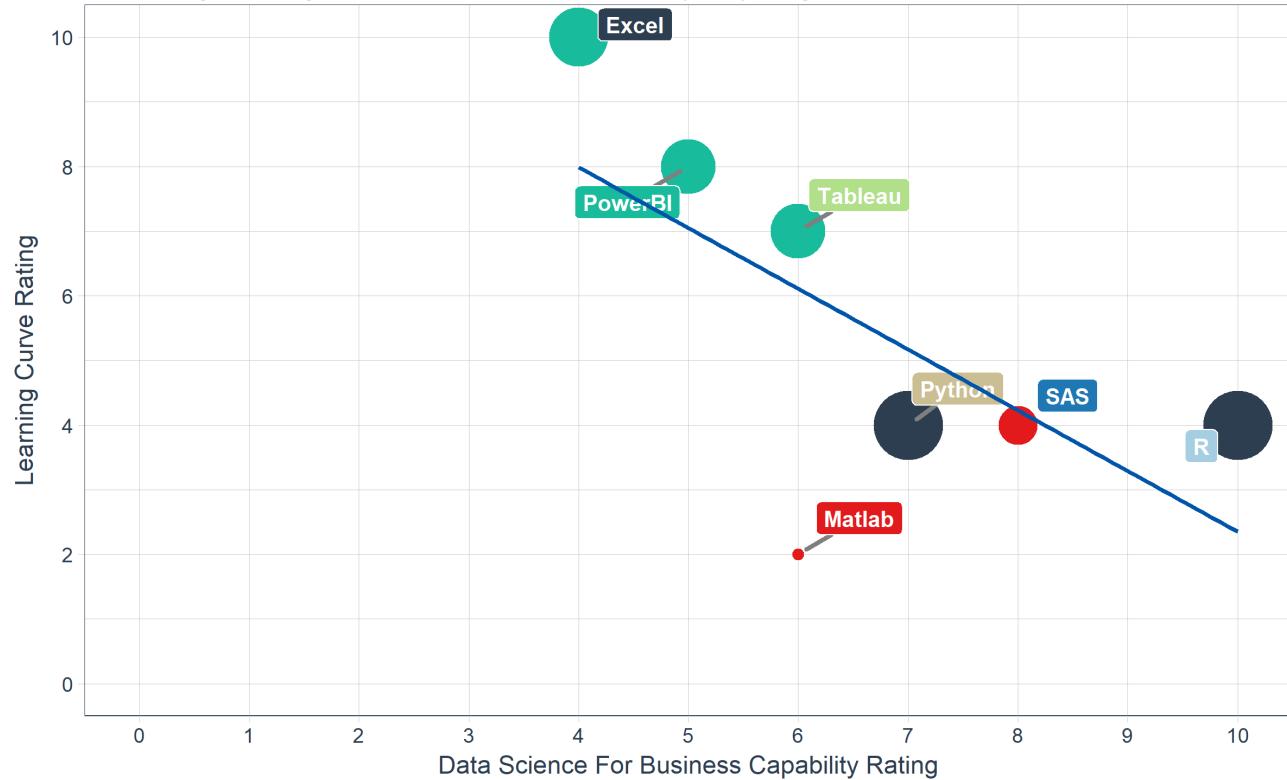


- "*a free software environment for ...*"
- "... *statistical computing and graphics*"

- 支持 Windows、MacOS、Unix 等众多主流操作系统
- 功能强大，“几乎”应有尽有
 - {{CRAN}} 上现 (2023-09-14) 有 19877 个扩展 R 包！
 - {{github}} 上也托管着大量的 R 包
- 学习曲线适中
- 良好的编程社区支持
- 免费、开源！

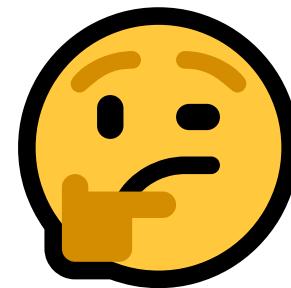
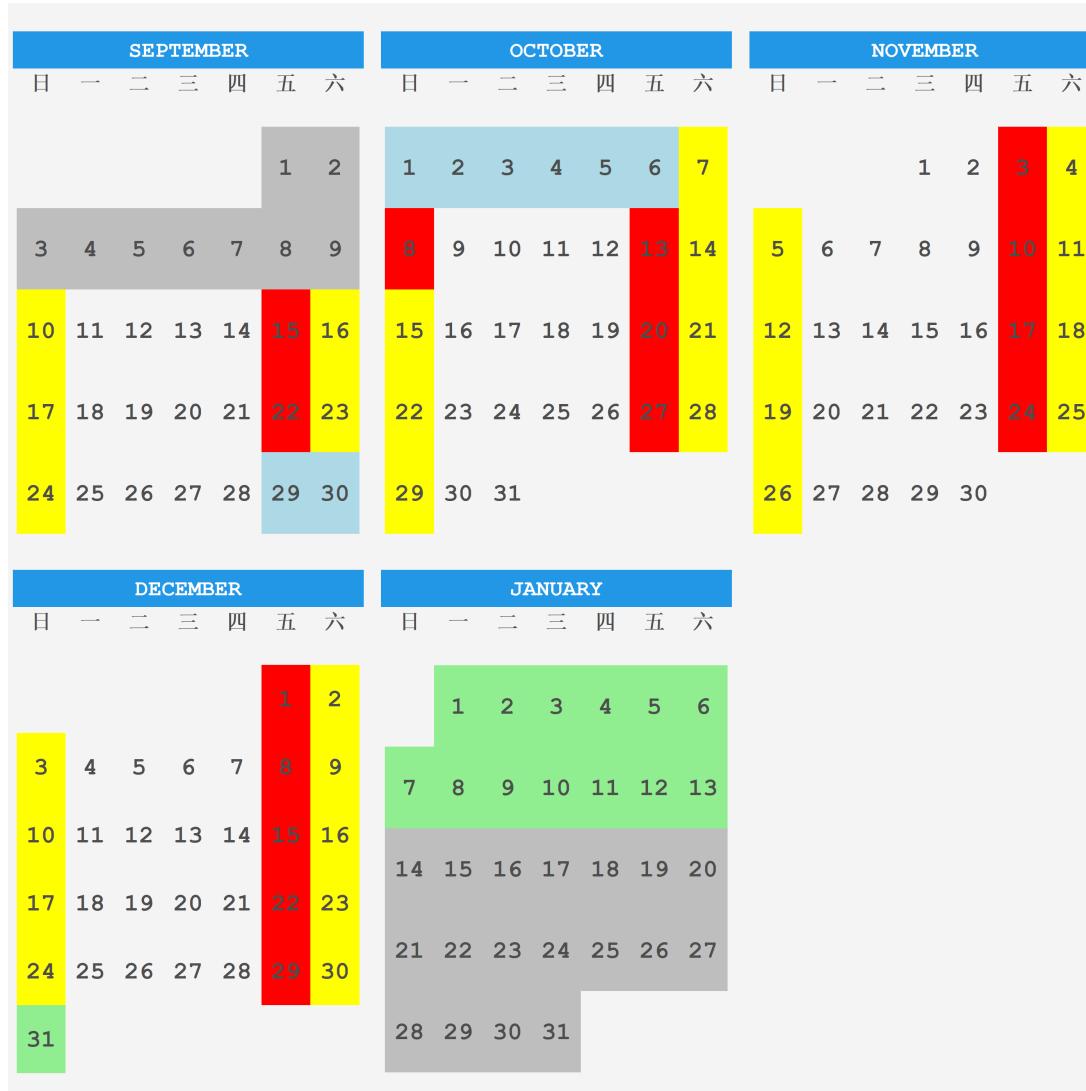
DS4B Tools: Capability Vs Learning Curve

R has a longer learning curve but has a massive business capability rating



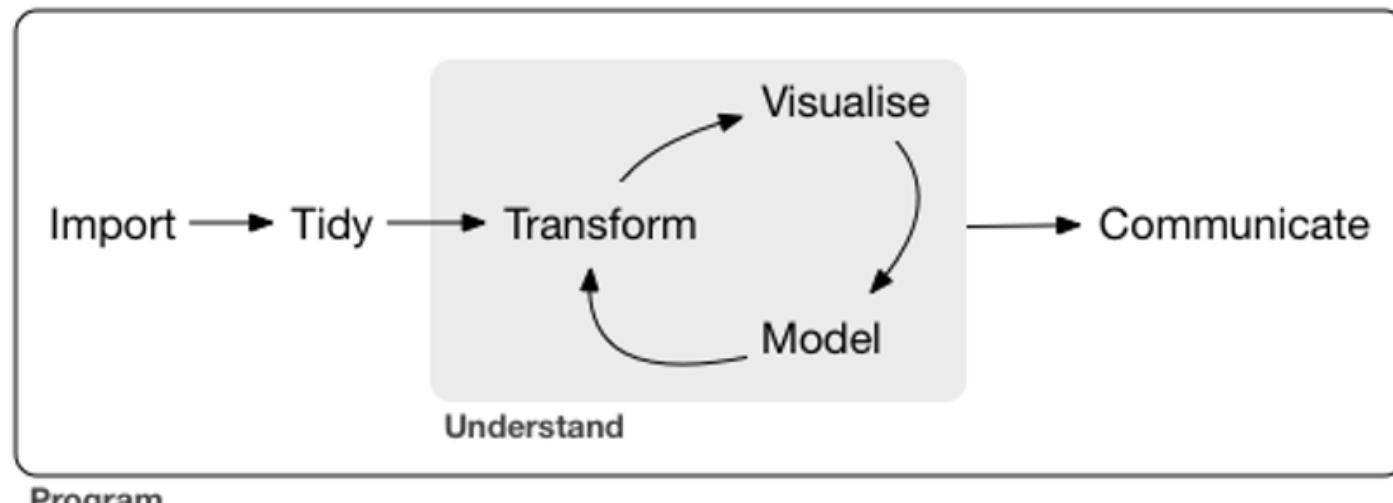
Sep 2023	Sep 2022	Change	Programming Language	Ratings	Change
1	1		 Python	14.16%	-1.58%
2	2		 C	11.27%	-2.70%
3	4		 C++	10.65%	+0.90%
4	3		 Java	9.49%	-2.23%
5	5		 C#	7.31%	+2.42%
6	7		 JavaScript	3.30%	+0.48%
7	6		 Visual Basic	2.22%	-2.18%
8	10		 PHP	1.55%	-0.13%
9	8		 Assembly language	1.53%	-0.96%
10	9		 SQL	1.44%	-0.57%
11	15		 Fortran	1.28%	+0.26%
12	12		 Go	1.19%	+0.03%
13	14		 MATLAB	1.19%	+0.13%
14	22		 Scratch	1.08%	+0.51%
15	13		 Delphi/Object Pascal	1.02%	-0.07%
16	16		 Swift	1.00%	+0.02%
17	26		 Rust	0.97%	+0.47%
18	18		 R	0.97%	+0.02%
19	20		 Ruby	0.95%	+0.30%
20	34		 Kotlin	0.90%	+0.59%

1.2 学好这门课的正确方式



1.2 学好这门课的正确方式

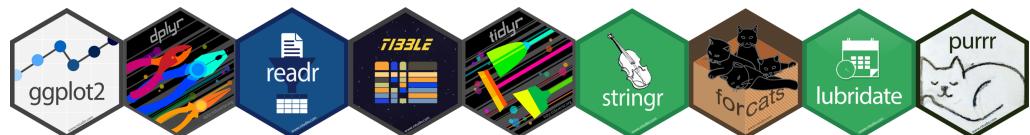
✓ 掌握科学的**workflow**, 提升效率



《Workflow from "R for Data Science, 2e"》

1.2 学好这门课的正确方式

Start with {{tidyverse}}



{{R Markdown}} | {{Quarto}}

- 将 (R、Python ...) 代码（及其动态计算结果，如图表等）和 Markdown 文字汇编成文档，并可转化为多种格式的输出
-> efficient and *reproducible research*

Stay in



1.2 学好这门课的正确方式

task导向，掌握核心 

- 专题任务
 - 数据搜集-整理-可视化
 - 投资组合优化
 - 资产定价模型
 - 衍生品定价
 - 量化交易策略
 - 实证研究文献复刻 ...
- {{CRAN Task views}}
 - Econometrics
 - Finance
 - TimeSeries
 - Optimization
 - MachineLearning
 - Graphics
 - ReproducibleResearch ...

1.2 学好这门课的正确方式

practice makes perfect!



纸上得来终觉浅，绝知此事要躬行。

——陆游·冬夜读书示子律

- 课上 2 学时/周
 - 我：概要 + 出题 + 答疑 + 扩展
 - 同学：听讲 + 练习 + 反馈
- **课后 5 小时/周**
 - 同学：预习 + 复习 + 作业
 - 我：备课 + (在线) 答疑解惑

- 课程的成绩构成：
 - 考勤：5%
 - 课堂参与：15%
 - 个人作业/随堂小测：40%
 - 小组研究项目：40% *

* 每个小组 ~ 4 名同学

1.3 谁该选这门课？

- 想继续读研深造的同学
- 毕业后想和金融（） 、数据打交道的同学
- 想更好理解金工、固收、金融数学、风险管理等专业课程的同学
- 希望能学习并掌握酷炫好玩新工具和新“姿势”的同学
- 其他

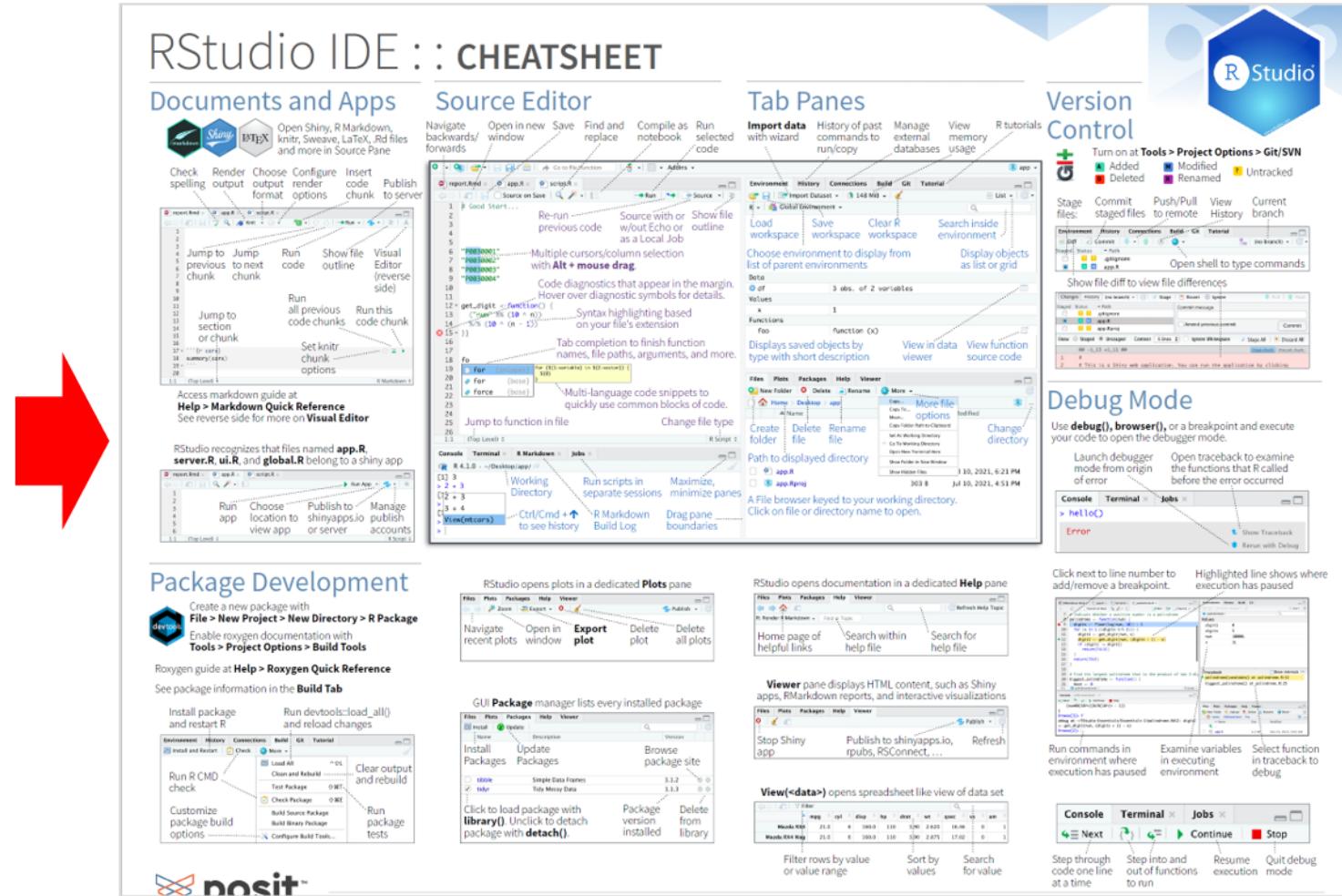
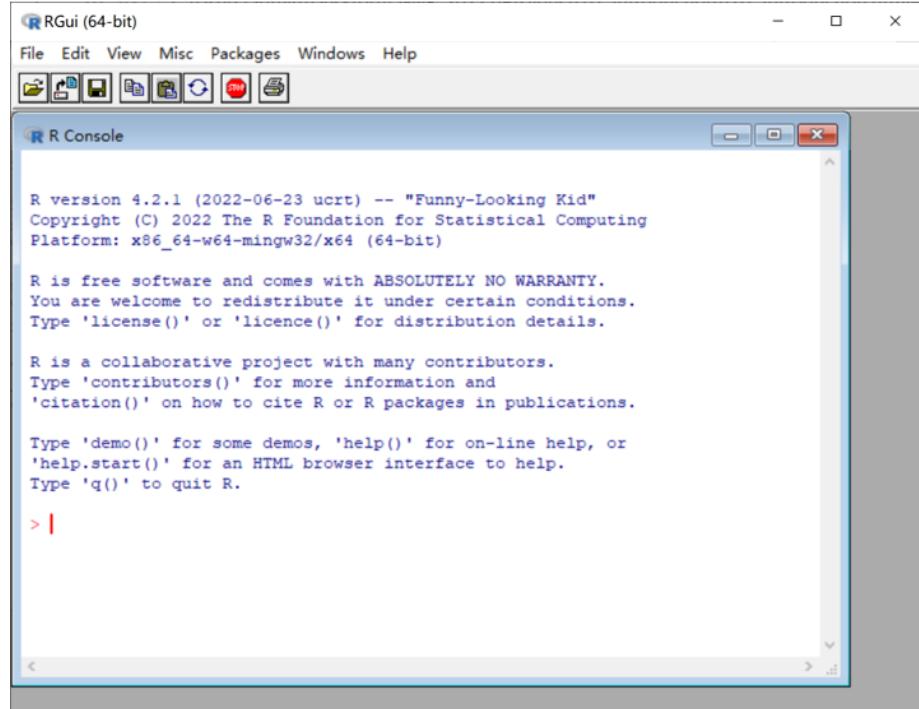


2. RStudio 概览

< R 语言的赋能工具！>



>> RStudio 为 R 赋能 {{rstudio-IDE-cheatsheet}} {{本地pdf版本}}





>> RStudio 快捷键

- Search command history	Ctrl+↑
- Interrupt current command	Esc
- Clear console	Ctrl+L
- Restart R Session	Ctrl+Shift+F10
- Run current line/selection	Ctrl+Enter
- Attempt completion	Tab or Ctrl+Space
- Insert <-	Alt+-
- Insert %>%	Ctrl+Shift+M
- (Un)Comment lines	Ctrl+Shift+C
- Knit document (knitr)	Ctrl+Shift+K
- Insert chunk	Ctrl+Alt+I
- Run the current chunk	Ctrl+Alt+C
- Show command palette	Ctrl+Shift+P
- Keyboard shortcuts help	Alt+Shift+K

>> RStudio's



3. SOS

(getting help)





>> help()

```
help(topic, package = NULL, lib.loc = NULL,  
      verbose = getOption("verbose"),  
      try.all.packages = getOption("help.try.all.packages"),  
      help_type = getOption("help_type"))
```

```
help(mean)    # ?mean  
help("for")   # ?"for"  
help(files)   # ?files  
help(package = "fs")  # package?fs  
#-----  
  
example(topic, package = NULL,  
        lib.loc = NULL, ...)  
vignette(topic, package = NULL,  
         lib.loc = NULL,  
         all = TRUE)  
browseVignettes(package = NULL,  
                lib.loc = NULL,  
                all = TRUE)
```

R Documentation

mean {base} ① 函数名及其所在的包

Arithmetic Mean ② 标题

Description ③ 描述

Generic function for the (trimmed) arithmetic mean.

Usage ④ 用法

```
mean(x, ...)  
## Default S3 method:  
mean(x, trim = 0, na.rm = FALSE, ...)
```

Arguments ⑤ 参数

- x An R object. Currently there are methods for numeric/logical vectors and [date](#), [date-time](#) and [time interval](#) objects. Complex vectors are allowed for `trim = 0`, only.
- trim the fraction (0 to 0.5) of observations to be trimmed from each end of `x` before the mean is computed. Values of `trim` outside that range are taken as the nearest endpoint.
- na.rm a logical value indicating whether NA values should be stripped before the computation proceeds.
- ... further arguments passed to or from other methods.

Value ⑥ 返回值

If `trim` is zero (the default), the arithmetic mean of the values in `x` is computed, as a numeric or complex vector of length one. If `x` is not logical (coerced to numeric), numeric (including integer) or complex, `NA_real_` is returned, with a warning. If `trim` is non-zero, a symmetrically trimmed mean is computed with a fraction of `trim` observations deleted from each end before the mean is computed.

References ⑦ 参考资料

Becker, R. A., Chambers, J. M. and Wilks, A. R. (1988) *The New S Language*. Wadsworth & Brooks/Cole.

See Also ⑧ 另参见

[weighted.mean](#), [mean.POSIXct](#), [colMeans](#) for row and column means.

Examples ⑨ 示例

```
x <- c(0:10, 50)  
xm <- mean(x)
```



>> help.search() & RSiteSearch()

```
help.search(pattern, fields = c("alias", "concept", "title"),
            apropos, keyword, whatis, ignore.case = TRUE,
            package = NULL, lib.loc = NULL,
            help.db = getOption("help.db"),
            verbose = getOption("verbose"), rebuild = FALSE,
            agrep = NULL, use_UTF8 = FALSE,
            types = getOption("help.search.types"))
```

```
# Search for key words or phrases in help pages, vignettes or task views,
# using the search engine at http://search.r-project.org and view them
# in a web browser.
RSiteSearch(string,
            restrict = c("functions", "descriptions", "news", "Rfunctions",
                        "Rmanuals", "READMES", "views", "vignettes"),
            format,
            sortby = c("score", "date:late", "date:early", "subject",
                      "subject:descending", "size", "size:descending"),
            matchesPerPage = 20,
            words = c("all", "any"))
```



>> sos::findFn() & packagefinder::fp()

```
# Search Contributed R Packages, Sort by Package
# install.packages("sos")
help(package = "sos")

sos::findFn(string, maxPages = 100, sortby = NULL, verbose = 1, ...)
## ???string(maxPages)
# Returns a data.frame from RSiteSearch(string, "functions") which can be
# sorted and subsetted by user specifications and viewed in an HTML table.
```

```
# Comfortable Search for R Packages on CRAN
# install.pacages("packagefinder")
help(package = "packagefinder")
```

```
findPackage(keywords = NULL, query = NULL, mode = "or",
            case.sensitive = FALSE, always.sensitive = NULL,
            weights = c(2, 2, 1, 2), display = "viewer",
            results.longdesc = FALSE, limit.results = 15,
            silent = FALSE, index = NULL,
            advanced.ranking = TRUE, return.df = FALSE,
            clipboard = FALSE)
```



>> {{CRAN Task views}}

```
# install.packages("ctv")
ctv::available.views(repos = "https://cran.r-project.org")[[14]]
```



```
#> CRAN Task view
#> -----
#> Name:      ExperimentalDesign
#> Topic:     Design of Experiments (DoE) & Analysis of Experimental Data
#> Maintainer: Ulrike Groemping, Tyler Morgan-Wall
#> Contact:   ulrike.groemping@bht-berlin.de
#> Version:   2023-04-05
#> Repository: https://cran.r-project.org
#> Source:    https://github.com/cran-task-views/ExperimentalDesign/
#> Packages:  acebayes, agricolae*,agridat, AlgDesign*, ALTopt, asd,
#>             BatchExperiments, bcrm, BHH2, binseqtest, bioOED,
#>             blocksdesign, blockTools, BOIN, choiceDes, CombiNS,
#>             conf.design*, crmPack, crossdes*, Crossover, dae, daewr,
#>             designmatch, desirability, desplot, dfcomb, dfcrm, dfmta,
#>             DiceDesign, DiceEval, DiceKriging, Diceview, docopulae,
#>             DoE.base*, DoE.MIParray, DoE.wrapper*, DoseFinding,
#>             dynatree, easypower, EngrExpt, experiment, g3, FMC
```

>> 网络社区

- 有问题就问 或者直接上 stackoverflow
- 登录 posit™, 关注
 - Products 栏目下的 {{Open Source}}, 特别是其中的 {{R Packages}}
 - Learn & Support 栏目下的 {{Resources}}, 包括 {{Blogs}}、{{Videos}} 和 {{Cheatsheets}}
 - {{Posit Community}}
- 订阅 -bloggers, 和 R 圈保持同步!

-
- 登录 統 CAPITAL OF STATISTICS
PROFESSION, HUMANITY & INTEGRITY



>> QQ课程群



群名：量化金融与金融编程
群号：922652997

>> {{reprex}} 包: Help Me Help You}



Prepare Reproducible Example Code via the Clipboard

The screenshot shows the RStudio interface. In the top-left corner of the code editor, there is a small green hexagonal icon with the word "reprex" and a small icon of a person at a desk.

The code editor window contains the following R code:

```
1 mtcars
2 ggplot(mtcars) %>%
3   geom_point(aes(mpg, wt))
```

The R console window displays the standard R startup message:

```
R version 4.0.2 (2020-06-22) -- "Taking Off Again"
Copyright (C) 2020 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.
```

>> 领域 + R 书籍



课后作业 与 课前预习





⌚ 明确是否选修这门课程

- 若确定不选，请尽快在 **{{厦门大学教学服务平台}}** 上提出退课（申请）
 - 若确定选修本门课程，请于2023年9月17日24:00前通过 **{{坚果云链接}}** 回答几道问题
-

⌚ 初步了解 RStudio 的工作界面，并大致浏览下 **{{rstudio-IDE-cheatsheet}}**

⌚ 在 RStudio 命令窗口中键入 `help(mean)` 和 `help(files)`，了解 R 帮助文档的整体结构

⌚ 到前面课件中提到的那些 **{{网络社区}}** 随意逛逛

⌚ 完成课前预习（具体任务下周一前我会在 QQ 课程群上通知）



本网页版讲义的制作由 **R** 包 `{{xaringan}}` 赋能！