Check ADAM or Github regularly for new material. (https://https://github.com/yvan-lengwiler/Finance-Uni)

You will have **homework** every week. The lectures (via zoom) are here mainly for you sharing your work with fellow students. I will not go in detail through the material. I am here to assist you in working out the problems with you if you get stuck.

Lectures are in **two groups**. (14 to 16 and 16 to 18). You should have received a mail with your group allocation? If not, send us a mail asap.

In addition, Tri (triminh.phan@unibas.ch) offers a **tutorial** online session on Monday afternoon to help you if you get badly stuck on homework (see the Zoom link on ADAM to the tutorial).

You should try to solve the homework the latest on Monday morning to be able to know if you have difficulties. Ideally, you should **send your questions** by email to Tri before the tutorial.

I advise you to **form groups**. It is much easier to work in a small group (just 2 people is best).

3CP, runs only in 1st half of semester.

Take-home exam in the 6th or 7th week.

First look at some data

Asset Pricing I

Yvan Lengwiler, University of Basel

ON THIS COURSE

This course is practical: you will learn stuff that you can use in your future working life if you work in the finance space.

This course is also programming heavy. We use R because it is widely used, it is free, and it is more approachable than C or C++.

ADAM vs git: You can download files for this class from ADAM or Github. See the explanations in the handout and the documentation in git.pdf.

2 Types of assets

1 Question. What types of financial assets do you know? What are their defining properties?

Next slide: 3 Download some data

```r
symbol    <- 'GM'            # General Motors
interval  <- 'monthly'         # daily, weekly, monthly
from_date <- '2010-12-01'
to_date   <- '2023-12-31'

data <- yf_get(
    tickers = symbol,
    first_date = from_date,
    last_date = to_date,
    freq_data = interval,
    do_cache = TRUE,
    be_quiet = TRUE
)
price <- as.numeric(data$price_adjusted)
dates <- as.Date(data$ref_date)

plot(dates, log(price), main = symbol, type='l')
```

2 Task. Study this code. What does it do? Try to run this bit one your machine.

```r
factor <- switch(
    interval,
        'monthly' = 12,        # number of trading months
        'weekly'  = 365.25/7,  # number of trading weeks
        'daily'   = 365.25*5/7  # number of trading days
    )

yield <- diff(log(price)) * factor

bullet_size <- sqrt(150/length(yield))
plot(dates[-1], yield,
    main = paste("annualized", interval_name, "return of", symbol),
    pch=20, cex=bullet_size, axes = FALSE)
axis.Date(1, dates[-1], at = seq(dates[2], dates[length(dates)], "years"))
axis(2)
```
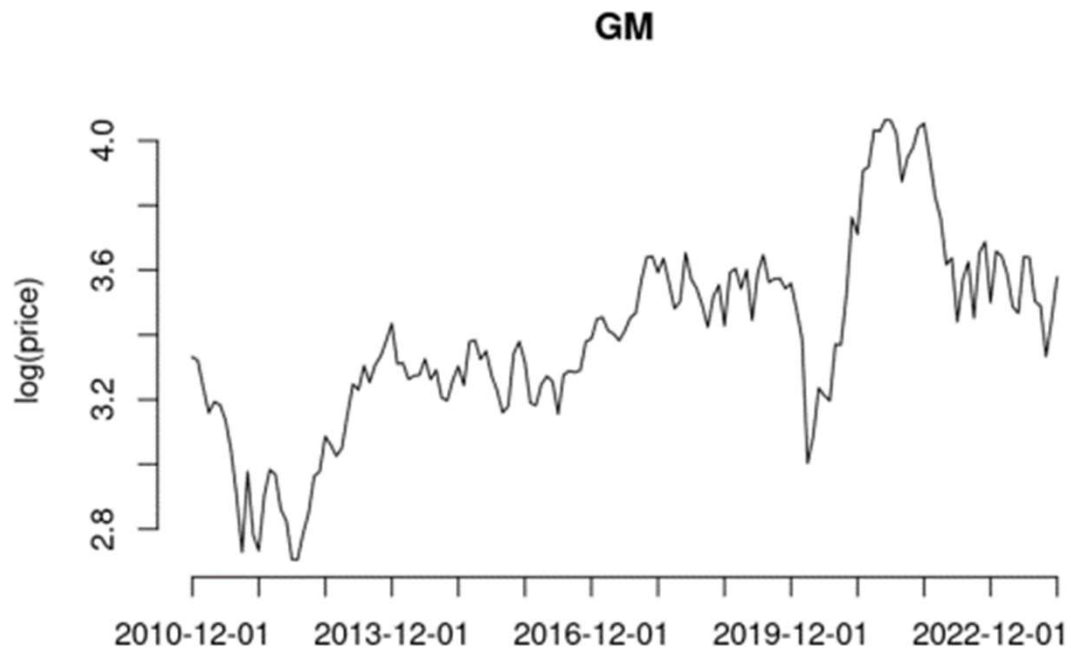
3 Task. Again, study this code. What does it do? How is the 'factor' function used? Try to run this bit one your machine.

4 Equities as stochastic processes

GM

4 Question. Try to describe the most relevant features of this time series. is it random? is there a trend? etc.

5 Question. The chart is represented on a logarithmic scale. What are the two main advantages of the log scale here?

Note: If you are interested in such things, check out `https://youtu.be/0jIwCOevUew?si=BtzwSN5DI6NdE6CN` for a discussion of the history of the logarithm and an intuitive explanation of its properties.

annualized monthly return of GM
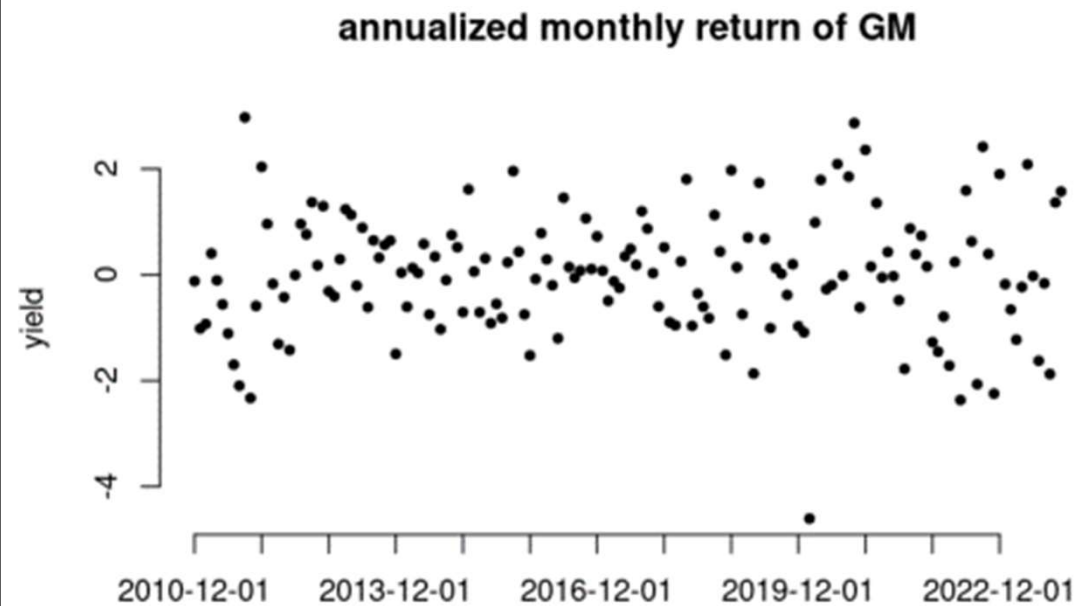
6 Question. What can you observe with the naked eye?

5 Distribution of return rates

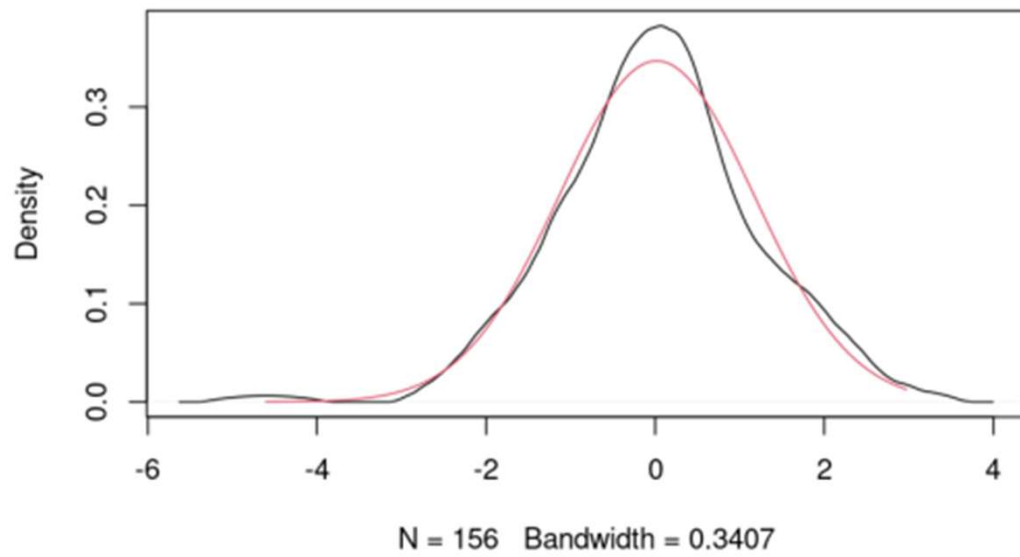The kernel estimate is a computation of the empirical density function of the data.

The Q–Q plot is a method to compare the empirical distribution with the Gaussian (normal) distribution.

7 Task. Expand our R skript so that it produces a kernel estimate and a Q-Q plot of the returns. The following R functions are useful for this: `density`, `qqnorm`, and `qqline`. You can find the manual of any R function with `?command`, so for instance `?density`. You are free to work in groups.
The aim is to produce kernel estimates and Q-Q plots for the mobthly returns of the GM stock.

8 Task. Create kernel estimates and Q-Q plots for the S$P500 index (`symbol <- '^GSPC'`) for monthly and for daily data. Feel free to explore other equities as well. Describe your observations. Is there a qualitative difference between the distributions of the monthly and the daily returns?

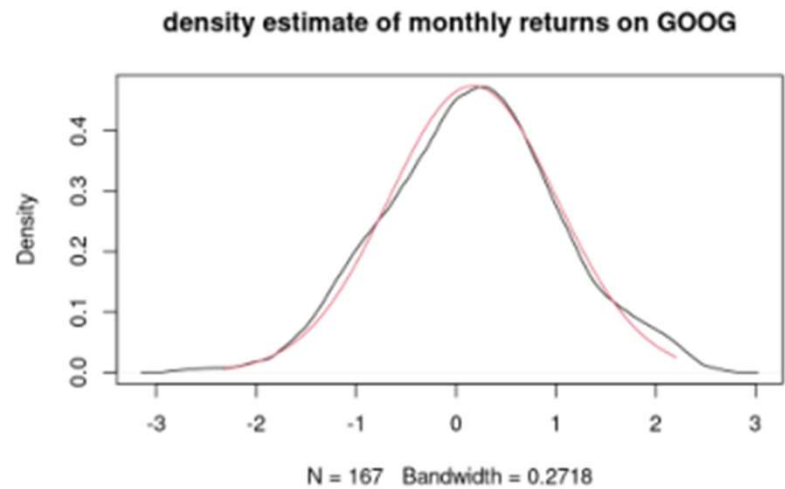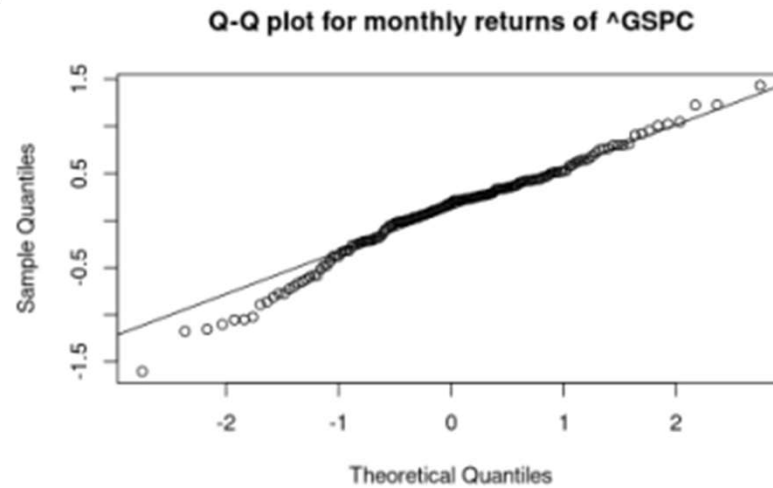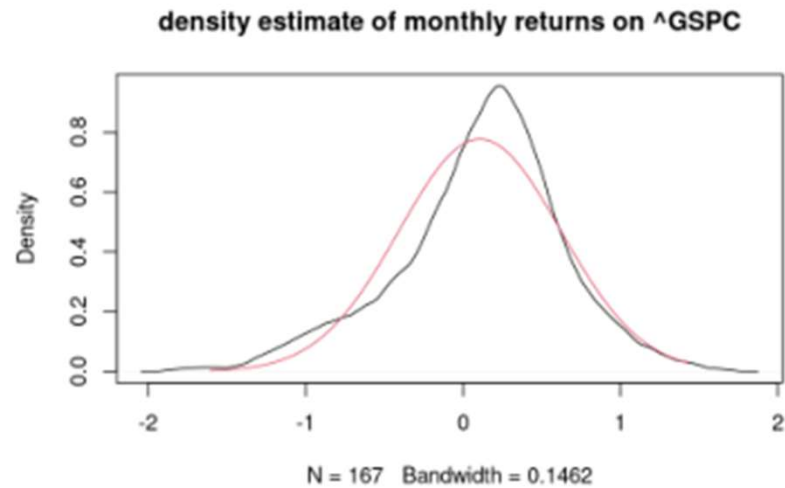## density estimate of monthly returns on GM

N = 156   Bandwidth = 0.3407

Q-Q plot for monthly returns of GM

Theoretical Quantiles

more monthly returns …

density estimate of monthly returns on ^GSPC

N = 167   Bandwidth = 0.1462

Q-Q plot for monthly returns of ^GSPC

density estimate of monthly returns on GOOG
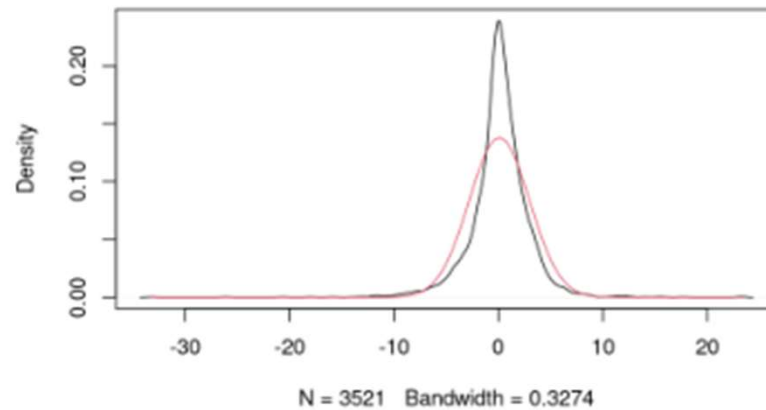
N = 167   Bandwidth = 0.2718
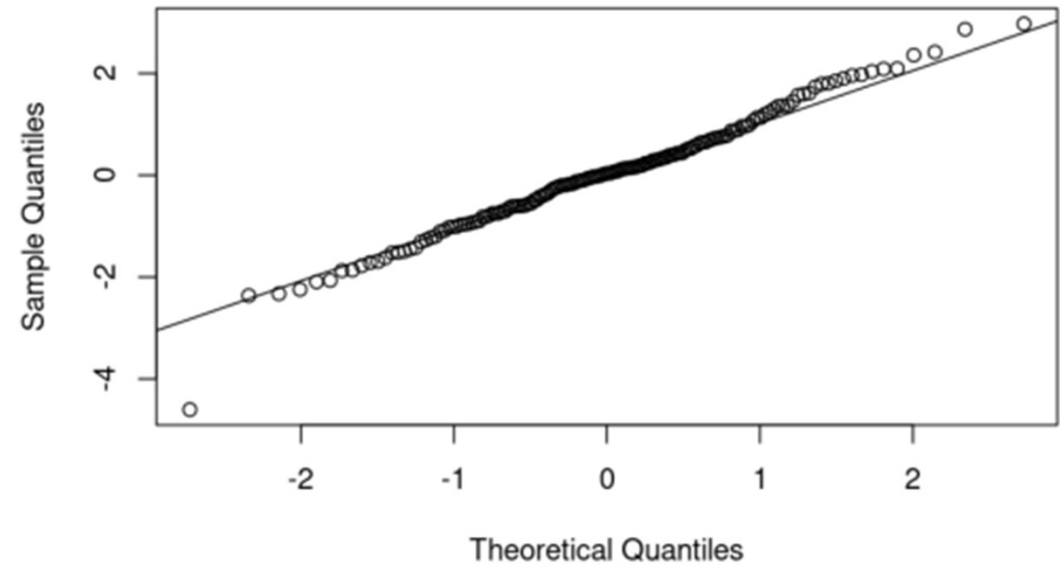
Q-Q plot for monthly returns of GOOG

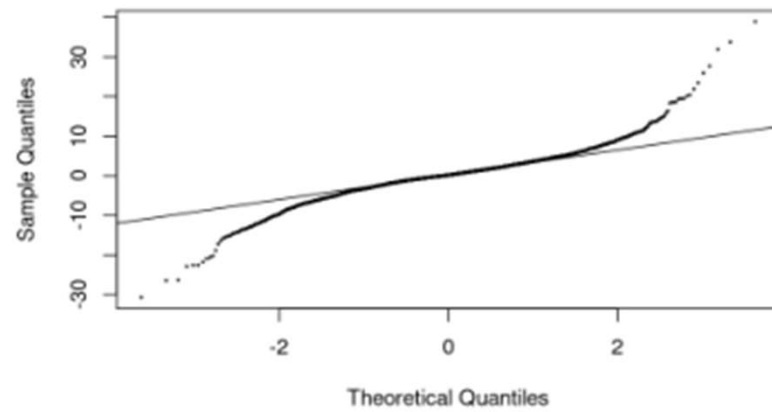# daily returns …

density estimate of daily returns on ^GSPC

N = 3521   Bandwidth = 0.3274

Q-Q plot for daily returns of ^GSPC
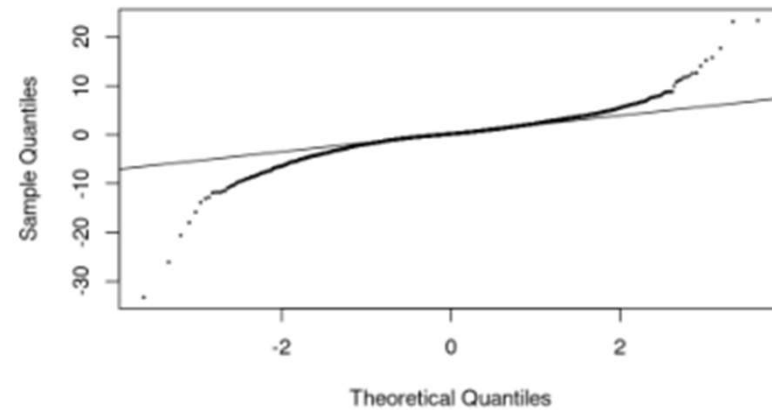
density estimate of daily returns on GOOG

N = 3521   Bandwidth = 0.5521
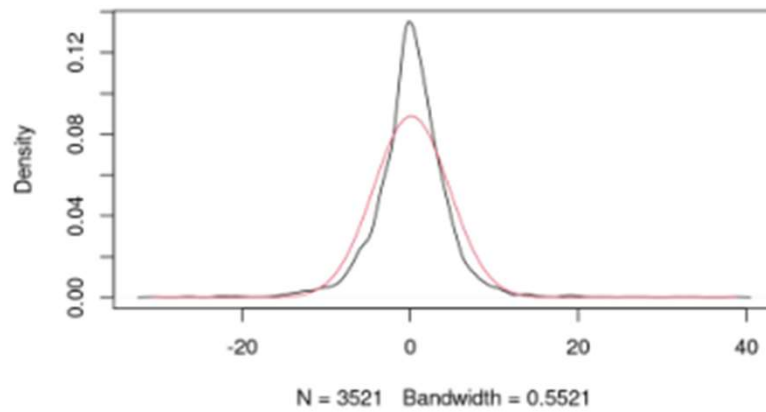
Q-Q plot for daily returns of GOOG

Please go through the material in

6   Short-term vs longer-term return rates

I will assume that you understand this.
If not, let me know next week.

In addition, please download the **material for next week** and work though all the questions and tasks.

The next lecture will be online. You should be prepared to share your work with the class then.