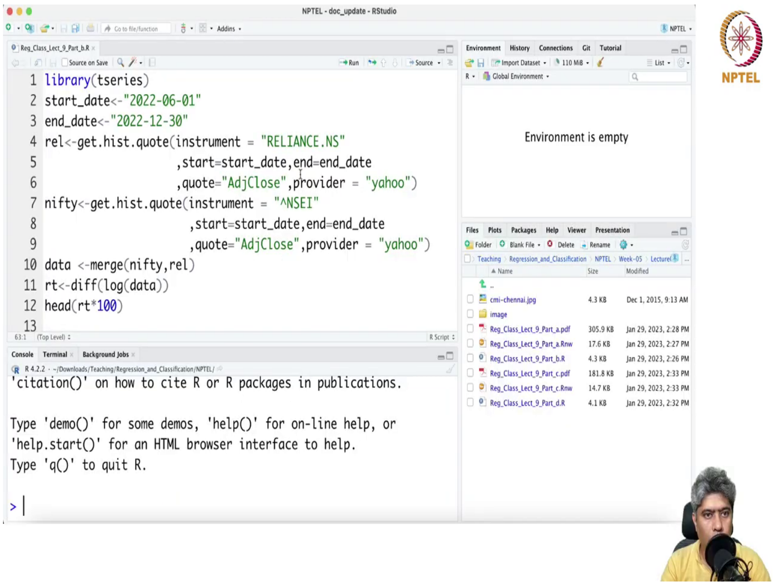
Predictive Analytics - Regression and Classification
Prof. Sourish Das
Department of Mathematics
Chennai Mathematical Institute

Lecture - 31
Hands on with R for CAPM

Hello all welcome back to the part B of lecture 9. In this video lecture, we will do some hands on with R. So, let me first open my R, RStudio.

(Refer Slide Time: 00:34)

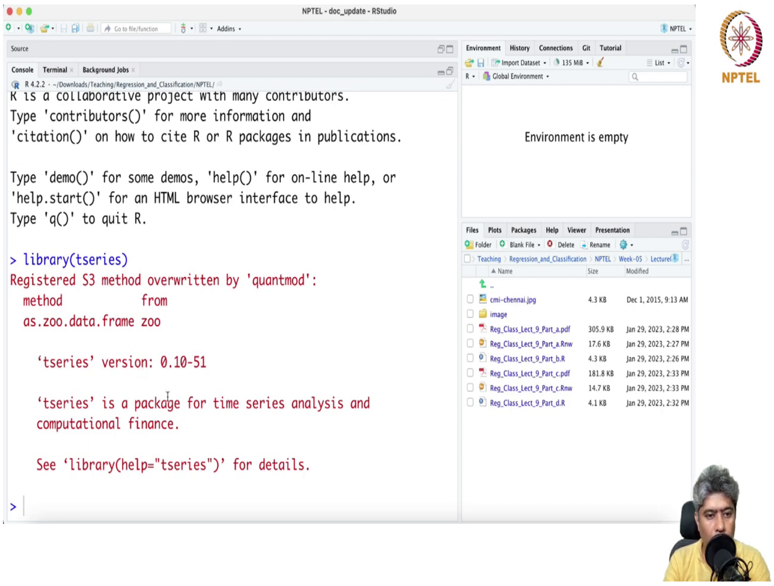


```r
library(tseries)
start_date<-"2022-06-01"
end_date<-"2022-12-30"
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
head(rt*100)
```

```
'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.

>
```

So, this is the code that I have partially showed you in the, in my part first part of this lecture 9, where I am going to use this first line, the live T series package. In case you do not have T series package in your. So, if you run this.

(Refer Slide Time: 01:01)



```
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.

> library(tseries)
Registered S3 method overwritten by 'quantmod':
  method            from
  as.zoo.data.frame zoo

    'tseries' version: 0.10-51

    'tseries' is a package for time series analysis and
    computational finance.

    See 'library(help="tseries")' for details.

>
```

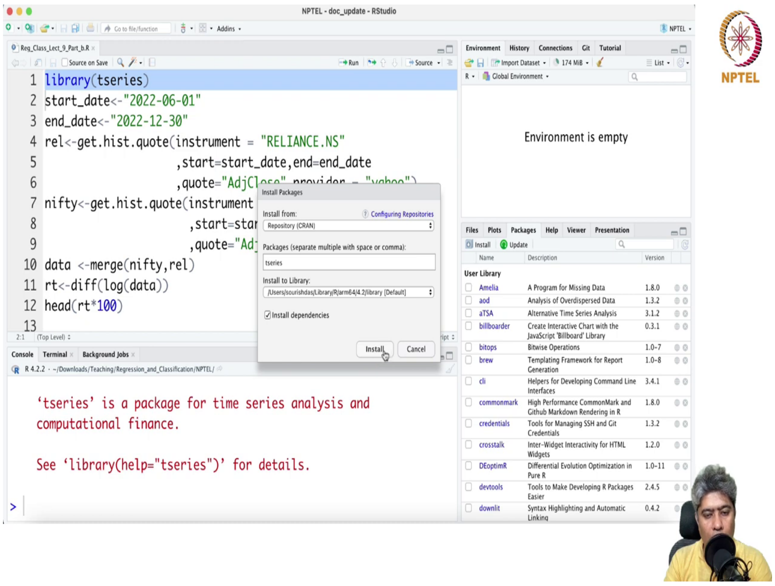
Environment is empty

Teaching › Regression_and_Classification › NPTEL › Week-05 › Lecture

Name	Size	Modified
..		
cmi-chennai.jpg	4.3 KB	Dec 1, 2015, 9:13 AM
image		
Reg_Class_Lect_9_Part_a.pdf	305.9 KB	Jan 29, 2023, 2:28 PM
Reg_Class_Lect_9_Part_a.Rnw	17.6 KB	Jan 29, 2023, 2:27 PM
Reg_Class_Lect_9_Part_b.R	4.3 KB	Jan 29, 2023, 2:26 PM
Reg_Class_Lect_9_Part_c.pdf	181.8 KB	Jan 29, 2023, 2:33 PM
Reg_Class_Lect_9_Part_c.Rnw	14.7 KB	Jan 29, 2023, 2:33 PM
Reg_Class_Lect_9_Part_d.R	4.1 KB	Jan 29, 2023, 2:32 PM

So, in this case you may get a like you know it is this kind of information. If you do not have T series package then in your R install, then what you can do you can see here if there is a package you can see ok.

(Refer Slide Time: 01:21)



```
library(tseries)
start_date<-"2022-06-01"
end_date<-"2022-12-30"
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument
                      ,start=star
                      ,quote="Adj
data <-merge(nifty,rel)
rt<-diff(log(data))
head(rt*100)
```

Install Packages

Install from: Repository (CRAN)

Packages (separate multiple with space or comma): tseries

Install to Library: /Users/sourishdas/Library/R/arm64/4.2/library [Default]

☑ Install dependencies

Install Cancel

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/

'tseries' is a package for time series analysis and
computational finance.

See 'library(help="tseries")' for details.

>
```

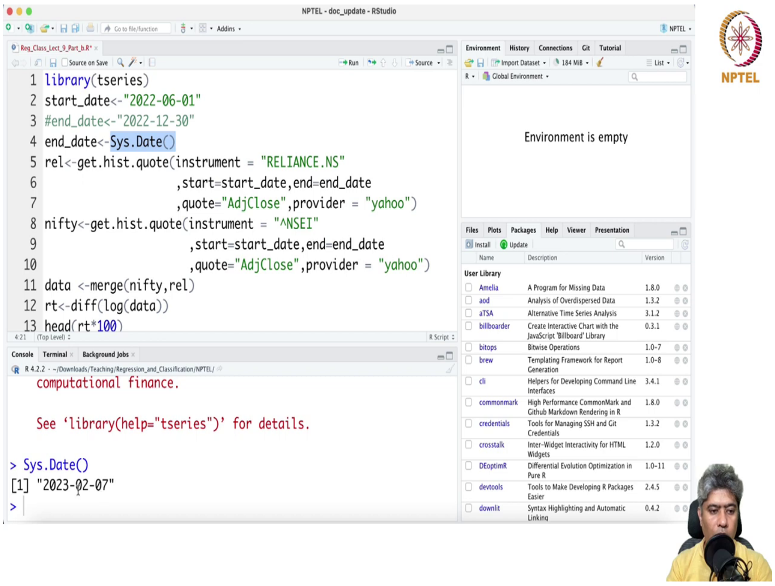
Environment is empty

Name	Description	Version
User Library		
Amelia	A Program for Missing Data	1.8.0
aod	Analysis of Overdispersed Data	1.3.2
aTSA	Alternative Time Series Analysis	3.1.2
billboarder	Create Interactive Chart with the JavaScript 'Billboard' Library	0.3.1
bitops	Bitwise Operations	1.0-7
brew	Templating Framework for Report Generation	1.0-8
cli	Helpers for Developing Command Line Interfaces	3.4.1
commonmark	High Performance CommonMark and Github Markdown Rendering in R	1.8.0
credentials	Tools for Managing SSH and Git Credentials	1.3.2
crosstalk	Inter-Widget Interactivity for HTML Widgets	1.2.0
DEoptimR	Differential Evolution Optimization in Pure R	1.0-11
devtools	Tools to Make Developing R Packages Easier	2.4.5
downlit	Syntax Highlighting and Automatic Linking	0.4.2

In package you can click on there you can go to install and then if you write tseries and make sure your install dependency is corrected check and then you click install. Now, I am not going to install because it is already installed in my R environment. So, I am cancelling it.

Now, I am going to consider the start date as 1st June 2022 and in the analysis that I have shown in the package in the previous video I have considered 30th December 2022.

(Refer Slide Time: 02:11)



```
library(tseries)
start_date<-"2022-06-01"
#end_date<-"2022-12-30"
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
head(rt*100)
```

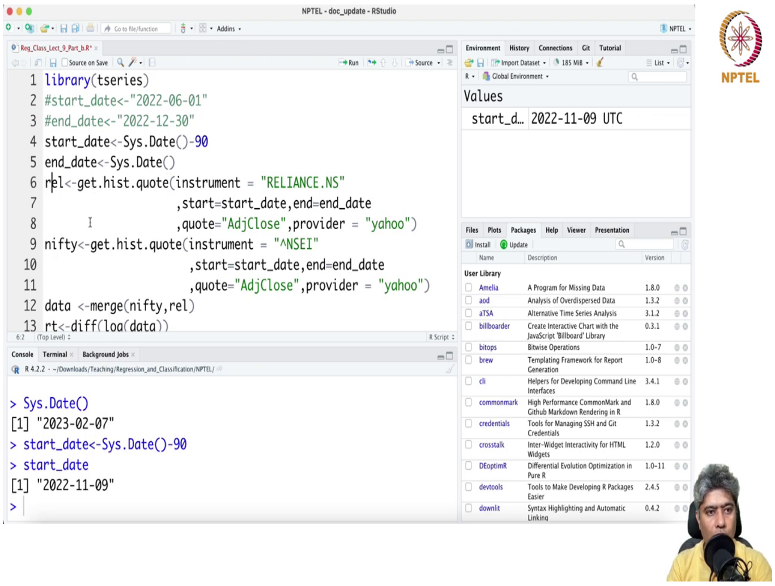
Environment is empty

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
    computational finance.

    See 'library(help="tseries")' for details.

> Sys.Date()
[1] "2023-02-07"
>
```

	Name	Description	Version
	User Library		
□	Amelia	A Program for Missing Data	1.8.0
□	aod	Analysis of Overdispersed Data	1.3.2
□	aTSA	Alternative Time Series Analysis	3.1.2
□	billboarder	Create Interactive Chart with the JavaScript 'Billboard' Library	0.3.1
□	bitops	Bitwise Operations	1.0-7
□	brew	Templating Framework for Report Generation	1.0-8
□	cli	Helpers for Developing Command Line Interfaces	3.4.1
□	commonmark	High Performance CommonMark and Github Markdown Rendering in R	1.8.0
□	credentials	Tools for Managing SSH and Git Credentials	1.3.2
□	crosstalk	Inter-Widget Interactivity for HTML Widgets	1.2.0
□	DEoptimR	Differential Evolution Optimization in Pure R	1.0-11
□	devtools	Tools to Make Developing R Packages Easier	2.4.5
□	downlit	Syntax Highlighting and Automatic Linking	0.4.2

However, what we can do? We can instead of that we can take the ended as usual some ended of Sys dot Date if you just take Sys dot Date. So, that will give you the today's date, today is 7th February 2023 as of I am recording this video it is 7th February 2023.

(Refer Slide Time: 02:38)



```
library(tseries)
#start_date<-"2022-06-01"
#end_date<-"2022-12-30"
start_date<-Sys.Date()-90
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
```

```
> Sys.Date()
[1] "2023-02-07"
> start_date<-Sys.Date()-90
> start_date
[1] "2022-11-09"
>
```

Values

start_d...	2022-11-09 UTC

	Name	Description	Version
User Library			
□	Amelia	A Program for Missing Data	1.8.0
□	aod	Analysis of Overdispersed Data	1.3.2
□	aTSA	Alternative Time Series Analysis	3.1.2
□	billboarder	Create Interactive Chart with the JavaScript 'Billboard' Library	0.3.1
□	bitops	Bitwise Operations	1.0-7
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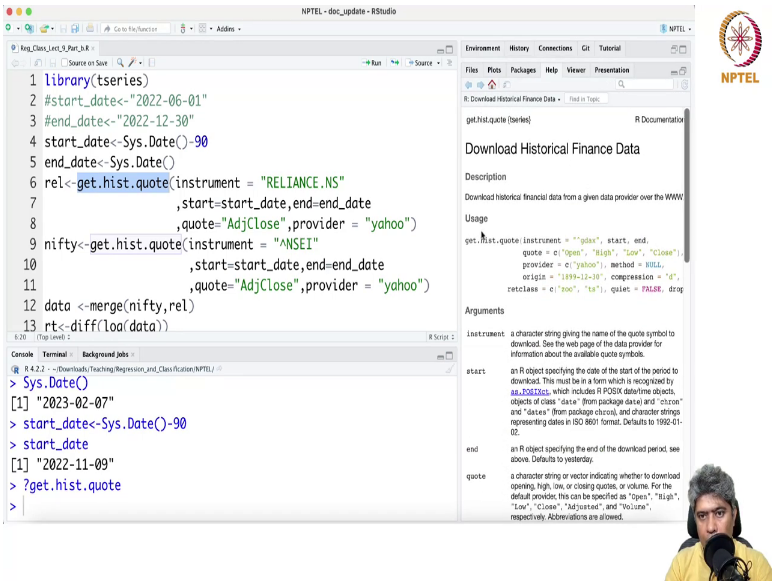
□	crosstalk	Inter-Widget Interactivity for HTML Widgets	1.2.0
□	DEoptimR	Differential Evolution Optimization in Pure R	1.0-11
□	devtools	Tools to Make Developing R Packages Easier	2.4.5
□	downlit	Syntax Highlighting and Automatic Linking	0.4.2

And what I can do is I can take a start date which is maybe 60 days prior to the system date. So, what I can do? I can just take Sys Date minus 180 days like 6 or maybe I just I will just take last 90 days of data. So, if I just give this then start date will be 90 days prior which is 9th November 2022. Now, given these 2 date. So, now, get dot hist dot quote is the function that comes with the package tseries.

(Refer Slide Time: 03:23)



```
library(tseries)
#start_date<-"2022-06-01"
#end_date<-"2022-12-30"
start_date<-Sys.Date()-90
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
> Sys.Date()
[1] "2023-02-07"
> start_date<-Sys.Date()-90
> start_date
[1] "2022-11-09"
> ?get.hist.quote
>
```

get.hist.quote {tseries}   R Documentation

Download Historical Finance Data

Description

Download historical financial data from a given data provider over the WWW.

Usage

```
get.hist.quote(instrument = "^gdax", start, end,
               quote = c("Open", "High", "Low", "Close"),
               provider = c("yahoo"), method = NULL,
               origin = "1899-12-30", compression = "d",
            retclass = c("zoo", "ts"), quiet = FALSE, drop
```

Arguments

instrument: a character string giving the name of the quote symbol to download. See the web page of the data provider for information about the available quote symbols.

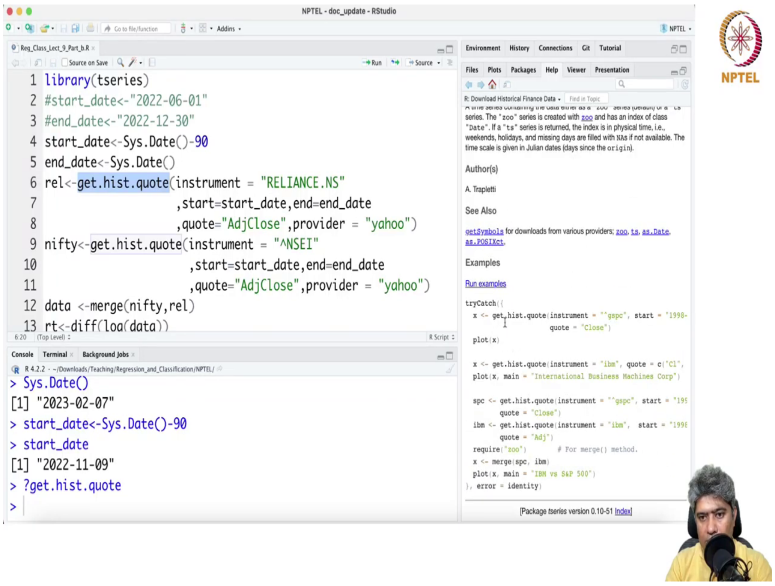
start: an R object specifying the date of the start of the period to download. This must be in a form which is recognized by as.POSIXct, which includes R POSIX date/time objects, objects of class "date" (from package date) and "chron" and "dates" (from package chron), and character strings representing dates in ISO 8601 format. Defaults to 1992-01-02.

end: an R object specifying the end of the download period, see above. Defaults to yesterday.

quote: a character string or vector indicating whether to download opening, high, low, or closing quotes, or volume. For the default provider, this can be specified as "Open", "High", "Low", "Close", "Adjusted", and "Volume", respectively. Abbreviations are allowed.

So, if you just question mark get dot hist dot quote then you can download historical financial data ok and here there are some examples also.

(Refer Slide Time: 03:34)



```r
library(tseries)
#start_date<-"2022-06-01"
#end_date<-"2022-12-30"
start_date<-Sys.Date()-90
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
> Sys.Date()
[1] "2023-02-07"
> start_date<-Sys.Date()-90
> start_date
[1] "2022-11-09"
> ?get.hist.quote
>
```

A time series containing the data either as a "zoo" series (default) or a "ts" series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

Examples

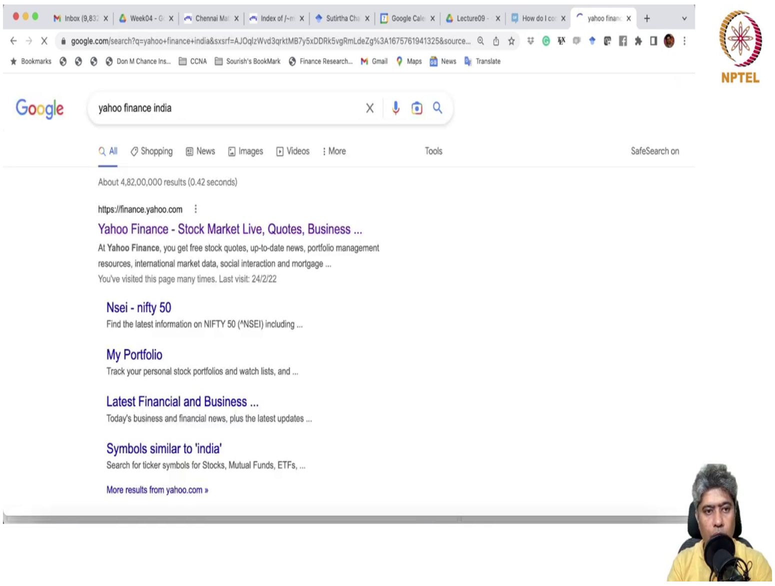
Run examples

```r
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)

  x <- get.hist.quote(instrument = "ibm", quote = c("Cl",
  plot(x, main = "International Business Machines Corp")

  spc <- get.hist.quote(instrument = "^gspc", start = "199
         quote = "Close")
  ibm <- get.hist.quote(instrument = "ibm",  start = "199
         quote = "Adj")
  require("zoo")          # For merge() method.
  x <- merge(spc, ibm)
  plot(x, main = "IBM vs S&P 500")
}, error = identity)
```

[Package tseries version 0.10-51 Index]

So, what you can do? I am going to download the instrument name RELIANCE dot NS. You can try some other stock also like TCS or something, but you have to know with the name of the instrument in this case TCS.

(Refer Slide Time: 04:03)



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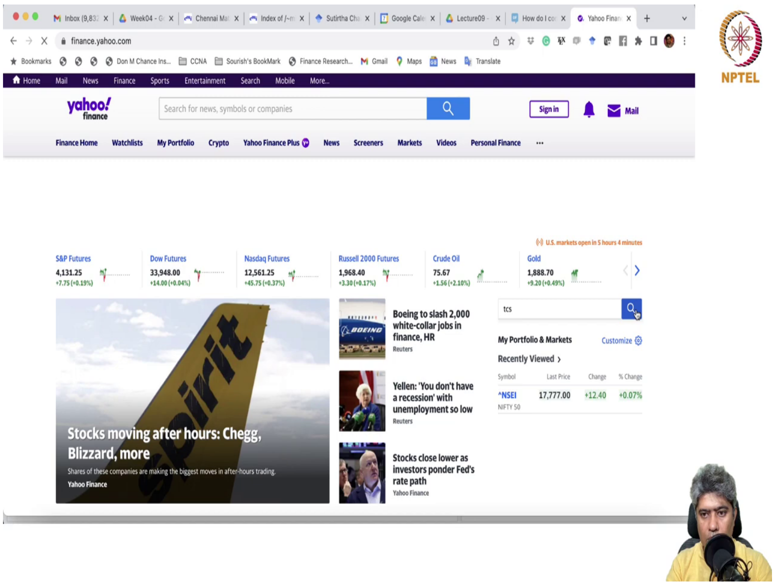
So, one way to figure out which instrument you want to use is you go to Google Yahoo you search Yahoo finance India make sure you are giving Yahoo finance India and then you if you click on that.

(Refer Slide Time: 04:20)



U.S. markets open in 5 hours 4 minutes

S&P Futures	Dow Futures	Nasdaq Futures	Russell 2000 Futures	Crude Oil	Gold
4,131.25	33,948.00	12,561.25	1,968.40	75.67	1,888.70
+7.75 (+0.19%)	+14.00 (+0.04%)	+45.75 (+0.37%)	+3.30 (+0.17%)	+1.56 (+2.10%)	+9.20 (+0.49%)

Stocks moving after hours: Chegg, Blizzard, more

Shares of these companies are making the biggest moves in after-hours trading.

Yahoo Finance

Boeing to slash 2,000 white-collar jobs in finance, HR

Reuters

Yellen: 'You don't have a recession' with unemployment so low

Reuters

Stocks close lower as investors ponder Fed's rate path

Yahoo Finance

tcs

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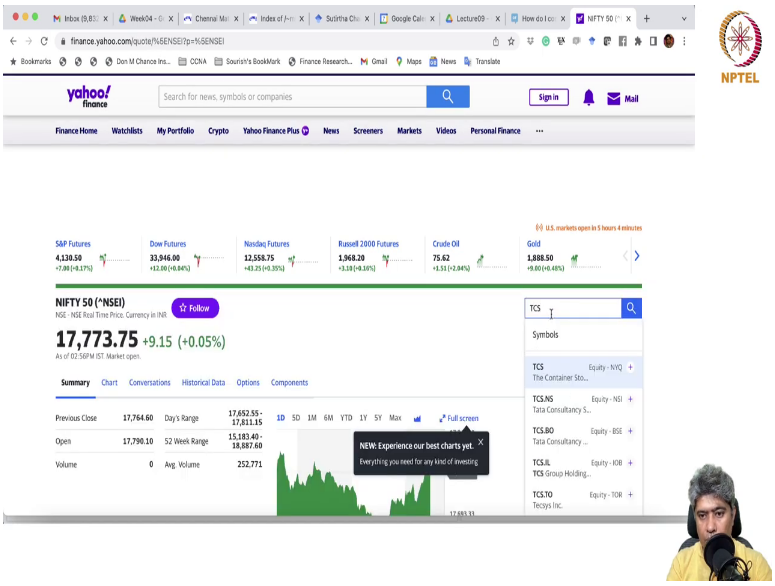
Symbol	Last Price	Change	% Change
^NSEI NIFTY 50	17,777.00	+12.40	+0.07%

And then you can look for typically quote look up here if you just gives a TCS.

(Refer Slide Time: 04:33)



S&P Futures	Dow Futures	Nasdaq Futures	Russell 2000 Futures	Crude Oil	Gold
4,130.50	33,946.00	12,558.75	1,968.20	75.62	1,888.50
+7.00 (+0.17%)	+12.00 (+0.04%)	+43.25 (+0.35%)	+3.10 (+0.16%)	+1.51 (+2.04%)	+9.00 (+0.48%)

NIFTY 50 (^NSEI)

NSE - NSE Real Time Price. Currency in INR

17,773.75 +9.15 (+0.05%)

As of 02:56PM IST. Market open.

Previous Close	17,764.60	Day's Range	17,652.55 - 17,811.15
Open	17,790.10	52 Week Range	15,183.40 - 18,887.60
Volume	0	Avg. Volume	252,771

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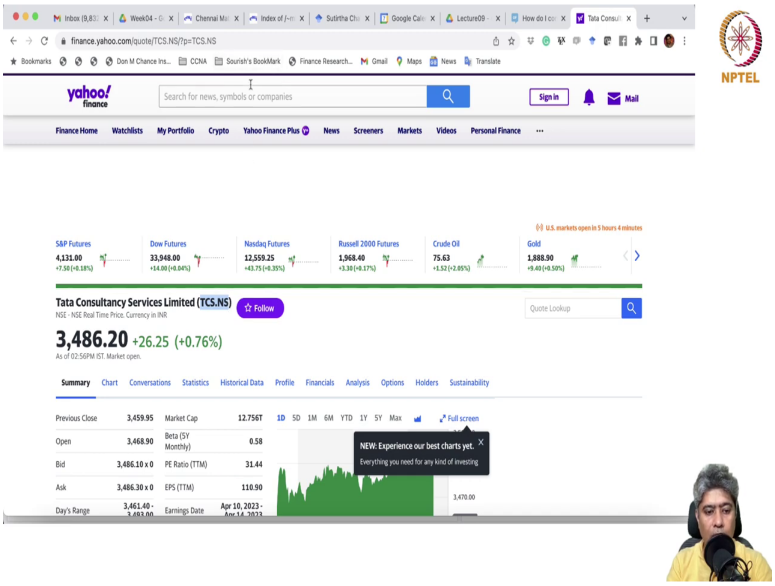
TCS

Symbols

TCS The Container Sto...	Equity - NYQ
TCS.NS Tata Consultancy S...	Equity - NSI
TCS.BO Tata Consultancy ...	Equity - BSE
TCS.IL TCS Group Holding...	Equity - IOB
TCS.TO Tecsys Inc.	Equity - TOR

If you gives TCS ok.

(Refer Slide Time: 04:36)



finance.yahoo.com/quote/TCS.NS?p=TCS.NS

U.S. markets open in 5 hours 4 minutes

S&P Futures	Dow Futures	Nasdaq Futures	Russell 2000 Futures	Crude Oil	Gold
4,131.00	33,948.00	12,559.25	1,968.40	75.63	1,888.90
+7.50 (+0.18%)	+14.00 (+0.04%)	+43.75 (+0.35%)	+3.30 (+0.17%)	+1.52 (+2.05%)	+9.40 (+0.50%)

Tata Consultancy Services Limited (TCS.NS) ☆ Follow

NSE - NSE Real Time Price. Currency in INR

3,486.20 +26.25 (+0.76%)

As of 02:56PM IST. Market open.

Previous Close	3,459.95	Market Cap	12.756T
Open	3,468.90	Beta (5Y Monthly)	0.58
Bid	3,486.10 x 0	PE Ratio (TTM)	31.44
Ask	3,486.30 x 0	EPS (TTM)	110.90
Day's Range	3,461.40 - 3,493.00	Earnings Date	Apr 10, 2023 - Apr 14, 2023

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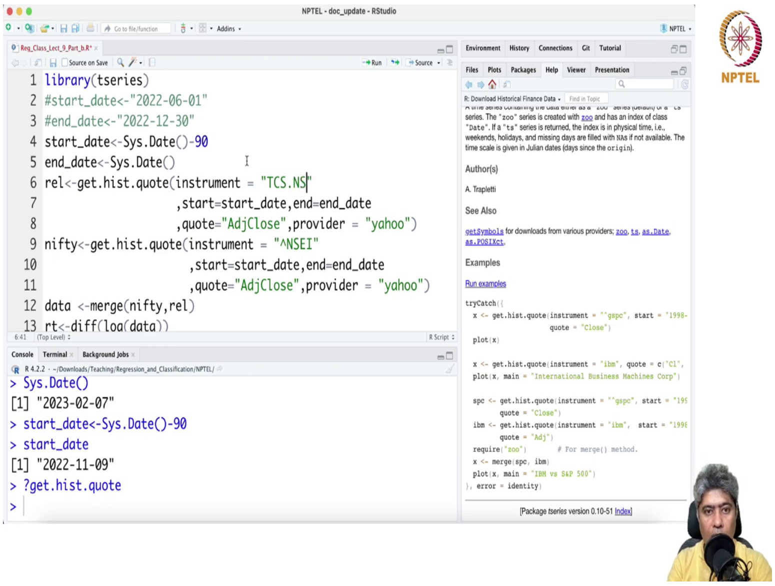
So, TCS dot NS is the Tata Consultancy Services. So, Tata Consultancy Services that is TCS dot NS. So, if I want to download the data for Tata Consultancy Services. So, I will choose TCS dot NS and I will go in my R and here instead of RELIANCE dot is.

(Refer Slide Time: 04:57)



```r
library(tseries)
#start_date<-"2022-06-01"
#end_date<-"2022-12-30"
start_date<-Sys.Date()-90
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "TCS.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
> Sys.Date()
[1] "2023-02-07"
> start_date<-Sys.Date()-90
> start_date
[1] "2022-11-09"
> ?get.hist.quote
>
```

A time series containing the data either as a "zoo" series (default) or a "ts" series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

Examples

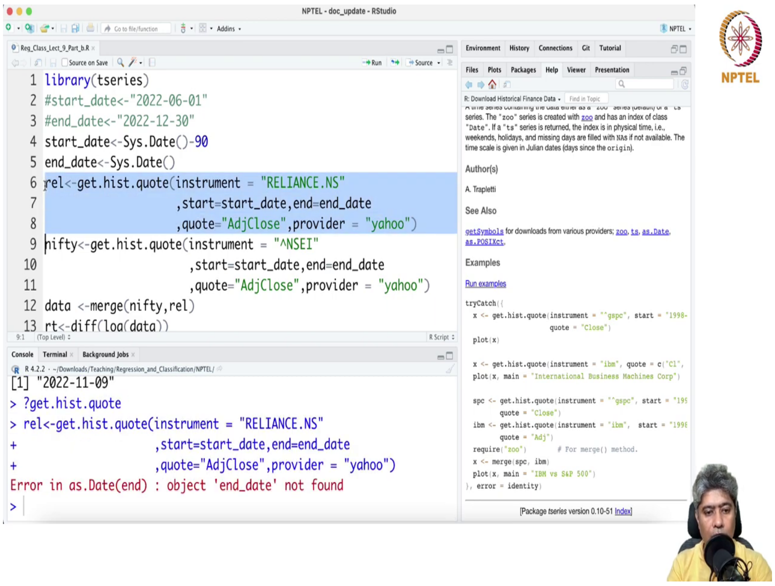
Run examples

```r
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)

  x <- get.hist.quote(instrument = "ibm", quote = c("Cl",
  plot(x, main = "International Business Machines Corp")

  spc <- get.hist.quote(instrument = "^gspc", start = "199
         quote = "Close")
  ibm <- get.hist.quote(instrument = "ibm",  start = "1998
         quote = "Adj")
  require("zoo")        # For merge() method.
  x <- merge(spc, ibm)
  plot(x, main = "IBM vs S&P 500")
}, error = identity)
```

[Package tseries version 0.10-51 Index]

I will say TCS dot NS, but I will just keep it is as Reliance dot NS.

(Refer Slide Time: 05:07)



```
library(tseries)
#start_date<-"2022-06-01"
#end_date<-"2022-12-30"
start_date<-Sys.Date()-90
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
```

```
[1] "2022-11-09"
> ?get.hist.quote
> rel<-get.hist.quote(instrument = "RELIANCE.NS"
+                     ,start=start_date,end=end_date
+                     ,quote="AdjClose",provider = "yahoo")
Error in as.Date(end) : object 'end_date' not found
>
```

R: Download Historical Finance Data

A time series containing the data either as a "zoo" series (default) or a "ts" series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct,

Examples

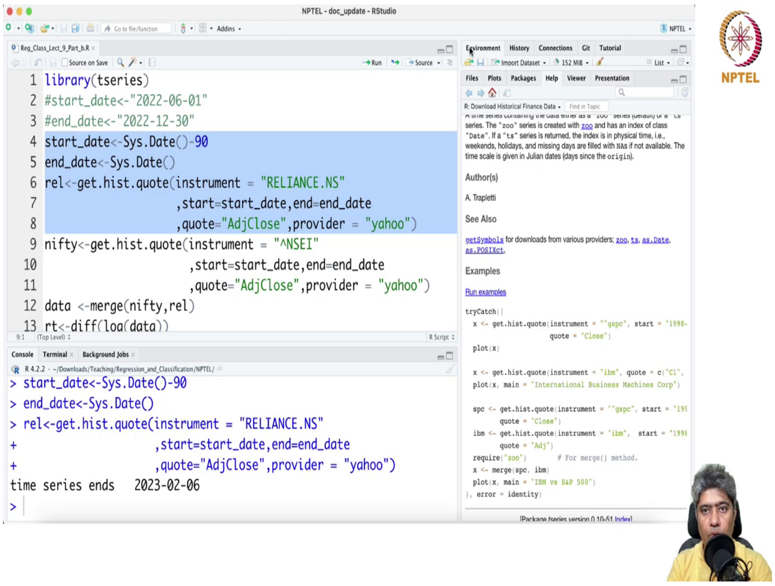
Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)

  x <- get.hist.quote(instrument = "ibm", quote = c("Cl",
  plot(x, main = "International Business Machines Corp")

  spc <- get.hist.quote(instrument = "^gspc", start = "199
         quote = "Close")
  ibm <- get.hist.quote(instrument = "ibm",  start = "1998
         quote = "Adj")
  require("zoo")        # For merge() method.
  x <- merge(spc, ibm)
  plot(x, main = "IBM vs S&P 500")
}, error = identity)
```

[Package tseries version 0.10-51 Index]

And I will just download the data oh I need to just run this to and I will just run the data.

(Refer Slide Time: 05:12)



```
library(tseries)
#start_date<-"2022-06-01"
#end_date<-"2022-12-30"
start_date<-Sys.Date()-90
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
```

```
> start_date<-Sys.Date()-90
> end_date<-Sys.Date()
> rel<-get.hist.quote(instrument = "RELIANCE.NS"
+                    ,start=start_date,end=end_date
+                    ,quote="AdjClose",provider = "yahoo")
time series ends   2023-02-06
>
```

A time series containing the data either as a "zoo" series (default) or a "ts" series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

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Examples

Run examples

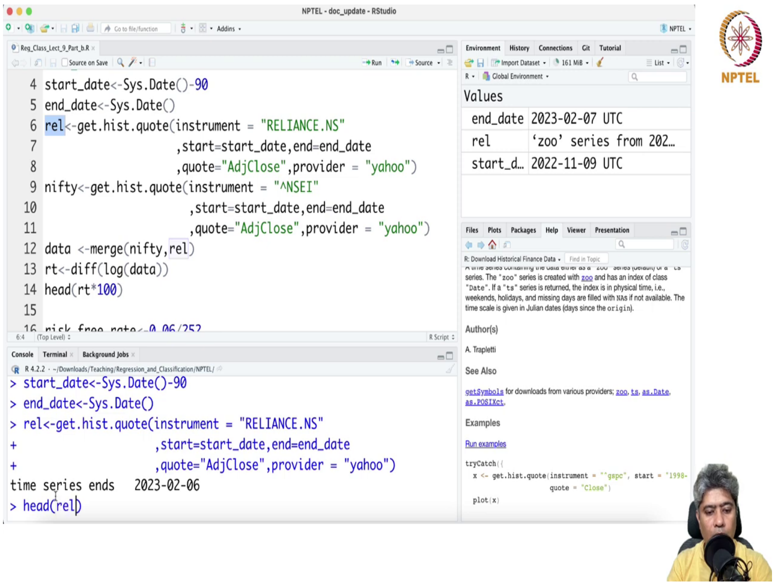
```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)

  x <- get.hist.quote(instrument = "ibm", quote = c("Cl",
  plot(x, main = "International Business Machines Corp")

  spc <- get.hist.quote(instrument = "^gspc", start = "199
         quote = "Close")
  ibm <- get.hist.quote(instrument = "ibm",  start = "1998
         quote = "Adj")
  require("zoo")         # For merge() method.
  x <- merge(spc, ibm)
  plot(x, main = "IBM vs S&P 500")
}, error = identity)
```

[Package tseries version 0.10-51 Index]

(Refer Slide Time: 05:15)



```r
start_date<-Sys.Date()-90
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
head(rt*100)

risk_free_rate<-0.06/252
```

```
> start_date<-Sys.Date()-90
> end_date<-Sys.Date()
> rel<-get.hist.quote(instrument = "RELIANCE.NS"
+                     ,start=start_date,end=end_date
+                     ,quote="AdjClose",provider = "yahoo")
time series ends   2023-02-06
> head(rel)
```

Values

end_date	2023-02-07 UTC
rel	‘zoo’ series from 202…
start_d…	2022-11-09 UTC

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct,

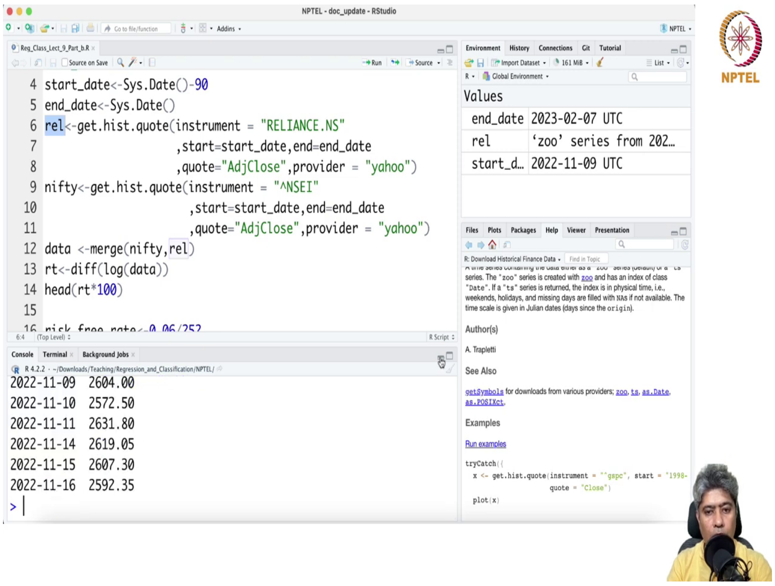
Examples

Run examples

```r
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

Now, if you go to the environment. So, you can see the Reliance it has downloaded as zoo package. Similarly, you have if you just. So, if you just say head Reliance this is the object name if you just say Reliance.

(Refer Slide Time: 05:37)



```r
start_date<-Sys.Date()-90
end_date<-Sys.Date()
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
head(rt*100)

risk_free_rate<-0.06/252
```

```
2022-11-09  2604.00
2022-11-10  2572.50
2022-11-11  2631.80
2022-11-14  2619.05
2022-11-15  2607.30
2022-11-16  2592.35
>
```

Values

end_date	2023-02-07 UTC
rel	‘zoo’ series from 202…
start_d…	2022-11-09 UTC

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

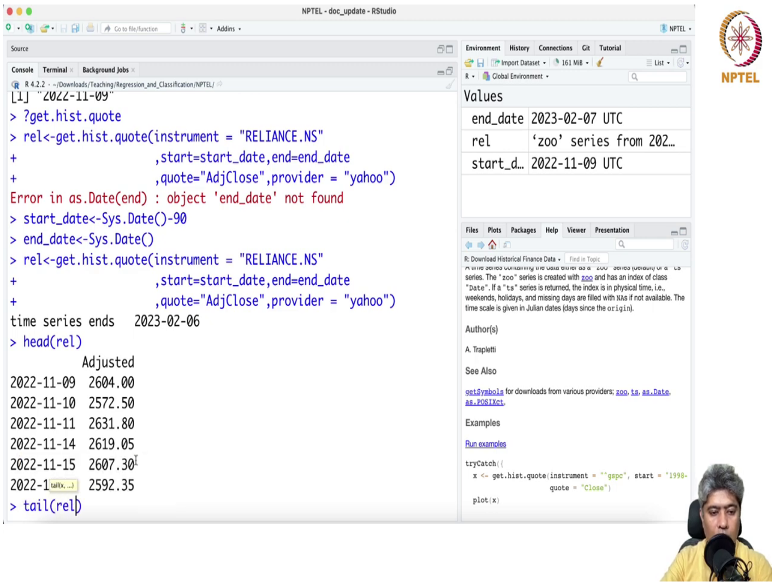
getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

Examples

Run examples

```r
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

(Refer Slide Time: 05:39)



```
[1] "2022-11-09"
> ?get.hist.quote
> rel<-get.hist.quote(instrument = "RELIANCE.NS"
+                     ,start=start_date,end=end_date
+                     ,quote="AdjClose",provider = "yahoo")
Error in as.Date(end) : object 'end_date' not found
> start_date<-Sys.Date()-90
> end_date<-Sys.Date()
> rel<-get.hist.quote(instrument = "RELIANCE.NS"
+                     ,start=start_date,end=end_date
+                     ,quote="AdjClose",provider = "yahoo")
time series ends   2023-02-06
> head(rel)
           Adjusted
2022-11-09  2604.00
2022-11-10  2572.50
2022-11-11  2631.80
2022-11-14  2619.05
2022-11-15  2607.30
2022-1       2592.35
> tail(rel)
```

Values

end_date	2023-02-07 UTC
rel	‘zoo’ series from 202…
start_d…	2022-11-09 UTC

A time series containing the data either as a "zoo" series (default) or a "ts" series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct,

Examples

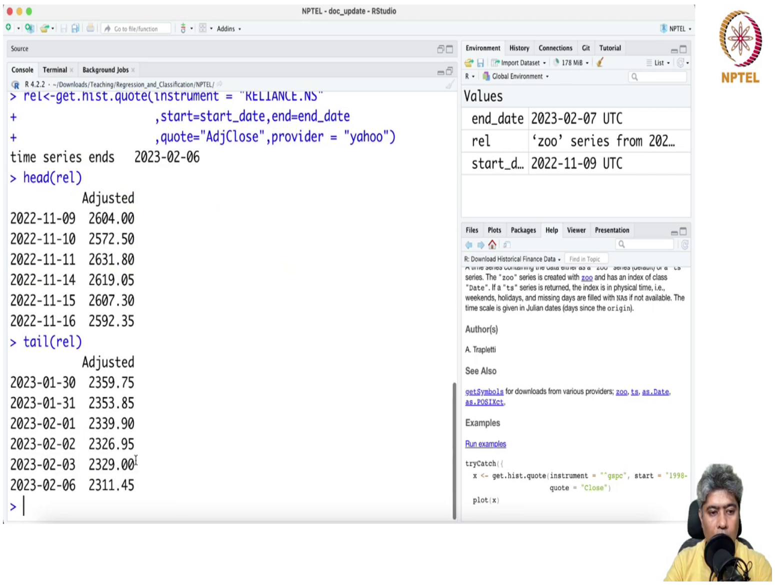
Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

So, it has the adjusted close prices of Reliance.

Now, if you say tail of TL.

(Refer Slide Time: 05:51)



```
> rel<-get.hist.quote(instrument = "RELIANCE.NS"
+                     ,start=start_date,end=end_date
+                     ,quote="AdjClose",provider = "yahoo")
time series ends   2023-02-06
> head(rel)
           Adjusted
2022-11-09  2604.00
2022-11-10  2572.50
2022-11-11  2631.80
2022-11-14  2619.05
2022-11-15  2607.30
2022-11-16  2592.35
> tail(rel)
           Adjusted
2023-01-30  2359.75
2023-01-31  2353.85
2023-02-01  2339.90
2023-02-02  2326.95
2023-02-03  2329.00
2023-02-06  2311.45
>
```

Values

end_date	2023-02-07 UTC
rel	‘zoo’ series from 202…
start_d…	2022-11-09 UTC

R: Download Historical Finance Data

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

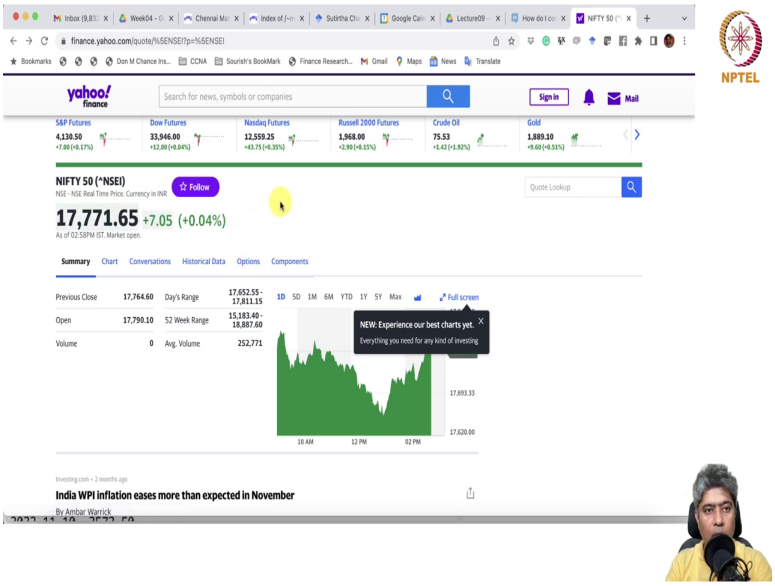
Examples

Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

So, till yesterday the price was 2311.45 per share ok. Now, nifty is the index if you go back if you remember.

(Refer Slide Time: 06:04)



S&P Futures	Dow Futures	Nasdaq Futures	Russell 2000 Futures	Crude Oil	Gold
4,130.50	33,946.00	12,559.25	1,968.00	75.53	1,889.10
+7.00 (+0.17%)	+12.00 (+0.04%)	+43.75 (+0.35%)	+2.90 (+0.15%)	+1.42 (+1.92%)	+9.60 (+0.51%)

NIFTY 50 (^NSEI)

NSE - NSE Real Time Price. Currency in INR

17,771.65 +7.05 (+0.04%)

As of 02:58PM IST. Market open.

Previous Close	17,764.60	Day's Range	17,652.55 - 17,811.15
Open	17,790.10	52 Week Range	15,183.40 - 18,887.60
Volume	0	Avg. Volume	252,771

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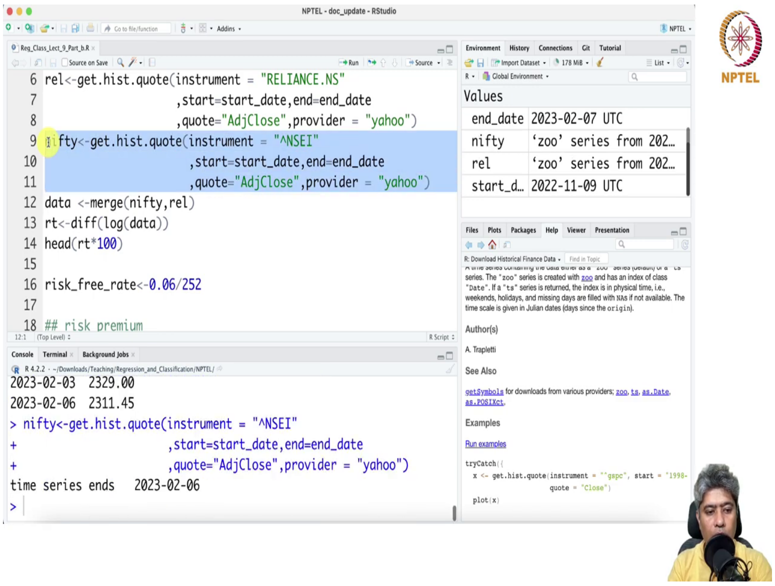
India WPI inflation eases more than expected in November

By Ambar Warrick

So, this is the NIFTY 50, NIFTY 50 is the index of National Stock Exchange this is the 50 largest company of the country.

(Refer Slide Time: 06:21)



```
rel<-get.hist.quote(instrument = "RELIANCE.NS"
                    ,start=start_date,end=end_date
                    ,quote="AdjClose",provider = "yahoo")
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
head(rt*100)

risk_free_rate<-0.06/252

## risk premium
```

Values

end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…
rel	‘zoo’ series from 202…
start_d…	2022-11-09 UTC

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
2023-02-03  2329.00
2023-02-06  2311.45
> nifty<-get.hist.quote(instrument = "^NSEI"
+                       ,start=start_date,end=end_date
+                       ,quote="AdjClose",provider = "yahoo")
time series ends   2023-02-06
>
```

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

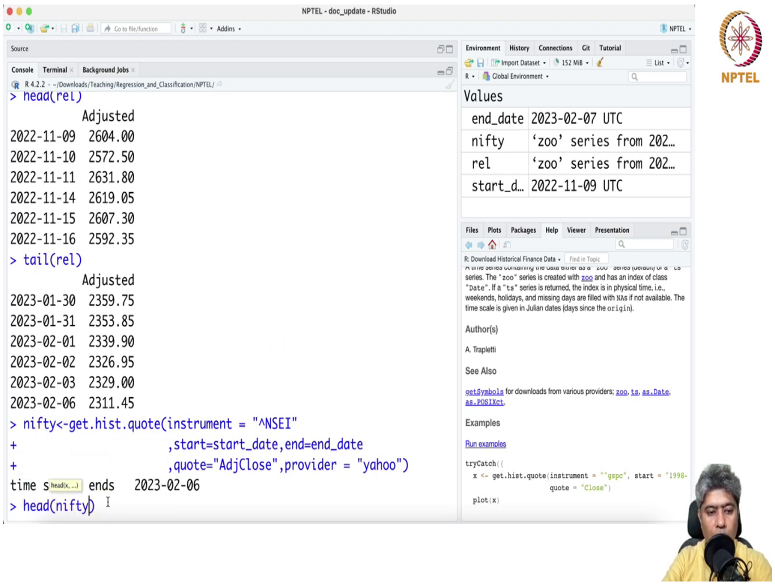
Examples

Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

So, if you just run the NIFTY 50 it will give you the NIFTY values also.

(Refer Slide Time: 06:29)



```
> head(rel)
           Adjusted
2022-11-09  2604.00
2022-11-10  2572.50
2022-11-11  2631.80
2022-11-14  2619.05
2022-11-15  2607.30
2022-11-16  2592.35
> tail(rel)
           Adjusted
2023-01-30  2359.75
2023-01-31  2353.85
2023-02-01  2339.90
2023-02-02  2326.95
2023-02-03  2329.00
2023-02-06  2311.45
> nifty<-get.hist.quote(instrument = "^NSEI"
+                        ,start=start_date,end=end_date
+                        ,quote="AdjClose",provider = "yahoo")
time s head(x, ...) ends   2023-02-06
> head(nifty)
```

Values

```
end_date  2023-02-07 UTC
nifty     'zoo' series from 202…
rel       'zoo' series from 202…
start_d…  2022-11-09 UTC
```

A time series containing the data either as a "zoo" series (default) or a "ts" series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

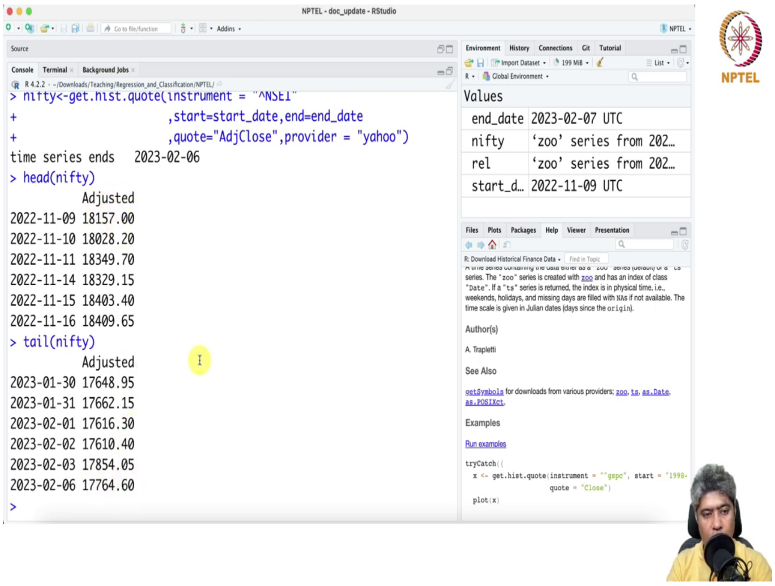
Examples

Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

Similarly, you can see the you can say head of nifty.

(Refer Slide Time: 06:35)



```
> nifty<-get.hist.quote(instrument = "^NSEI"
+                       ,start=start_date,end=end_date
+                       ,quote="AdjClose",provider = "yahoo")
time series ends   2023-02-06
> head(nifty)
           Adjusted
2022-11-09 18157.00
2022-11-10 18028.20
2022-11-11 18349.70
2022-11-14 18329.15
2022-11-15 18403.40
2022-11-16 18409.65
> tail(nifty)
           Adjusted
2023-01-30 17648.95
2023-01-31 17662.15
2023-02-01 17616.30
2023-02-02 17610.40
2023-02-03 17854.05
2023-02-06 17764.60
>
```

Values

end_date	2023-02-07 UTC
nifty	'zoo' series from 202…
rel	'zoo' series from 202…
start_d…	2022-11-09 UTC

A time series containing the data either as a "zoo" series (default) or a "ts" series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

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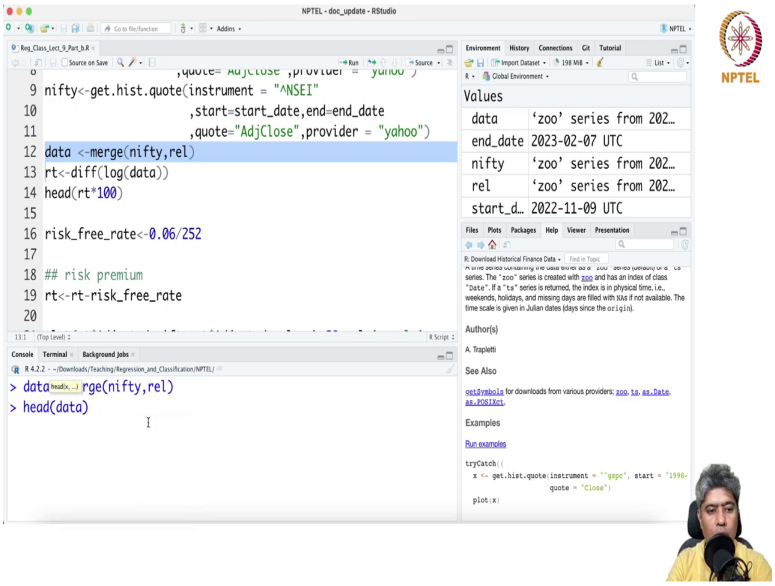
Examples

Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

And similarly, you can just say tail of nifty. You can see that in November it was running around 18,000 now it is near came down to 17,000 the market is not good now as of February.

(Refer Slide Time: 06:53)



```r
nifty<-get.hist.quote(instrument = "^NSEI"
                      ,start=start_date,end=end_date
                      ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
head(rt*100)

risk_free_rate<-0.06/252

## risk premium
rt<-rt-risk_free_rate

```

R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/

```
> data head(x, ...) rge(nifty,rel)
> head(data)
```

Values

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…
rel	‘zoo’ series from 202…
start_d…	2022-11-09 UTC

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

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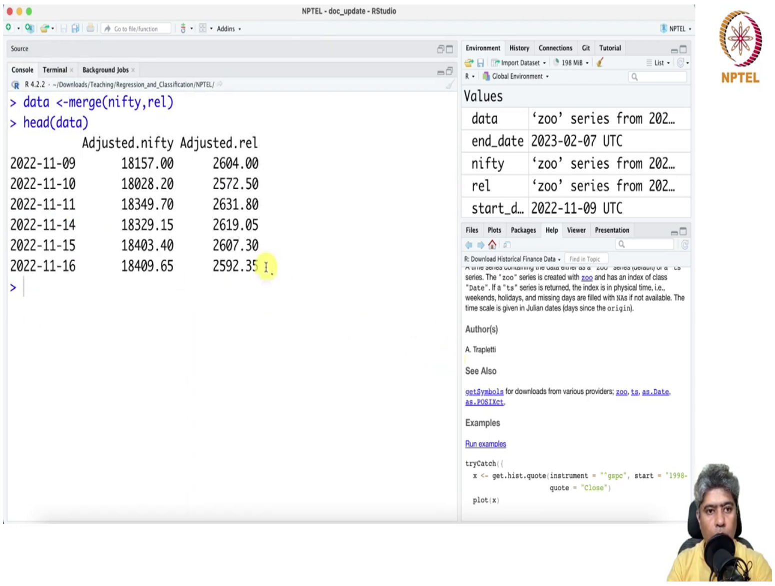
Examples

Run examples

```r
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

So, now what I am going to do? I am going to run the merge these two and it will automatically merge and so, head data.

(Refer Slide Time: 07:07)



```
> data <-merge(nifty,rel)
> head(data)
           Adjusted.nifty Adjusted.rel
2022-11-09       18157.00      2604.00
2022-11-10       18028.20      2572.50
2022-11-11       18349.70      2631.80
2022-11-14       18329.15      2619.05
2022-11-15       18403.40      2607.30
2022-11-16       18409.65      2592.35
>
```

Values

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…
rel	‘zoo’ series from 202…
start_d…	2022-11-09 UTC

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

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A. Trapletti

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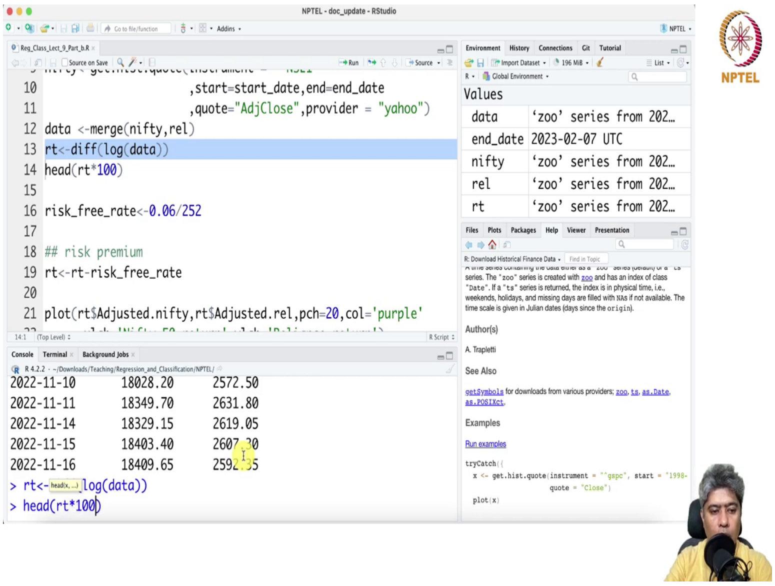
Examples

Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

So, now it is a Adjusted nifty and Adjusted Reliance. So, two series got merged by date automatically. So, you do not have to worry about that.

(Refer Slide Time: 07:23)



```r
                        ,start=start_date,end=end_date
                        ,quote="AdjClose",provider = "yahoo")
data <-merge(nifty,rel)
rt<-diff(log(data))
head(rt*100)

risk_free_rate<-0.06/252

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
2022-11-10        18028.20       2572.50
2022-11-11        18349.70       2631.80
2022-11-14        18329.15       2619.05
2022-11-15        18403.40       2607.30
2022-11-16        18409.65       2592.35
> rt<-head(x, ...)log(data))
> head(rt*100)
```

Values

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…
rel	‘zoo’ series from 202…
rt	‘zoo’ series from 202…

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

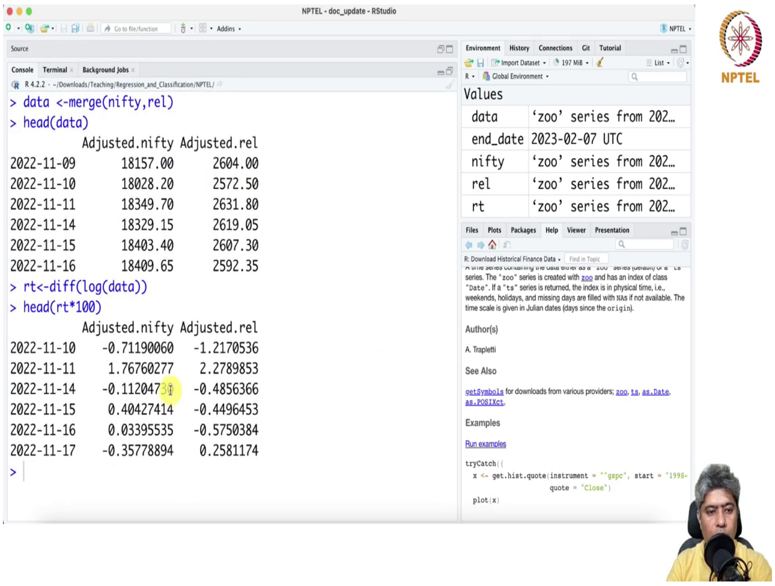
Examples

Run examples

```r
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

And now if you just calculate the this now head of rt times 100.

(Refer Slide Time: 07:36)



R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/

```
> data <-merge(nifty,rel)
> head(data)
           Adjusted.nifty Adjusted.rel
2022-11-09       18157.00      2604.00
2022-11-10       18028.20      2572.50
2022-11-11       18349.70      2631.80
2022-11-14       18329.15      2619.05
2022-11-15       18403.40      2607.30
2022-11-16       18409.65      2592.35
> rt<-diff(log(data))
> head(rt*100)
           Adjusted.nifty Adjusted.rel
2022-11-10    -0.71190060   -1.2170536
2022-11-11     1.76760277    2.2789853
2022-11-14    -0.11204730   -0.4856366
2022-11-15     0.40427414   -0.4496453
2022-11-16     0.03395535   -0.5750384
2022-11-17    -0.35778894    0.2581174
> 
```

Values

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…
rel	‘zoo’ series from 202…
rt	‘zoo’ series from 202…

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

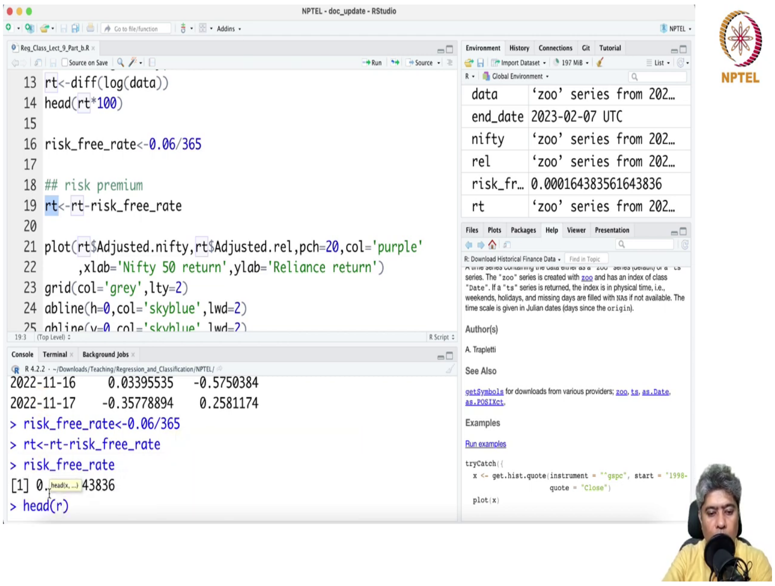
Examples

Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

This is precisely the value that you have seen that this is the nifty log returns and these are the reliance log return. Ok. Now, I have taken risk free rate as 6 percent I am going to. So, that is why I have taken rate as 0.06 ok and I am going to divide that by 252 because there are 252 business days you can use 365 also, we can use 365 that will be probably more meaningful.

(Refer Slide Time: 08:10)



```
rt<-diff(log(data))
head(rt*100)

risk_free_rate<-0.06/365

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
     ,xlab='Nifty 50 return',ylab='Reliance return')
grid(col='grey',lty=2)
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)
```

```
2022-11-16     0.03395535   -0.5750384
2022-11-17    -0.35778894    0.2581174
> risk_free_rate<-0.06/365
> rt<-rt-risk_free_rate
> risk_free_rate
[1] 0.head(x, ...) 43836
> head(r)
```

data	'zoo' series from 202…
end_date	2023-02-07 UTC
nifty	'zoo' series from 202…
rel	'zoo' series from 202…
risk_fr…	0.000164383561643836
rt	'zoo' series from 202…

A time series containing the data either as a "zoo" series (default) or a "ts" series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct,

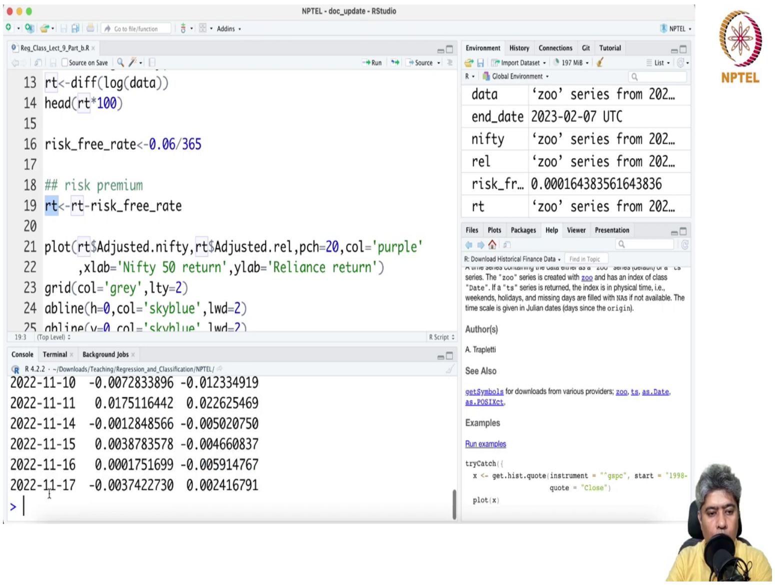
Examples

Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

So, we can use 365. So, the risk premium if we just calculate the subtract risk free from the return. So, now, it is risk premium.

(Refer Slide Time: 08:43)



```
rt<-diff(log(data))
head(rt*100)

risk_free_rate<-0.06/365

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
     ,xlab='Nifty 50 return',ylab='Reliance return')
grid(col='grey',lty=2)
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
2022-11-10  -0.0072833896 -0.012334919
2022-11-11   0.0175116442  0.022625469
2022-11-14  -0.0012848566 -0.005020750
2022-11-15   0.0038783578 -0.004660837
2022-11-16   0.0001751699 -0.005914767
2022-11-17  -0.0037422730  0.002416791
>
```

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…
rel	‘zoo’ series from 202…
risk_fr…	0.000164383561643836
rt	‘zoo’ series from 202…

R: Download Historical Finance Data

series. The "zoo" series is created with zoo and has an index of class "Date". If a "ts" series is returned, the index is in physical time, i.e., weekends, holidays, and missing days are filled with NAs if not available. The time scale is given in Julian dates (days since the origin).

Author(s)

A. Trapletti

See Also

getSymbols for downloads from various providers; zoo, ts, as.Date, as.POSIXct.

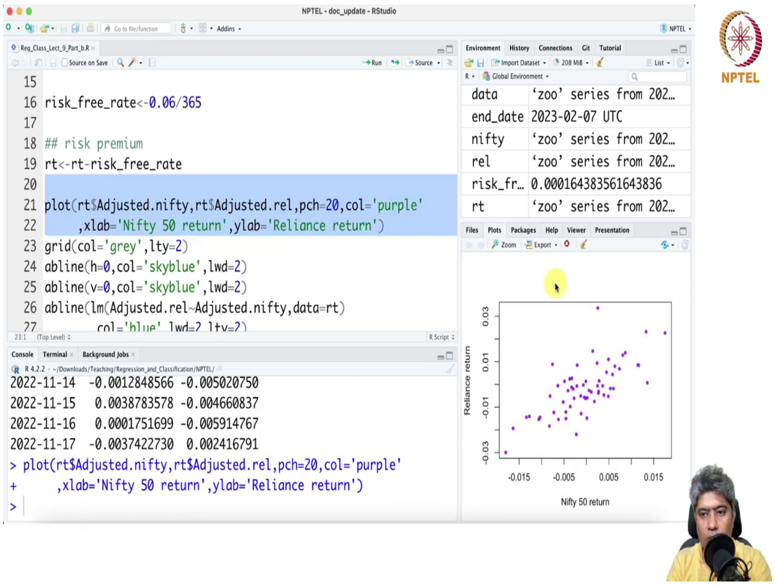
Examples

Run examples

```
tryCatch({
  x <- get.hist.quote(instrument = "^gspc", start = "1998-
                      quote = "Close")
  plot(x)
```

Now RT because I have just subtracted the risk-free rate from all the returns and that; obviously, then the rate rt if data frame is now what I have is risk free rate risk premium So, these are all my risk premium now.

(Refer Slide Time: 08:48)



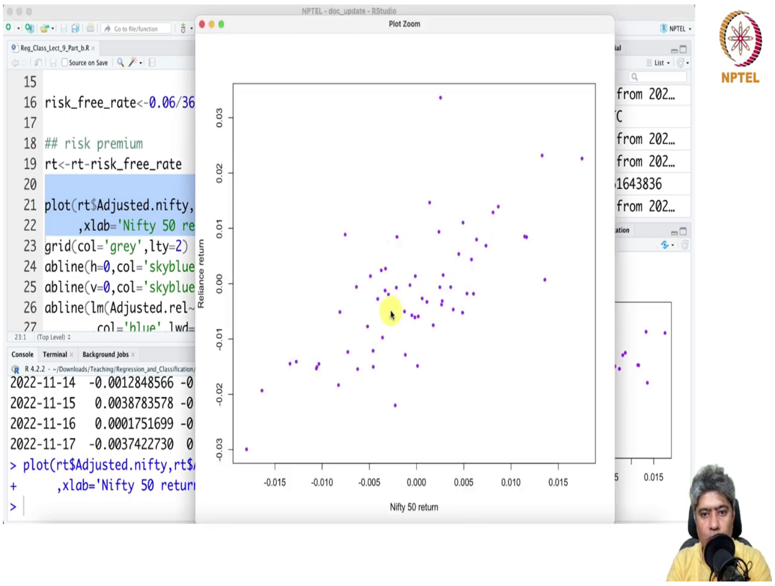
```r

risk_free_rate<-0.06/365

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
     ,xlab='Nifty 50 return',ylab='Reliance return')
grid(col='grey',lty=2)
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
       ,col='blue',lwd=2,lty=2)
```

data	'zoo' series from 202…
end_date	2023-02-07 UTC
nifty	'zoo' series from 202…
rel	'zoo' series from 202…
risk_fr…	0.000164383561643836
rt	'zoo' series from 202…

```
2022-11-14  -0.0012848566 -0.005020750
2022-11-15   0.0038783578 -0.004660837
2022-11-16   0.0001751699 -0.005914767
2022-11-17  -0.0037422730  0.002416791
> plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
+      ,xlab='Nifty 50 return',ylab='Reliance return')
> 
```

So, if I now plot risk premium that just it. So, these are my let me just zoom it.

(Refer Slide Time: 08:55)



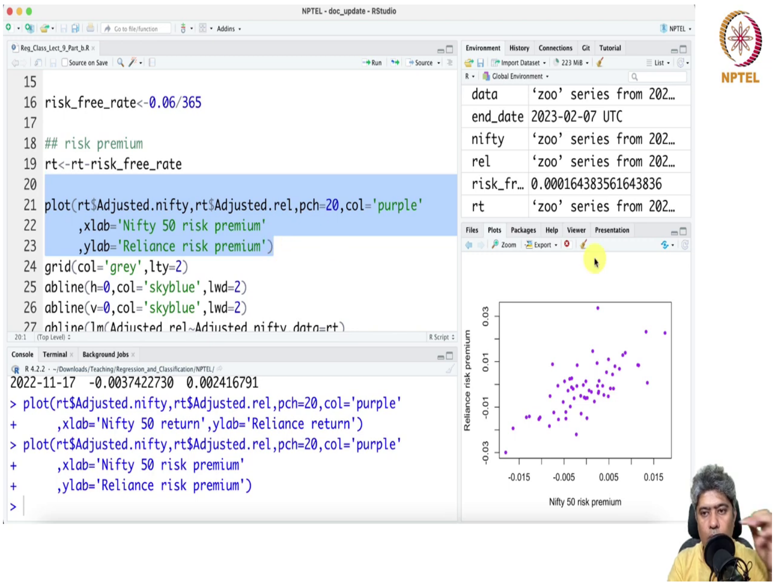
```
risk_free_rate<-0.06/36

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,
      ,xlab='Nifty 50 re
grid(col='grey',lty=2)
abline(h=0,col='skyblue
abline(v=0,col='skyblue
abline(lm(Adjusted.rel~
          col='blue' lwd=
```

```
2022-11-14  -0.0012848566 -0
2022-11-15   0.0038783578 -0
2022-11-16   0.0001751699 -0
2022-11-17  -0.0037422730  0
> plot(rt$Adjusted.nifty,rt$
+       ,xlab='Nifty 50 retur
>
```

```
from 202…
C
from 202…
from 202…
1643836
from 202…
```

So, these are the Nifty return on the x axis and Reliance return on the y axis ok looks like there is a or Nifty premium I should not say return Nifty premium risk premium and Reliance risk premium.

(Refer Slide Time: 09:14)



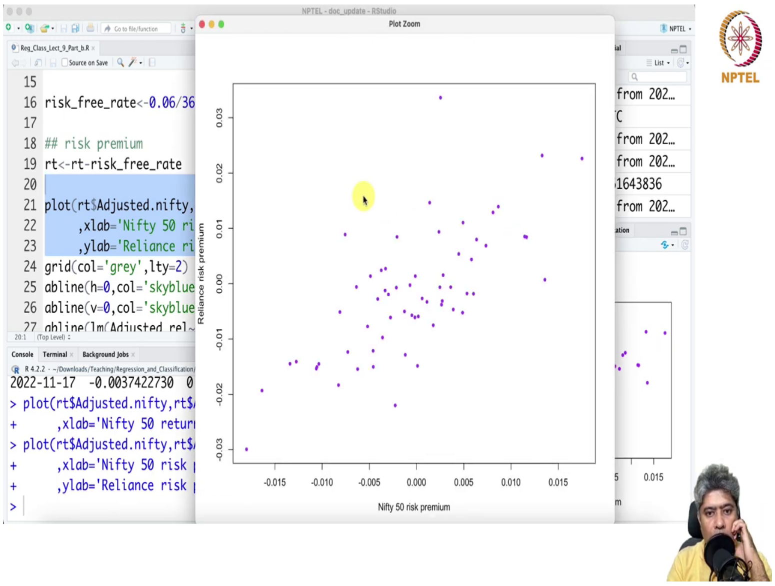
```
risk_free_rate<-0.06/365

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
     ,xlab='Nifty 50 risk premium'
     ,ylab='Reliance risk premium')
grid(col='grey',lty=2)
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
```

data	'zoo' series from 202…
end_date	2023-02-07 UTC
nifty	'zoo' series from 202…
rel	'zoo' series from 202…
risk_fr…	0.000164383561643836
rt	'zoo' series from 202…

```
2022-11-17  -0.0037422730  0.002416791
> plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
+      ,xlab='Nifty 50 return',ylab='Reliance return')
> plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
+      ,xlab='Nifty 50 risk premium'
+      ,ylab='Reliance risk premium')
> 
```

So, that is the more correct appropriate value. So, let me just connect once more now it is corrected.

(Refer Slide Time: 09:33)

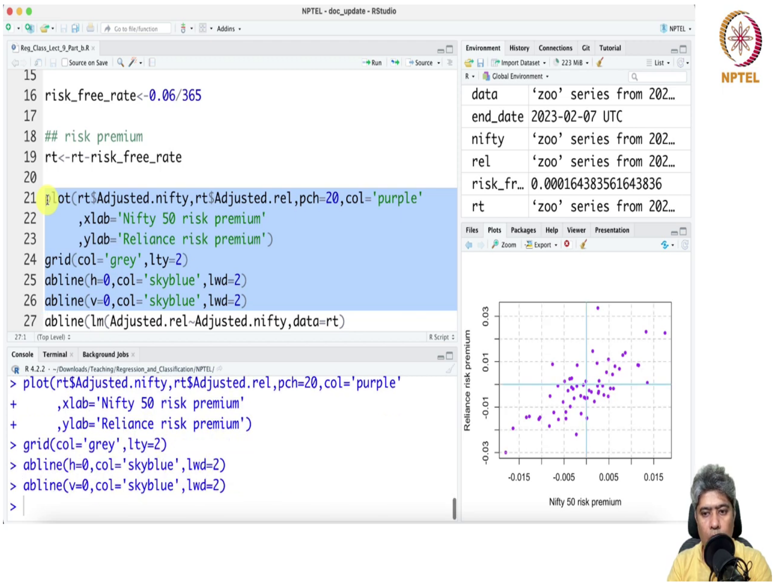


```
risk_free_rate<-0.06/36

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,
     ,xlab='Nifty 50 ri
     ,ylab='Reliance ri
grid(col='grey',lty=2)
abline(h=0,col='skyblue
abline(v=0,col='skyblue
abline(lm(Adjusted.rel~
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/
2022-11-17  -0.0037422730  0
> plot(rt$Adjusted.nifty,rt$/
+      ,xlab='Nifty 50 returr
> plot(rt$Adjusted.nifty,rt$/
+      ,xlab='Nifty 50 risk p
+      ,ylab='Reliance risk p
>
```

So, yeah Nifty risk premium and Reliance risk premium. So, now if I just run put some grid on it P9.

(Refer Slide Time: 09:48)

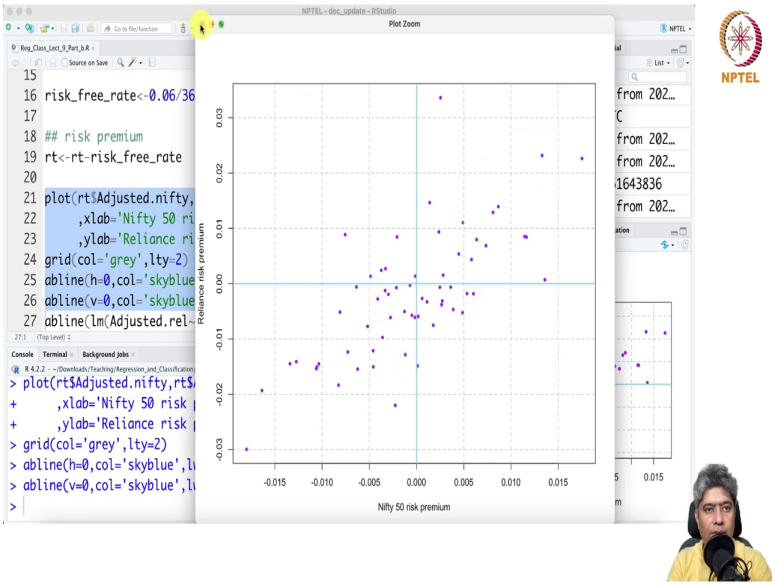


```r

risk_free_rate<-0.06/365

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
     ,xlab='Nifty 50 risk premium'
     ,ylab='Reliance risk premium')
grid(col='grey',lty=2)
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
```

```
> plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
+      ,xlab='Nifty 50 risk premium'
+      ,ylab='Reliance risk premium')
> grid(col='grey',lty=2)
> abline(h=0,col='skyblue',lwd=2)
> abline(v=0,col='skyblue',lwd=2)
>
```

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…
rel	‘zoo’ series from 202…
risk_fr…	0.000164383561643836
rt	‘zoo’ series from 202…

(Refer Slide Time: 09:51)

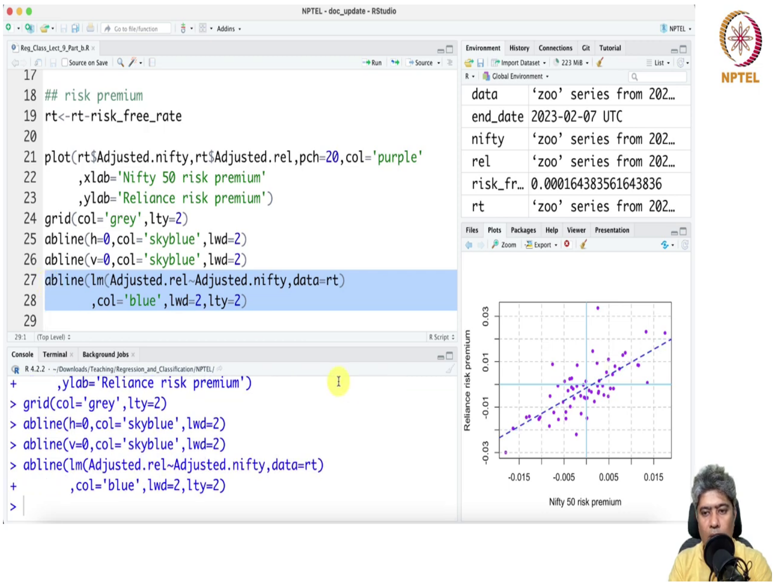


```
risk_free_rate<-0.06/36

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,
     ,xlab='Nifty 50 ri
     ,ylab='Reliance ri
grid(col='grey',lty=2)
abline(h=0,col='skyblue
abline(v=0,col='skyblue
abline(lm(Adjusted.rel~
```

```
> plot(rt$Adjusted.nifty,rt$/
+      ,xlab='Nifty 50 risk
+      ,ylab='Reliance risk
> grid(col='grey',lty=2)
> abline(h=0,col='skyblue',l
> abline(v=0,col='skyblue',l
>
```

So, you can see around 0 I put a line and so, most of them are like in almost on a almost like a 45 degree line it is getting created.

(Refer Slide Time: 10:03)



```r

## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,rt$Adjusted.rel,pch=20,col='purple'
     ,xlab='Nifty 50 risk premium'
     ,ylab='Reliance risk premium')
grid(col='grey',lty=2)
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
       ,col='blue',lwd=2,lty=2)

```

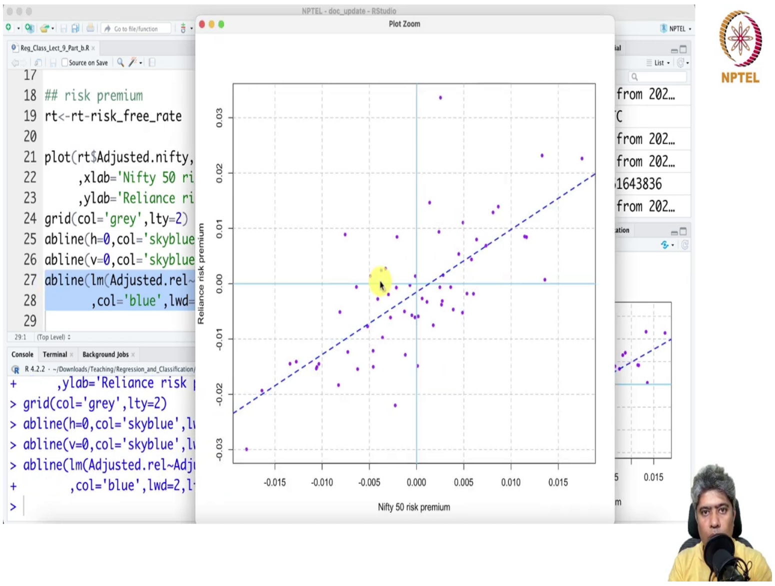
29:1 (Top Level) R Script

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…
rel	‘zoo’ series from 202…
risk_fr…	0.000164383561643836
rt	‘zoo’ series from 202…

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
+       ,ylab='Reliance risk premium')
> grid(col='grey',lty=2)
> abline(h=0,col='skyblue',lwd=2)
> abline(v=0,col='skyblue',lwd=2)
> abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
+        ,col='blue',lwd=2,lty=2)
>
```

And then what it does that it fit the Reliance Industry as a function of nifty and then it just yeah.

(Refer Slide Time: 10:16)

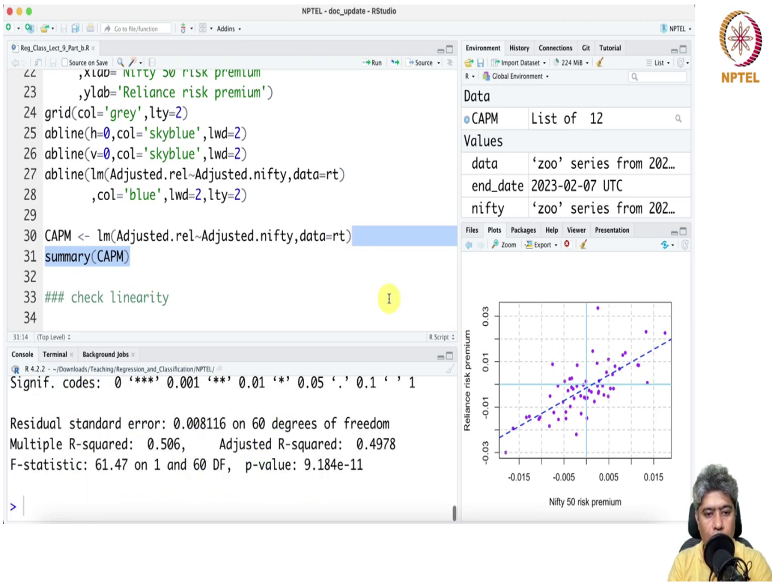


```
## risk premium
rt<-rt-risk_free_rate

plot(rt$Adjusted.nifty,
      ,xlab='Nifty 50 ri
      ,ylab='Reliance ri
grid(col='grey',lty=2)
abline(h=0,col='skyblue
abline(v=0,col='skyblue
abline(lm(Adjusted.rel~
         ,col='blue',lwd=
```

```
+       ,ylab='Reliance risk p
> grid(col='grey',lty=2)
> abline(h=0,col='skyblue',lw
> abline(v=0,col='skyblue',lw
> abline(lm(Adjusted.rel~Adju
+         ,col='blue',lwd=2,l
>
```

So, it just create this line through the almost through the center.

(Refer Slide Time: 10:25)



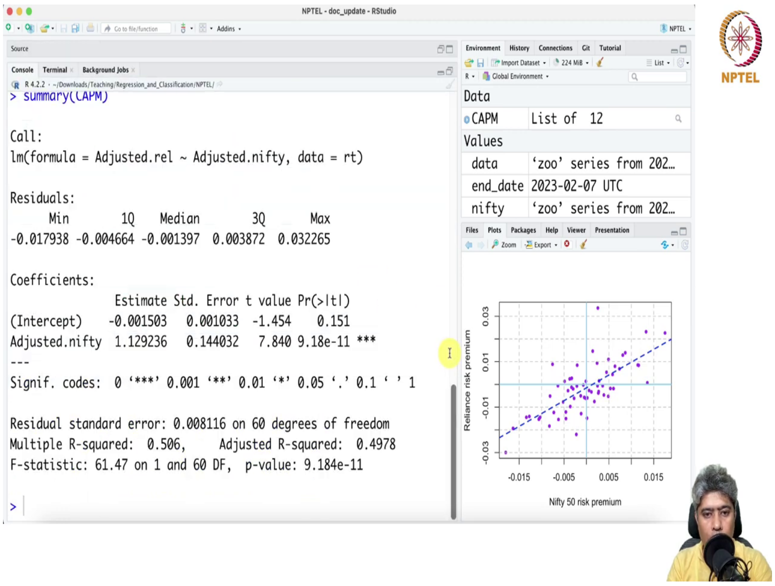
```r
      ,xlab='Nifty 50 risk premium'
      ,ylab='Reliance risk premium')
grid(col='grey',lty=2)
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
       ,col='blue',lwd=2,lty=2)

CAPM <- lm(Adjusted.rel~Adjusted.nifty,data=rt)
summary(CAPM)

### check linearity

```

```
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.008116 on 60 degrees of freedom
Multiple R-squared:  0.506,	Adjusted R-squared:  0.4978 
F-statistic: 61.47 on 1 and 60 DF,  p-value: 9.184e-11

> 
```

```
Data
CAPM       List of  12
Values
data       ‘zoo’ series from 202…
end_date   2023-02-07 UTC
nifty      ‘zoo’ series from 202…
```

So, now if I fit CAPM just all you have to do Reliance the risk premium of Reliance as the response and risk premium of Nifty market index as the predictor call lm and provide the data-rt rt contains all the risk premium after subtracting the risk-free rate from the log return. So, now you run the CAPM and run the summary.

(Refer Slide Time: 10:59)



```
> summary(CAPM)

Call:
lm(formula = Adjusted.rel ~ Adjusted.nifty, data = rt)

Residuals:
      Min        1Q    Median        3Q       Max 
-0.017938 -0.004664 -0.001397  0.003872  0.032265 

Coefficients:
                Estimate Std. Error t value Pr(>|t|)    
(Intercept)    -0.001503   0.001033  -1.454    0.151    
Adjusted.nifty  1.129236   0.144032   7.840 9.18e-11 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.008116 on 60 degrees of freedom
Multiple R-squared:  0.506,	Adjusted R-squared:  0.4978 
F-statistic: 61.47 on 1 and 60 DF,  p-value: 9.184e-11

> 
```

Data

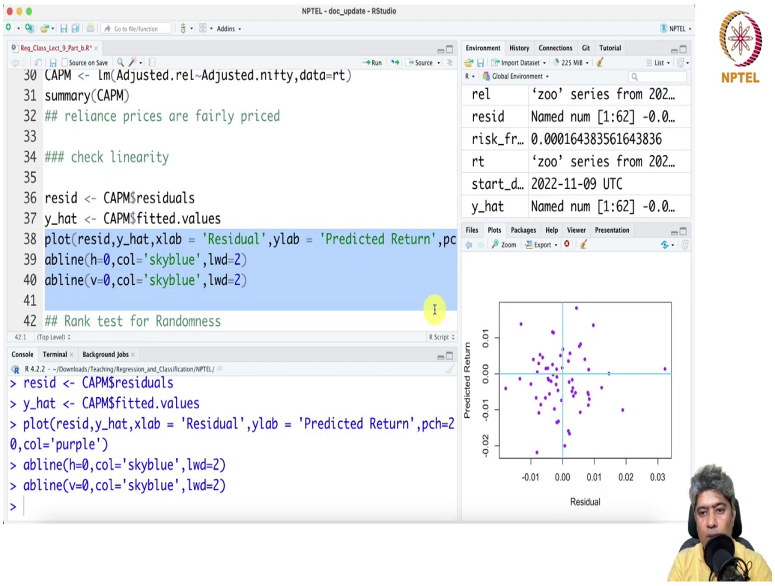
CAPM	List of 12

Values

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…

So, this is the alpha and this is the beta. So, beta is 1.12 and alpha is negative 0.00153, but P value is 0.151. So, we cannot really reject the null hypothesis that alpha is non-zero.

(Refer Slide Time: 11:26)



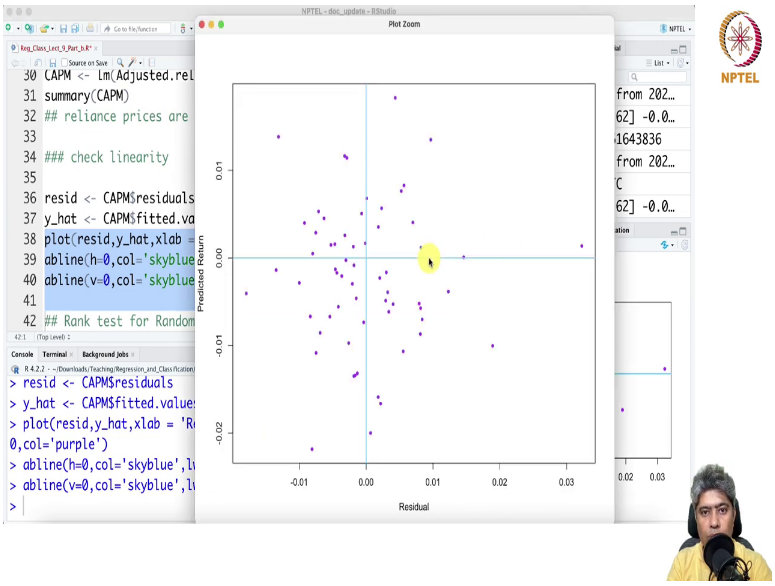
```r
CAPM <- lm(Adjusted.rel~Adjusted.nifty,data=rt)
summary(CAPM)
## reliance prices are fairly priced

### check linearity

resid <- CAPM$residuals
y_hat <- CAPM$fitted.values
plot(resid,y_hat,xlab = 'Residual',ylab = 'Predicted Return',pc
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)

## Rank test for Randomness
```

rel	'zoo' series from 202…
resid	Named num [1:62] -0.0…
risk_fr…	0.000164383561643836
rt	'zoo' series from 202…
start_d…	2022-11-09 UTC
y_hat	Named num [1:62] -0.0…

```
> resid <- CAPM$residuals
> y_hat <- CAPM$fitted.values
> plot(resid,y_hat,xlab = 'Residual',ylab = 'Predicted Return',pch=2
0,col='purple')
> abline(h=0,col='skyblue',lwd=2)
> abline(v=0,col='skyblue',lwd=2)
> 
```

So, we can say that reliance prices are fairly priced. Ok. First we would like to do some quick linearity check. So, first we will take the residuals, take the y hat and do some plot of residual versus y hat.

(Refer Slide Time: 11:57)



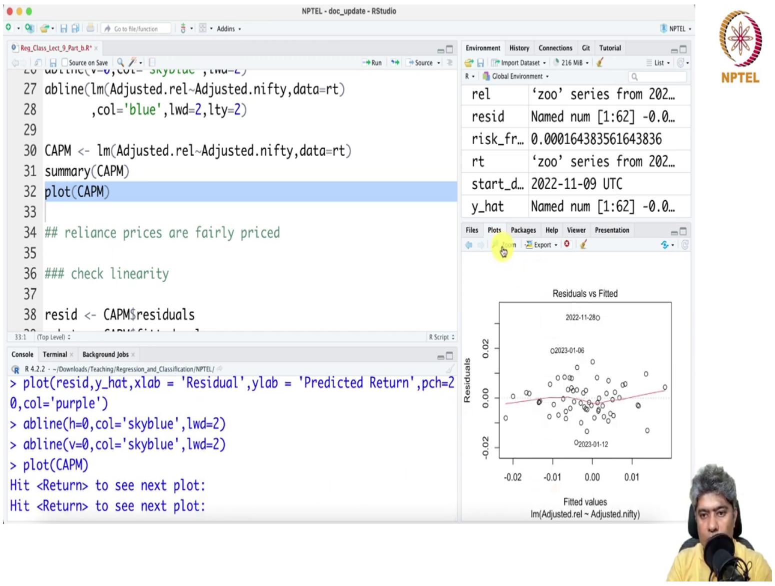
```
CAPM <- lm(Adjusted.rel
summary(CAPM)
## reliance prices are

### check linearity

resid <- CAPM$residuals
y_hat <- CAPM$fitted.va
plot(resid,y_hat,xlab =
abline(h=0,col='skyblue
abline(v=0,col='skyblue

## Rank test for Random
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/
> resid <- CAPM$residuals
> y_hat <- CAPM$fitted.values
> plot(resid,y_hat,xlab = 'R
0,col='purple')
> abline(h=0,col='skyblue',l
> abline(v=0,col='skyblue',l
>
```

```
from 202…
62] -0.0…
1643836
from 202…
C
62] -0.0…
```

So, here is the residual and here is the y hat. You can do one more thing also.

(Refer Slide Time: 12:06)



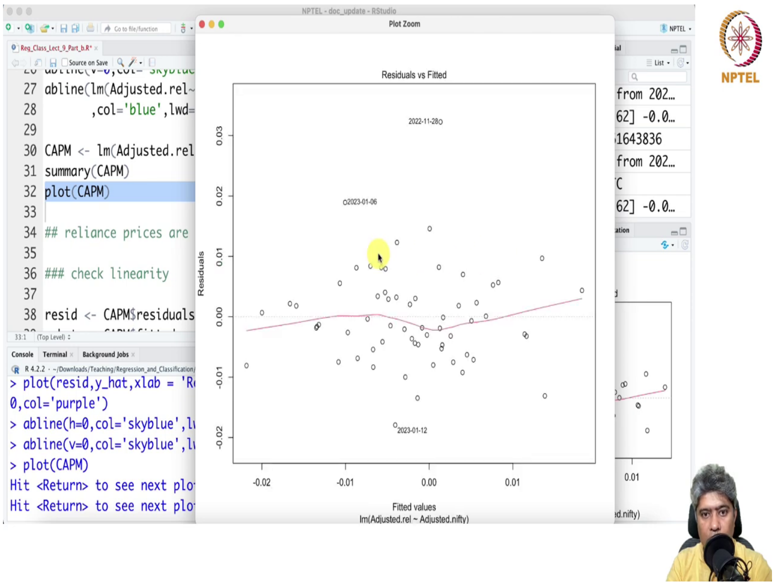
```
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
       ,col='blue',lwd=2,lty=2)

CAPM <- lm(Adjusted.rel~Adjusted.nifty,data=rt)
summary(CAPM)
plot(CAPM)

## reliance prices are fairly priced

### check linearity

resid <- CAPM$residuals
```

rel	‘zoo’ series from 202…
resid	Named num [1:62] -0.0…
risk_fr…	0.000164383561643836
rt	‘zoo’ series from 202…
start_d…	2022-11-09 UTC
y_hat	Named num [1:62] -0.0…

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
> plot(resid,y_hat,xlab = 'Residual',ylab = 'Predicted Return',pch=2
0,col='purple')
> abline(h=0,col='skyblue',lwd=2)
> abline(v=0,col='skyblue',lwd=2)
> plot(CAPM)
Hit <Return> to see next plot:
Hit <Return> to see next plot:
```

So, now here you have fitted plot if you just fit plot CAPM if you just fit plot CAPM you will see a bunch of plot will get created. This is a built-in function in R.

(Refer Slide Time: 12:21)



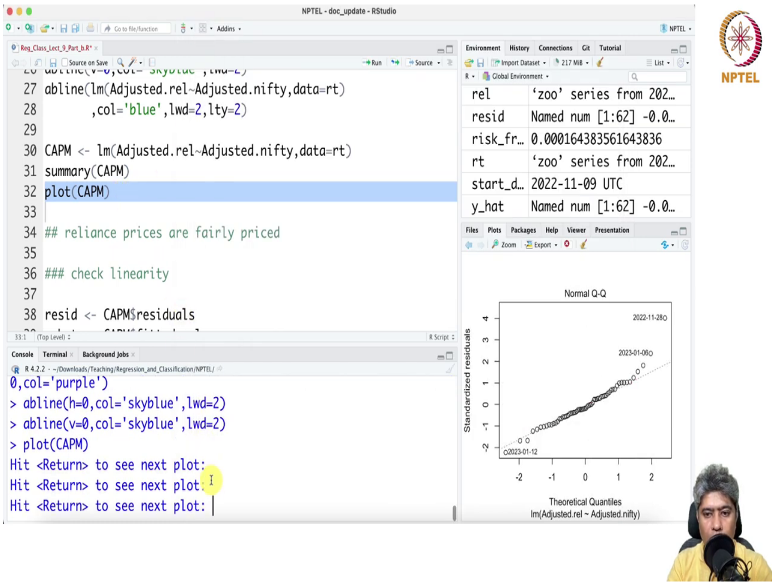
```
abline(lm(Adjusted.rel~
       ,col='blue',lwd=

CAPM <- lm(Adjusted.rel
summary(CAPM)
plot(CAPM)

## reliance prices are

### check linearity

resid <- CAPM$residuals
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/
> plot(resid,y_hat,xlab = 'Re
0,col='purple')
> abline(h=0,col='skyblue',lw
> abline(v=0,col='skyblue',lw
> plot(CAPM)
Hit <Return> to see next plot
Hit <Return> to see next plot
```

```
from 202…
62] -0.0…
1643836
from 202…
C
62] -0.0…
```

So, this is the first plot that you will get. So, here you have fitted value versus residual ok. Fitted value versus residual and some of the points are like sort of an outlier.

(Refer Slide Time: 12:35)



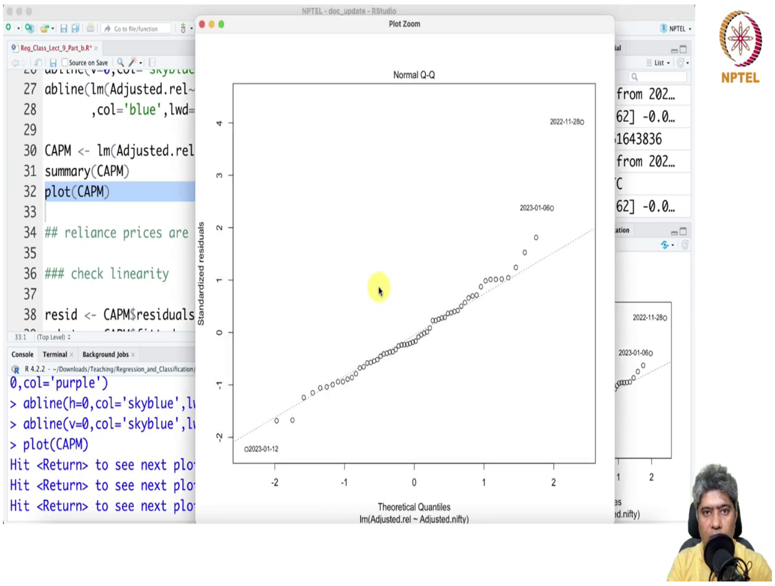
```
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
       ,col='blue',lwd=2,lty=2)

CAPM <- lm(Adjusted.rel~Adjusted.nifty,data=rt)
summary(CAPM)
plot(CAPM)

## reliance prices are fairly priced

### check linearity

resid <- CAPM$residuals
```

```
0,col='purple')
> abline(h=0,col='skyblue',lwd=2)
> abline(v=0,col='skyblue',lwd=2)
> plot(CAPM)
Hit <Return> to see next plot:
Hit <Return> to see next plot:
Hit <Return> to see next plot:
```

rel	'zoo' series from 202…
resid	Named num [1:62] -0.0…
risk_fr…	0.000164383561643836
rt	'zoo' series from 202…
start_d…	2022-11-09 UTC
y_hat	Named num [1:62] -0.0…

But the and then second plot it will be QQ plot.

(Refer Slide Time: 12:38)

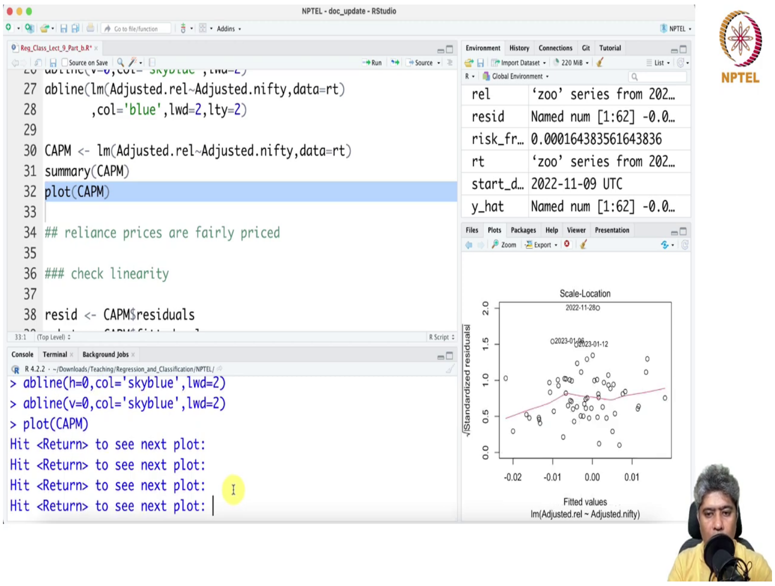


```
abline(lm(Adjusted.rel~
       ,col='blue',lwd=

CAPM <- lm(Adjusted.rel
summary(CAPM)
plot(CAPM)

## reliance prices are

### check linearity

resid <- CAPM$residuals
```

```
0,col='purple')
> abline(h=0,col='skyblue',l
> abline(v=0,col='skyblue',l
> plot(CAPM)
Hit <Return> to see next plo
Hit <Return> to see next plo
Hit <Return> to see next plo
```

It says that looks like some of the points are you know it is bit away from the like QQ line normality is looks like questionable.

(Refer Slide Time: 12:49)



NPTEL - doc_update - RStudio

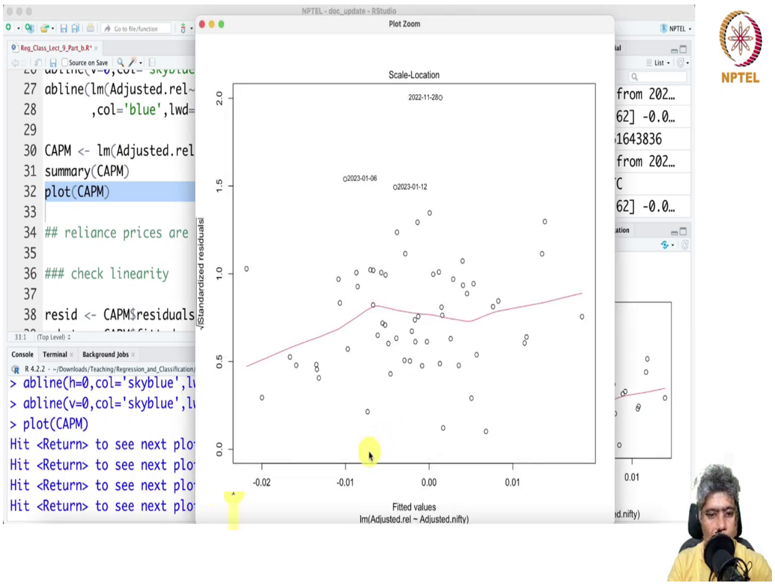
Reg_Class_Lect_9_Part_b.R*

```r
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
       ,col='blue',lwd=2,lty=2)

CAPM <- lm(Adjusted.rel~Adjusted.nifty,data=rt)
summary(CAPM)
plot(CAPM)

## reliance prices are fairly priced

### check linearity

resid <- CAPM$residuals
```

```
> abline(h=0,col='skyblue',lwd=2)
> abline(v=0,col='skyblue',lwd=2)
> plot(CAPM)
Hit <Return> to see next plot:
Hit <Return> to see next plot:
Hit <Return> to see next plot:
Hit <Return> to see next plot: 
```

rel	'zoo' series from 202…
resid	Named num [1:62] -0.0…
risk_fr…	0.000164383561643836
rt	'zoo' series from 202…
start_d…	2022-11-09 UTC
y_hat	Named num [1:62] -0.0…

(Refer Slide Time: 12:52)



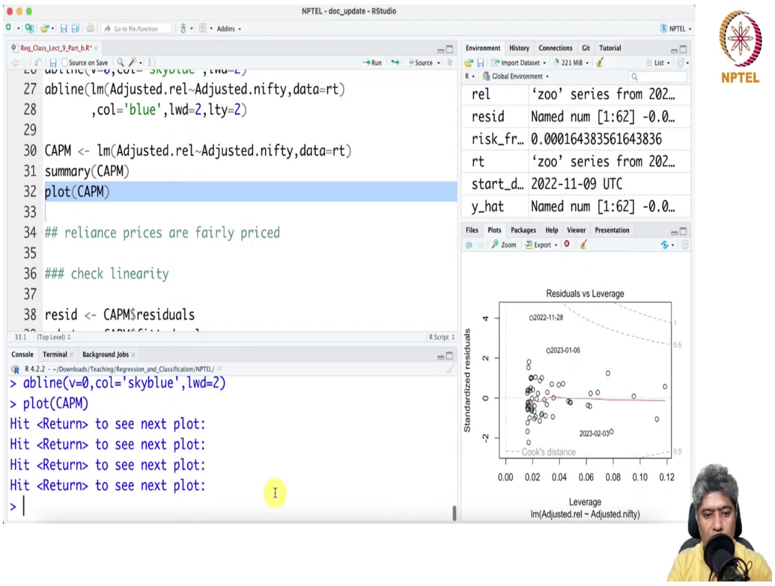
```
abline(lm(Adjusted.rel~
       ,col='blue',lwd=

CAPM <- lm(Adjusted.rel
summary(CAPM)
plot(CAPM)

## reliance prices are

### check linearity

resid <- CAPM$residuals
```

```
> abline(h=0,col='skyblue',l
> abline(v=0,col='skyblue',l
> plot(CAPM)
Hit <Return> to see next plo
Hit <Return> to see next plo
Hit <Return> to see next plo
Hit <Return> to see next plo
```

```
from 202…
62] -0.0…
1643836
from 202…
C
62] -0.0…
```

Then third is a fitted values versus standardized residual and there are some huge outlier as usual we were seeing and this is the this is the leverage versus standardized residuals.

(Refer Slide Time: 13:01)

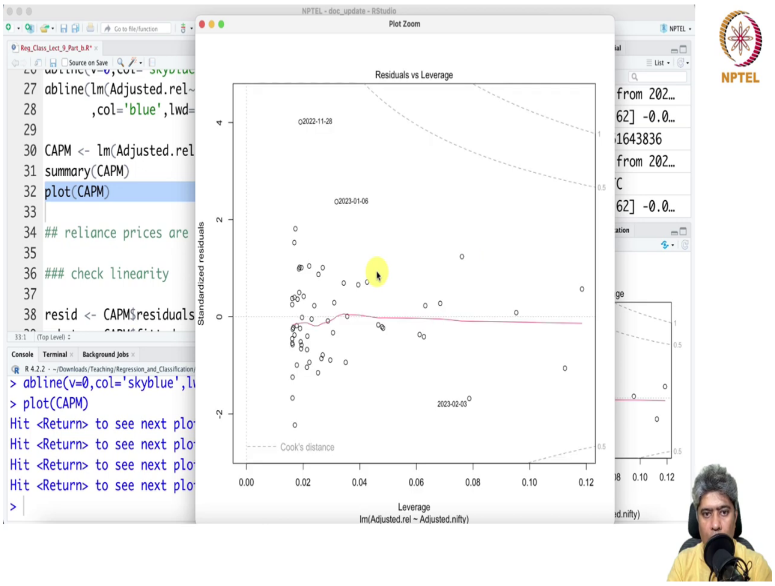


```
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
       ,col='blue',lwd=2,lty=2)

CAPM <- lm(Adjusted.rel~Adjusted.nifty,data=rt)
summary(CAPM)
plot(CAPM)

## reliance prices are fairly priced

### check linearity

resid <- CAPM$residuals
```

```
rel        'zoo' series from 202…
resid      Named num [1:62] -0.0…
risk_fr…   0.000164383561643836
rt         'zoo' series from 202…
start_d…   2022-11-09 UTC
y_hat      Named num [1:62] -0.0…
```

```
> abline(v=0,col='skyblue',lwd=2)
> plot(CAPM)
Hit <Return> to see next plot:
Hit <Return> to see next plot:
Hit <Return> to see next plot:
Hit <Return> to see next plot:
> 
```

(Refer Slide Time: 13:04)



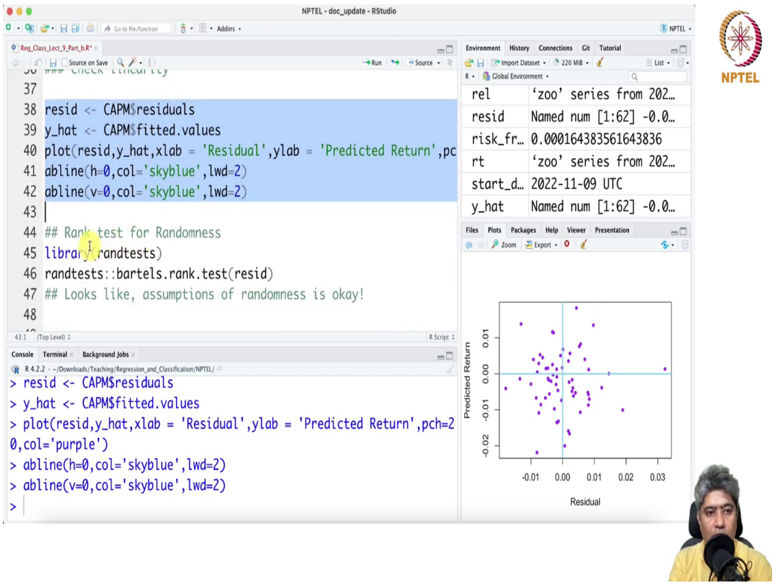
```
abline(lm(Adjusted.rel~
        ,col='blue',lwd=

CAPM <- lm(Adjusted.rel
summary(CAPM)
plot(CAPM)

## reliance prices are

### check linearity

resid <- CAPM$residuals
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/
> abline(v=0,col='skyblue',l
> plot(CAPM)
Hit <Return> to see next plo
Hit <Return> to see next plo
Hit <Return> to see next plo
Hit <Return> to see next plo
>
```

```
from 202…
62] -0.0…
1643836
from 202…
C
62] -0.0…
```

I have not discussed what is leverage and cooks distance all those things going forward. I will this I will teach you what is leverage what is cooks distance all those issues. So, at this moment I will not be able to explain this particular plot, but I am hoping by in next two weeks, I will be able to teach you what is leverage and what is residuals and at that time I will be able to explain this plot to you.

(Refer Slide Time: 13:41)



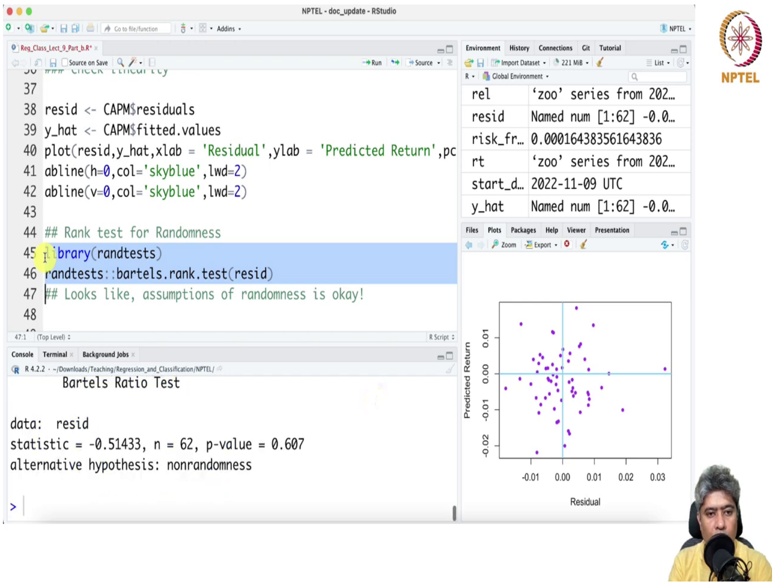
```
### check Linearity

resid <- CAPM$residuals
y_hat <- CAPM$fitted.values
plot(resid,y_hat,xlab = 'Residual',ylab = 'Predicted Return',pc
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)

## Rank test for Randomness
library(randtests)
randtests::bartels.rank.test(resid)
## Looks like, assumptions of randomness is okay!
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
> resid <- CAPM$residuals
> y_hat <- CAPM$fitted.values
> plot(resid,y_hat,xlab = 'Residual',ylab = 'Predicted Return',pch=2
0,col='purple')
> abline(h=0,col='skyblue',lwd=2)
> abline(v=0,col='skyblue',lwd=2)
>
```

rel	'zoo' series from 202…
resid	Named num [1:62] -0.0…
risk_fr…	0.000164383561643836
rt	'zoo' series from 202…
start_d…	2022-11-09 UTC
y_hat	Named num [1:62] -0.0…

So, our usual things I will check. So, here we have done a quick thing as of then we have test for randomness test.

(Refer Slide Time: 13:54)

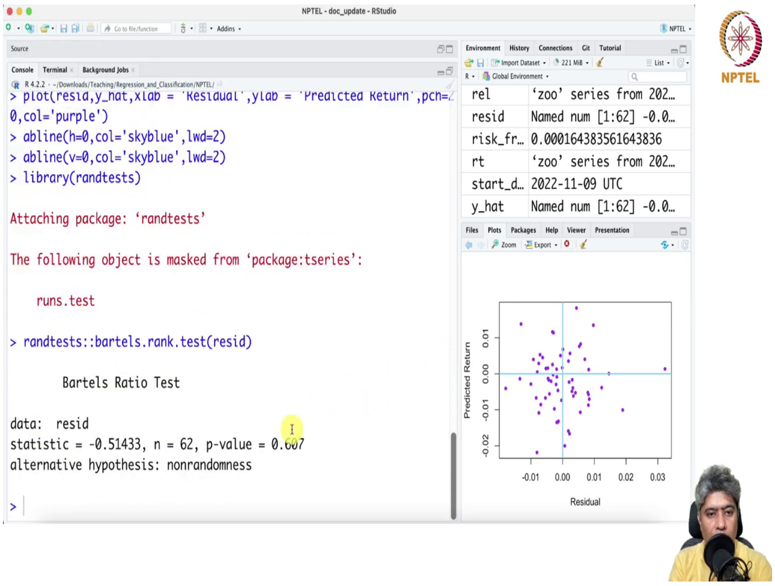


```
### check linearity

resid <- CAPM$residuals
y_hat <- CAPM$fitted.values
plot(resid,y_hat,xlab = 'Residual',ylab = 'Predicted Return',pc
abline(h=0,col='skyblue',lwd=2)
abline(v=0,col='skyblue',lwd=2)

## Rank test for Randomness
library(randtests)
randtests::bartels.rank.test(resid)
## Looks like, assumptions of randomness is okay!

```

```
rel        'zoo' series from 202…
resid      Named num [1:62] -0.0…
risk_fr…   0.000164383561643836
rt         'zoo' series from 202…
start_d…   2022-11-09 UTC
y_hat      Named num [1:62] -0.0…
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
         Bartels Ratio Test

data:  resid
statistic = -0.51433, n = 62, p-value = 0.607
alternative hypothesis: nonrandomness

>
```

(Refer Slide Time: 13:56)

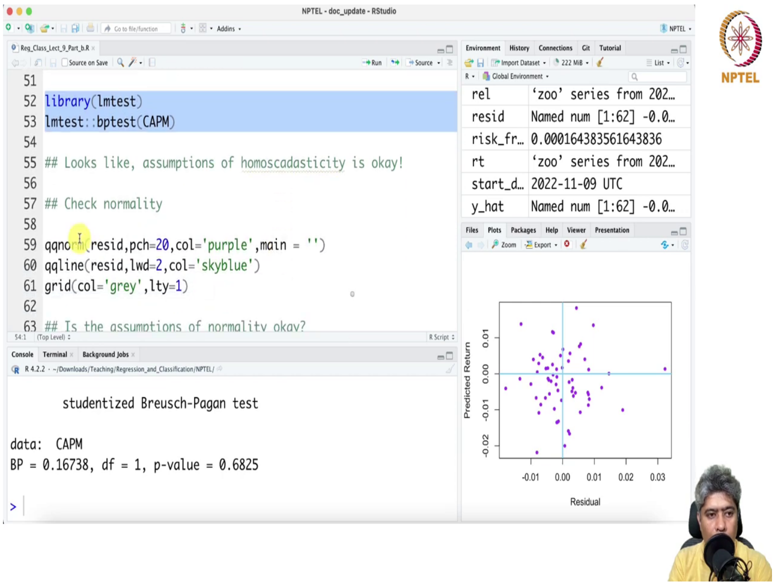


```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
> plot(resid,y_hat,xlab = 'Residual',ylab = 'Predicted Return',pch=2
0,col='purple')
> abline(h=0,col='skyblue',lwd=2)
> abline(v=0,col='skyblue',lwd=2)
> library(randtests)

Attaching package: ‘randtests’

The following object is masked from ‘package:tseries’:

    runs.test

> randtests::bartels.rank.test(resid)

	Bartels Ratio Test

data:  resid
statistic = -0.51433, n = 62, p-value = 0.607
alternative hypothesis: nonrandomness

> 
```

```
rel        ‘zoo’ series from 202…
resid      Named num [1:62] -0.0…
risk_fr…   0.000164383561643836
rt         ‘zoo’ series from 202…
start_d…   2022-11-09 UTC
y_hat      Named num [1:62] -0.0…
```

And what we found that p value is bit high. So, randomness is ok. So, the assumption of randomness is ok then we can run the Breusch Pagan Test for homoscedasticity.

(Refer Slide Time: 14:11)



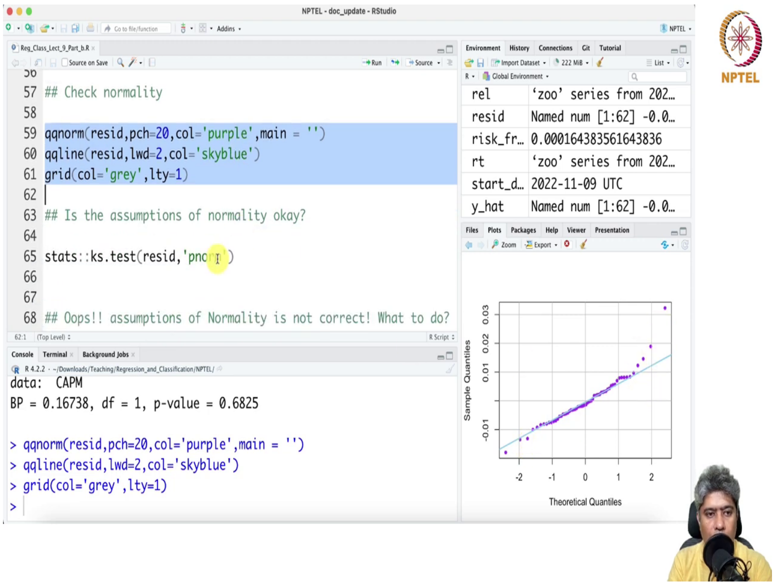
```r

library(lmtest)
lmtest::bptest(CAPM)

## Looks like, assumptions of homoscadasticity is okay!

## Check normality

qqnorm(resid,pch=20,col='purple',main = '')
qqline(resid,lwd=2,col='skyblue')
grid(col='grey',lty=1)

## Is the assumptions of normality okay?
```

rel	‘zoo’ series from 202…
resid	Named num [1:62] -0.0…
risk_fr…	0.000164383561643836
rt	‘zoo’ series from 202…
start_d…	2022-11-09 UTC
y_hat	Named num [1:62] -0.0…

```

	studentized Breusch-Pagan test

data:  CAPM
BP = 0.16738, df = 1, p-value = 0.6825

>
```

So, let us run the Breusch Pagan test for homoscedasticity and p-value we can see p-value for Breusch Pagan test is also very large. So, the assumption for homoscedasticity is also ok. Now, you run check for normality. So, looks like these points are far away from the QQ line. So, there is a questionable thing is the assumption of normality ok.

(Refer Slide Time: 14:24)

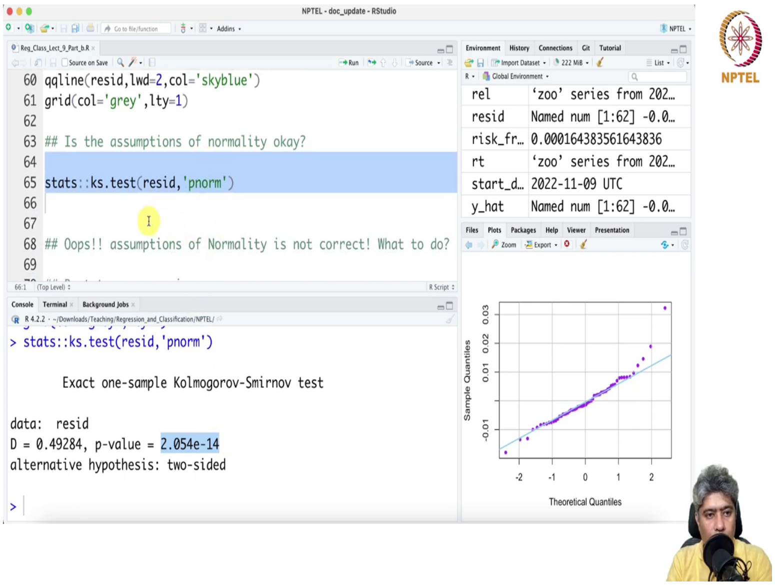


```
## Check normality

qqnorm(resid,pch=20,col='purple',main = '')
qqline(resid,lwd=2,col='skyblue')
grid(col='grey',lty=1)

## Is the assumptions of normality okay?

stats::ks.test(resid,'pnorm')


## Oops!! assumptions of Normality is not correct! What to do?
```

```
R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/
data:  CAPM
BP = 0.16738, df = 1, p-value = 0.6825

> qqnorm(resid,pch=20,col='purple',main = '')
> qqline(resid,lwd=2,col='skyblue')
> grid(col='grey',lty=1)
>
```

rel	‘zoo’ series from 202…
resid	Named num [1:62] -0.0…
risk_fr…	0.000164383561643836
rt	‘zoo’ series from 202…
start_d…	2022-11-09 UTC
y_hat	Named num [1:62] -0.0…

(Refer Slide Time: 14:35)



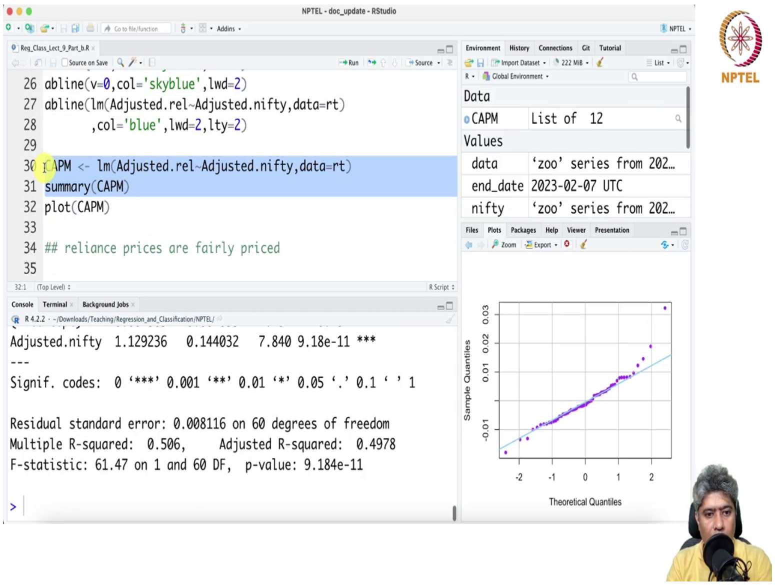
```
qqline(resid,lwd=2,col='skyblue')
grid(col='grey',lty=1)

## Is the assumptions of normality okay?

stats::ks.test(resid,'pnorm')


## Oops!! assumptions of Normality is not correct! What to do?

```

```
> stats::ks.test(resid,'pnorm')

        Exact one-sample Kolmogorov-Smirnov test

data:  resid
D = 0.49284, p-value = 2.054e-14
alternative hypothesis: two-sided

>
```

```
rel       'zoo' series from 202…
resid     Named num [1:62] -0.0…
risk_fr…  0.000164383561643836
rt        'zoo' series from 202…
start_d…  2022-11-09 UTC
y_hat     Named num [1:62] -0.0…
```

So, let us run the Kolmogorov Smirnov test and clearly p value is very very small. Very very small like after 0.14 zeros and then after 14 decimals place you are getting 2054. So, it is impossible. So, assumption of check normality is not correct. Therefore, this inference that we did if we this inference that we did.

(Refer Slide Time: 15:06)



NPTEL - doc_update - RStudio

Reg_Class_Lect_9_Part_b.R

```r
abline(v=0,col='skyblue',lwd=2)
abline(lm(Adjusted.rel~Adjusted.nifty,data=rt)
       ,col='blue',lwd=2,lty=2)

CAPM <- lm(Adjusted.rel~Adjusted.nifty,data=rt)
summary(CAPM)
plot(CAPM)

## reliance prices are fairly priced

```

R 4.2.2 · ~/Downloads/Teaching/Regression_and_Classification/NPTEL/

```
Adjusted.nifty  1.129236   0.144032   7.840 9.18e-11 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.008116 on 60 degrees of freedom
Multiple R-squared:  0.506,	Adjusted R-squared:  0.4978 
F-statistic: 61.47 on 1 and 60 DF,  p-value: 9.184e-11

> 
```

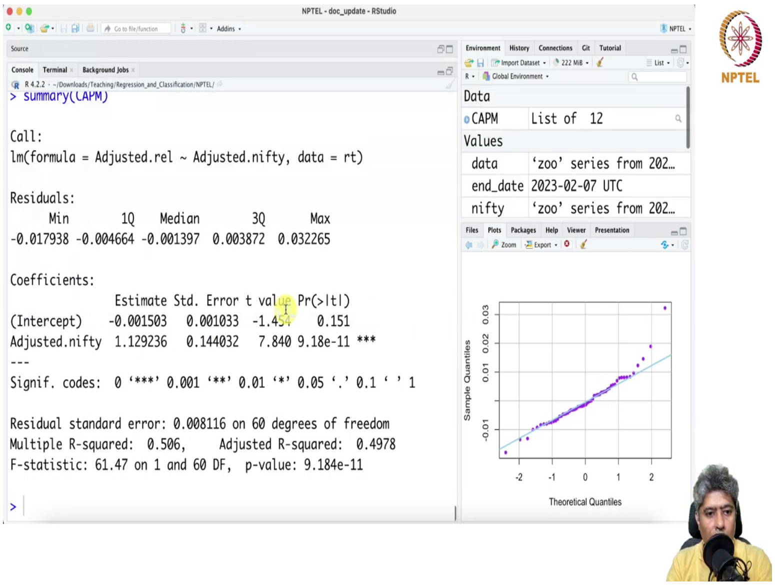
Data

CAPM	List of 12

Values

data	‘zoo’ series from 202…
end_date	2023-02-07 UTC
nifty	‘zoo’ series from 202…

(Refer Slide Time: 15:08)



```
> summary(CAPM)

Call:
lm(formula = Adjusted.rel ~ Adjusted.nifty, data = rt)

Residuals:
      Min        1Q    Median        3Q       Max
-0.017938 -0.004664 -0.001397  0.003872  0.032265

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    -0.001503   0.001033  -1.454    0.151
Adjusted.nifty  1.129236   0.144032   7.840 9.18e-11 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.008116 on 60 degrees of freedom
Multiple R-squared:  0.506,	Adjusted R-squared:  0.4978
F-statistic: 61.47 on 1 and 60 DF,  p-value: 9.184e-11

>
```

```
Data
CAPM      List of  12
Values
data      ‘zoo’ series from 202…
end_date  2023-02-07 UTC
nifty     ‘zoo’ series from 202…
```

This inference is now not anymore valid because this test is done based on t value and t value requires the assumption of normality. And clearly our residual does not follow normality. So, this assumption these entire analysis is not valid anymore ok. So, in order to solve this situation what typically we do? One possible solution is bootstrap regression and non-parametric bootstrap regression.

So, at this moment I am going to stop here and in the next video I will start discussing what is bootstrap regression and then I will do the hands on how we can solve this problem of capital asset pricing model using bootstrap regression. I hope you enjoyed this video.

Thank you very much. See you in the next video.