Using R/RStudio to Analyze Financial Time Series

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Outline

R Packages

There is an extensive range of packages in R. For collecting and analyzing financial time series, some of the packages we will use include:

- Financial data collection from internet (tidyquant, quantmod)
- Time series (xts,zoo)
- Time series forecasting (fpp2)
- Regression modeling (car)
- Non-linear volatility models (rugarch)
- Regime modeling (fxregime)

R Package: tidyquant

Collects financial time series from internet

- www.finance.yahoo.com
    - Stocks: GE, AMZN, GME, etc.
    - Indexes: SP500, VIX
    - Cryptos: BTC-USD

- https://fred.stlouisfed.org/ *(FRED)*
    - Interest rates of US Government Bonds/Bills
    - Interest rates of Foreign governments
    - Foreign exchange rates
    - Commodities: West-Texas-Intermediate Crude Oil
    - Macro-Economic Series: GDP, Unemployment, CPI

R Notebook: FM_Intro1.rmd

The R notebook illustrates the download and display of a variety of financial time series data from these internet sites.

- The code chunks use the R package *tidyquant* which provides easy downloading of financial time series from the internet.
- Compile/output the notebook to PDF/HTML/PPT files that contain all R commands/output/plots.
- Data saved in R workspace file "data_fm_intro1.Rdata' ', which can be used by R scripts to analyze/model the data.

Outline

RStudio Cloud

RStudio Cloud is portable but it is heavily dependent on an internet connection and the internet speed.

- The ebook *R Guide for NSC Statistics*, by Deanna Li, https://bookdown.org/dli/rguide/, provides a good introduction to R and the use of RStudio Cloud or Desktop RStudio (see next section).
- Chapter 1 details how RStudio Cloud runs in a browser connected to RStudio Server.
- Go to https://posit.cloud/plans and create a free account. You will then be ready to write R scripts, R Markdown documents, etc.

Running RStudio Cloud and Using an R Markdown Document.

- Log in to RStudio Cloud using your login and password created for your free account.
- In the top-left RStudio Panel, you can rename *Your Workspace* (I chose the name Project1).
- From the top left menu, select File/New File/R Markdown and select *OK*. An untitled R markdown file is created.
- Copy all the text in the file *FM_Intro1.Rmd* (from Canvas) and paste over all the template text in the R markdown file.
- Save the R markdown file as (your copy of) *FM_Intro_1.Rmd*.
- In the top left panel, click the *Knit* icon to create an output document (html or pdf) with all the R commands and output.

Notes on Using RStudio Cloud

- When using RStudio Cloud, you will be asked to ok installing various R packages as you save/knit R markdown documents. Go ahead and install all packages.
- The canvas file rstudio-export.zip was exported from RStudio Cloud. When you follow the steps above, your RStudio Project directory should look similar.

Desktop RStudio - An Alternative

- Desktop RStudio is not as portable but you can write scripts anywhere without an internet connection. You may find the desktop version has a much faster interface than the cloud version.
- The ebook *R for Data Science*, by Hadley Wickham and Garrett Grolemund, https://r4ds.had.co.nz/, provides a good introduction to R. See Section 1.4 for installing RStudio Desktop.

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