Inspecting stochastic properties of an equity

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This script downloads some stock market data from finance.yahoo.com and performs a few simple analyses.

1 Parameters

We begin by setting some parameters. These parameters will determine what the script does exactly.

```
#symbol    <- 'AMD'              # Advanced Micro Devices
#symbol    <- 'GOOG'             # Alphabet
#symbol    <- 'NESN.SW'          # Nestlé
symbol    <- 'GM'               # General Motors
#symbol    <- 'MSFT'             # Microsoft
#symbol    <- 'PM'               # Philip Morris
#symbol    <- 'XOM'              # Exxon Mobil
#symbol    <- '^GSPC'            # S&P500 index
#symbol    <- 'BTC-USD'          # BTC in USD
#symbol    <- 'CHFUSD=X'         # CHF-USD FX

#interval  <- '1d'                # 1d, 1wk, or 1mo
#interval  <- '1wk'               # 1d, 1wk, or 1mo
interval  <- '1mo'               # 1d, 1wk, or 1mo

from_date <- '2010-12-01'
to_date   <- '2023-12-31'
```

Next we set the variables `factor` and `interval_name` depending on the chosen observation frequency.

```
factor <- switch(
    interval,
        '1mo' = 12,           # number of trading months
        '1wk' = 365.25/7,     # number of trading weeks
        '1d'  = 365.25*5/7    # number of trading days
    )
interval_name <- switch(
    interval,
        '1mo' = 'monthly',
        '1wk' = 'weekly',
        '1d'  = 'daily'
    )
```

2 Acquire data

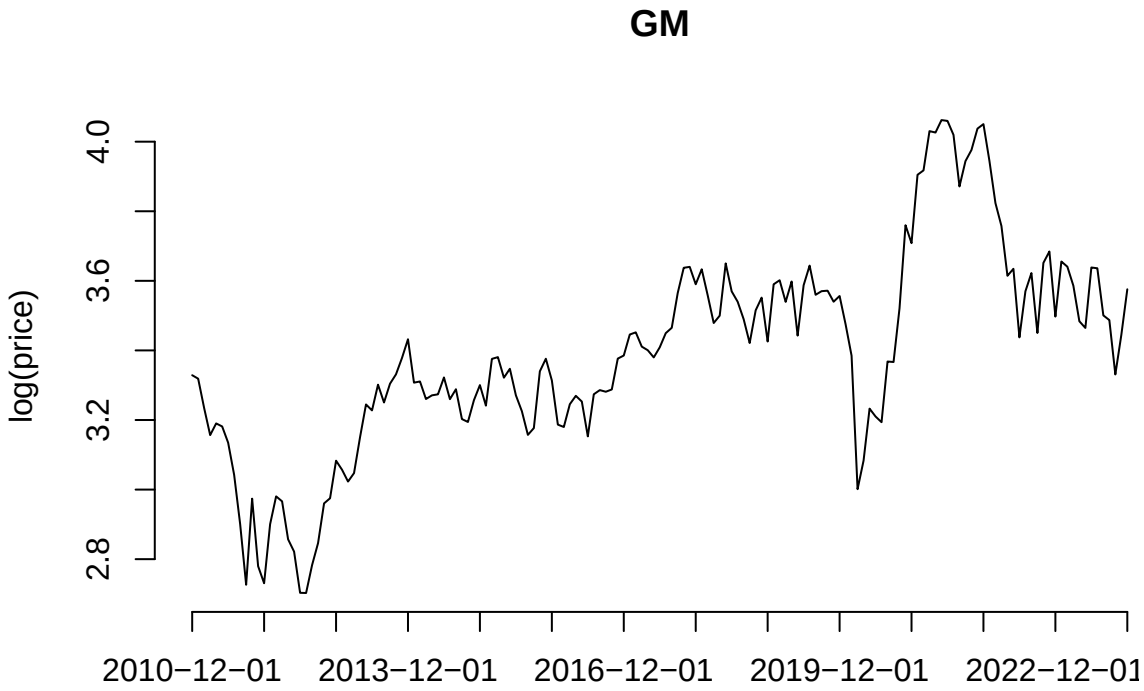
We now download the relevant data from `https://finance.yahoo.com`. We first construct the URL that conforms to yahoo's API and then download the data and assign in to a variable in R using `read.csv`.

```
basedate <- as.Date("1970-01-01")
fromcode <- difftime(as.Date(from_date), basedate, units="secs")
tocode   <- difftime(as.Date(to_date), basedate, units="secs")

url <- paste0('https://query1.finance.yahoo.com/v7/finance/download/',
    symbol, "?period1=", fromcode, "&period2=", tocode,
    "&interval=", interval, "&events=history&includeAdjustedClose=true")

data  <- read.csv(url, header=TRUE)
price <- as.numeric(data$Adj.Close)
dates <- data$Date
```

3 Take a look at the data

Let us plot the data ...

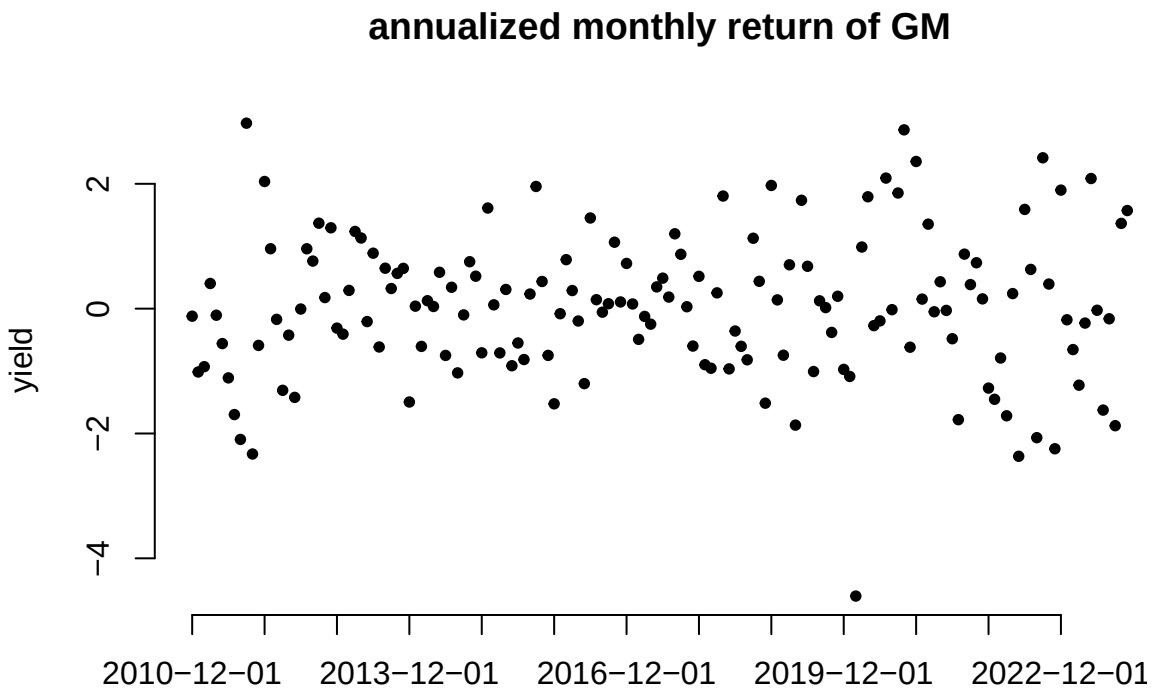
```
plot(1:length(price), log(price), main = symbol,
     type='l', axes = FALSE, xlab = "")
labels <- dates[seq(1, length(dates), factor)]
axis(1, at=seq(1,length(dates),factor), labels)
axis(2)
```



... and the yields ...

```
# annualized return rate from one observation to the next
yield <- diff(log(price)) * factor
# plot it
bullet_size <- sqrt(150/length(yield))
plot(yield, main = paste("annualized", interval_name, "return of", symbol),
     pch=20, cex=bullet_size, axes = FALSE, xlab = "")
labels <- dates[seq(1, length(dates)-1, factor)]
axis(1, at=seq(1,length(dates)-1,factor), labels)
```

```
axis(2)
```



4 Analyse the distribution of the yields

Here we compute the Q-Q plot of the yields (against the hypothesis of a normal distribution), and we also plot the Kernel estimate, showing us the empirical density of the yield data.

WORK FOR YOU TO COMPLETE HERE

```
# compute kernel
# ...
# plot it
# ...
```

```
# make a Q-Q plot
# ...
```