Univariate time series analysis

VISUALIZING TIME SERIES DATA IN R

Arnaud Amsellem

Quantitative Trader and creator of the R Trader blog

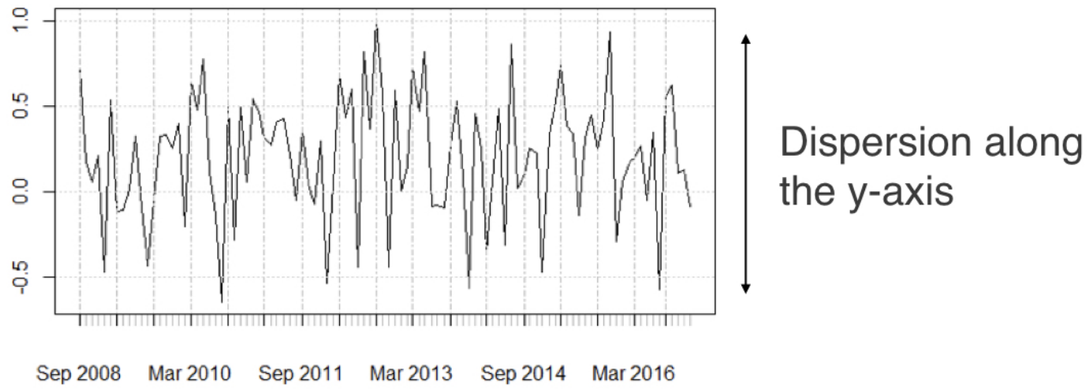
datacamp

Univariate time series analysis

- Location

Univariate time series analysis

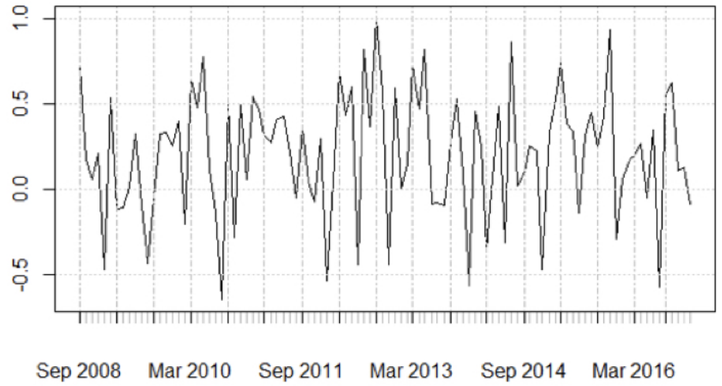
- Location
- Dispersion



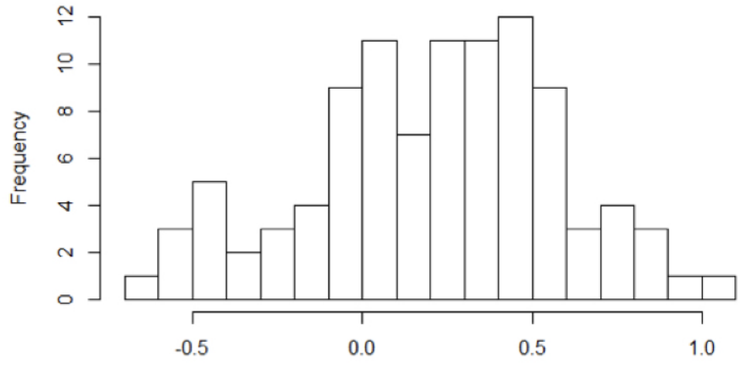
Dispersion along the y-axis

Univariate time series analysis

- Location
- Dispersion
- Distribution



Dispersion along the y-axis



Amazon stock price

- In their standard form, most time series do not exhibit the right statistical properties
- Example: stock with strong upward trend

Amazon stock return

- Amazon stock *return* is a random series centered around 0

Let's practice!

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Other visualization tools

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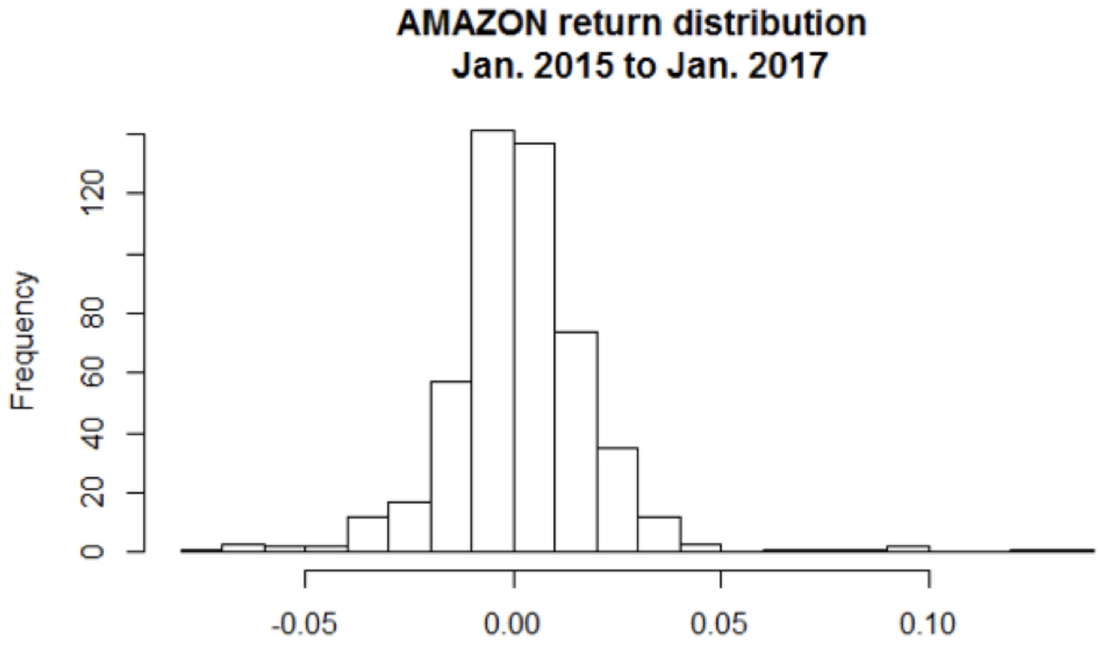
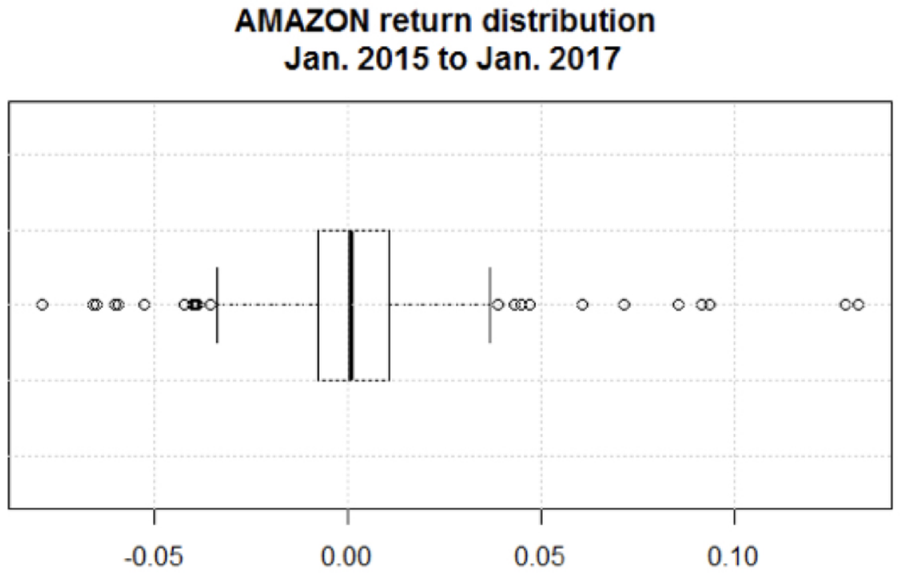
Histograms

```
hist(amazon_stocks,
     breaks = 20,
     main = "AMAZON return distribution \\n Jan. 2015 to Jan. 2017",
     xlab = "")
```



Box and whisker

```
boxplot(amazon_stocks,
horizontal = TRUE,
main = "AMAZON return distribution \\n Jan. 2015 to Jan. 2017")
```



Box and whisker

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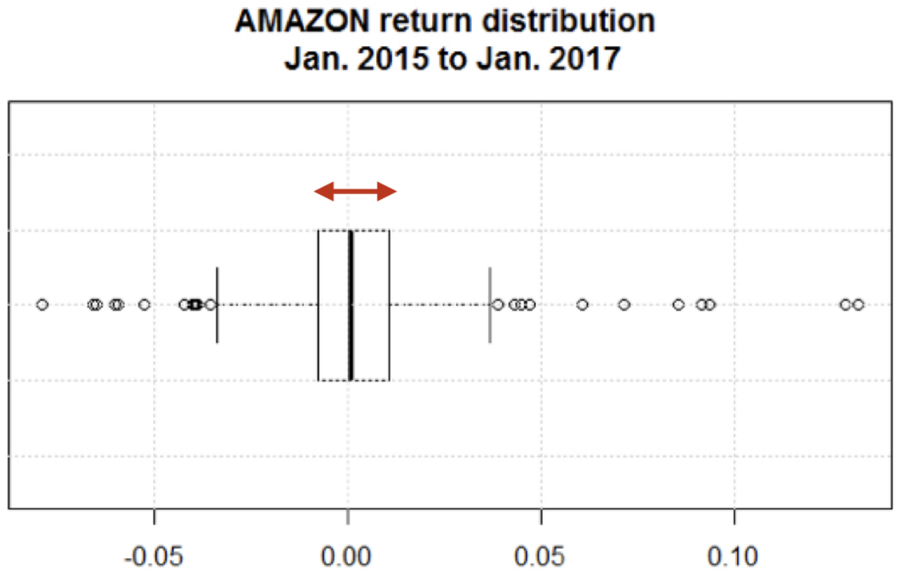
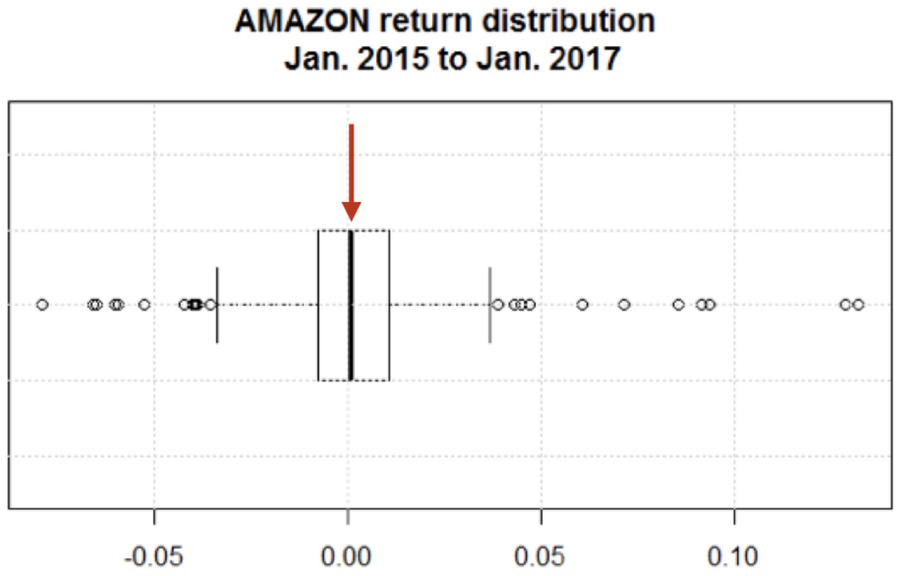
boxplot(amazon_stocks,
horizontal = TRUE,
main = "AMAZON return distribution \\n Jan. 2015 to Jan. 2017")
```



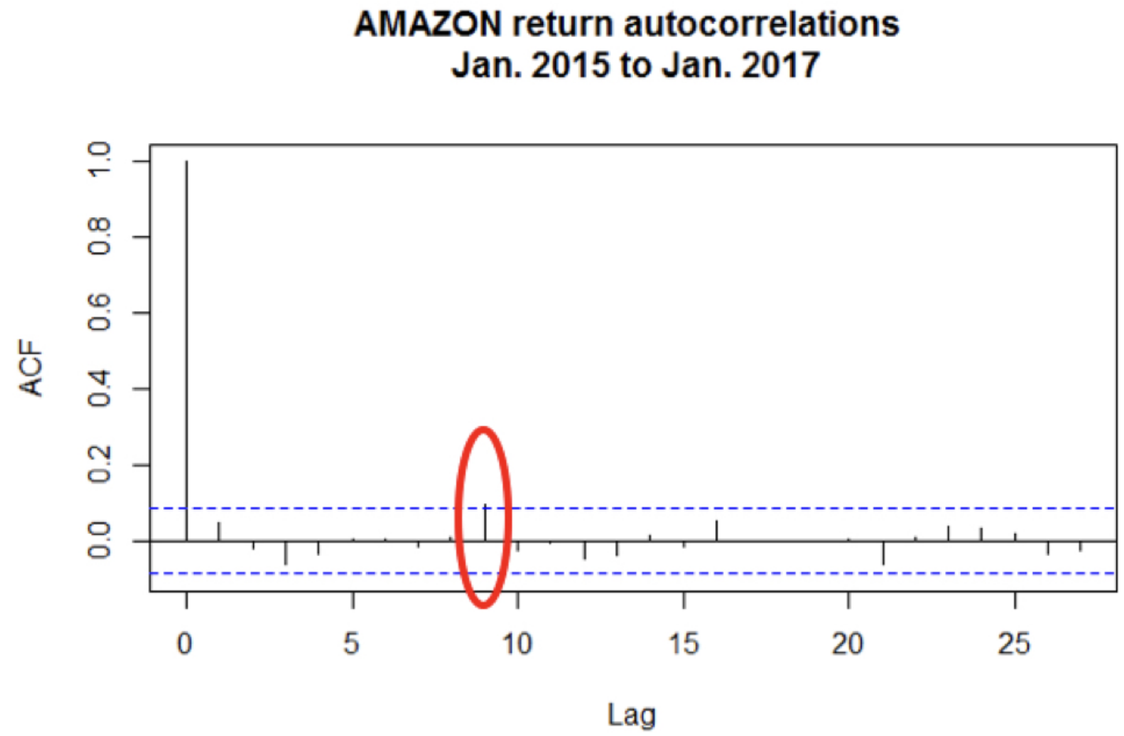
Box and whisker

```
boxplot(amazon_stocks,
horizontal = TRUE,
main = "AMAZON return distribution \\n Jan. 2015 to Jan. 2017")
```



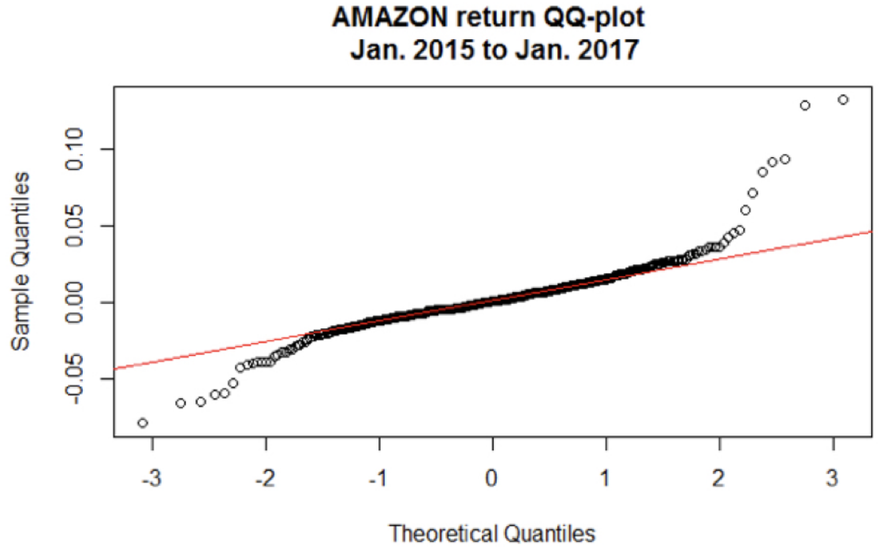
Autocorrelation

```
acf(amazon_stocks,
    main = "AMAZON return autocorrelations \\n Jan. 2015 to Jan. 2017")
```



QQ-plot

```
qqnorm(amazon_stocks,
       main = "AMAZON return QQ-plot \\n Jan. 2015 to Jan. 2017")
qqline(amazon_stocks,
       col = "red")
```



Let's practice!

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How to use everything we learned so far?

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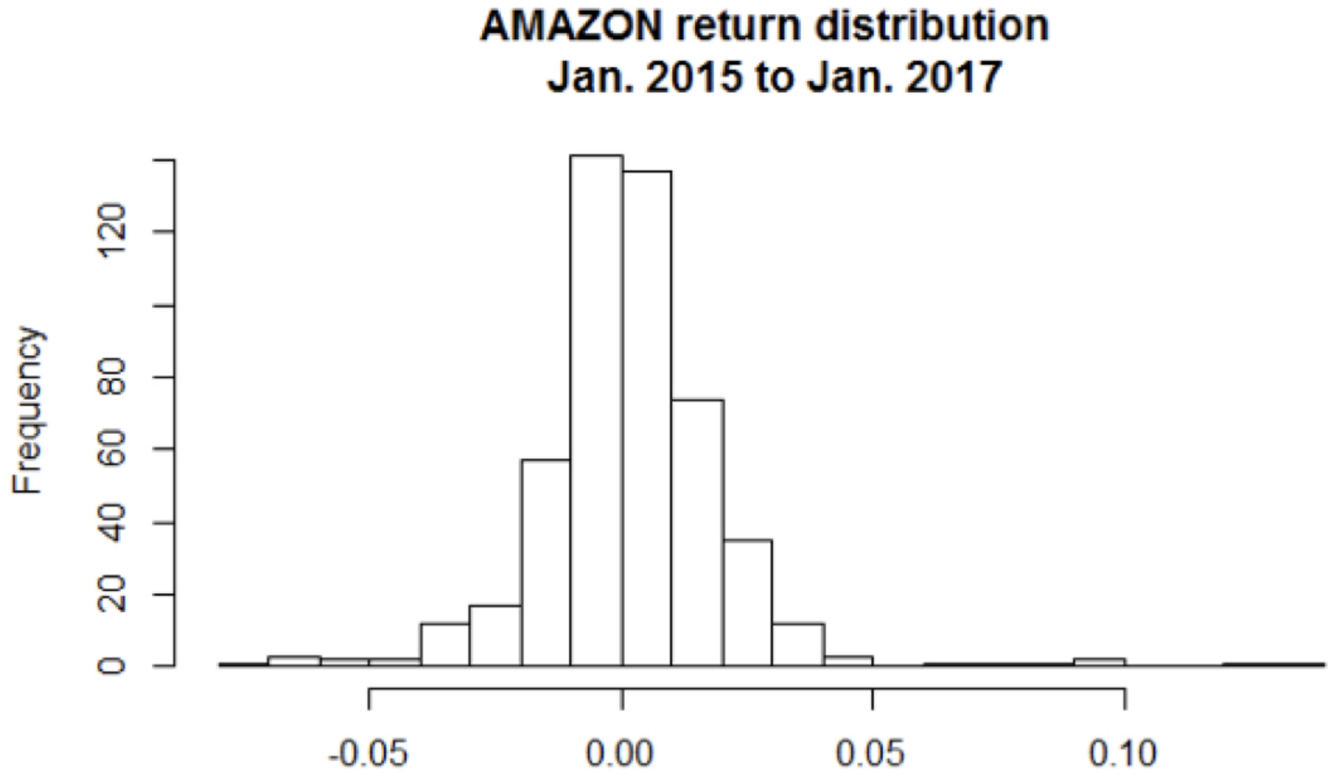
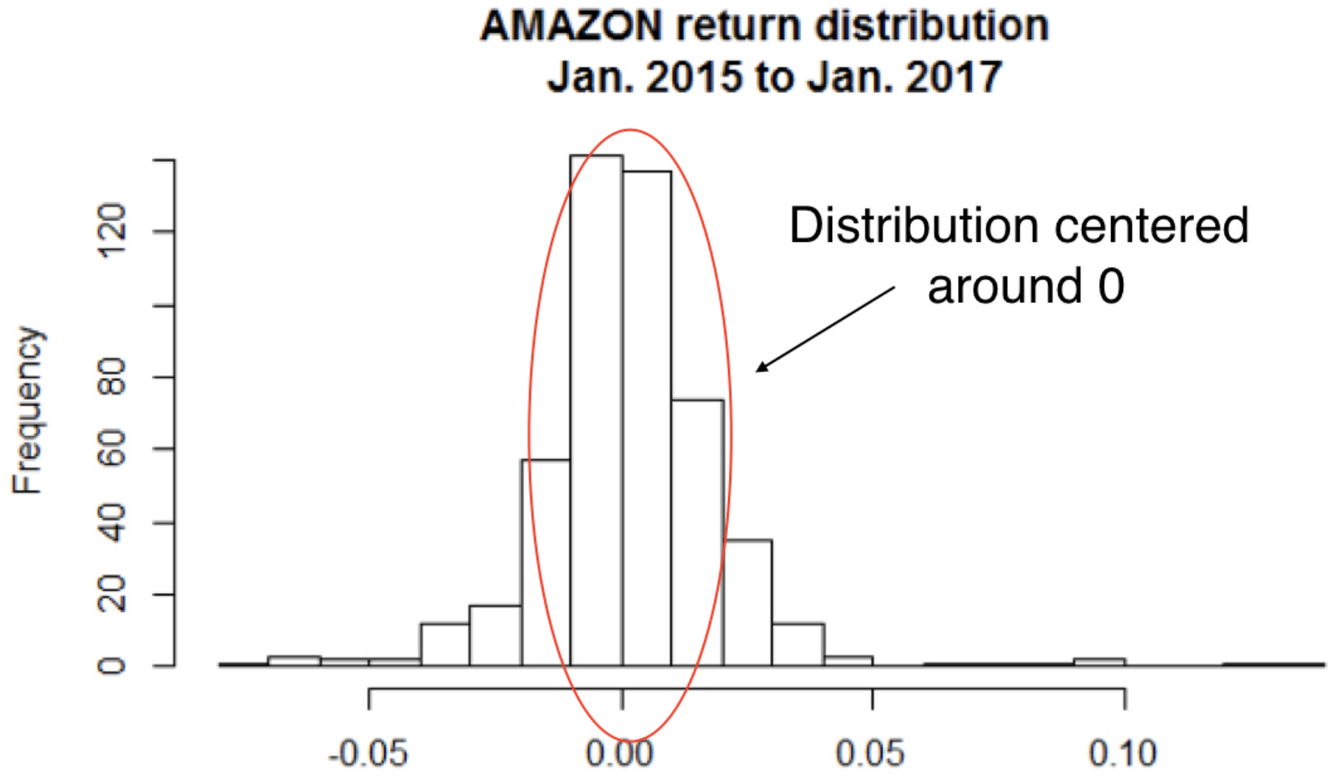
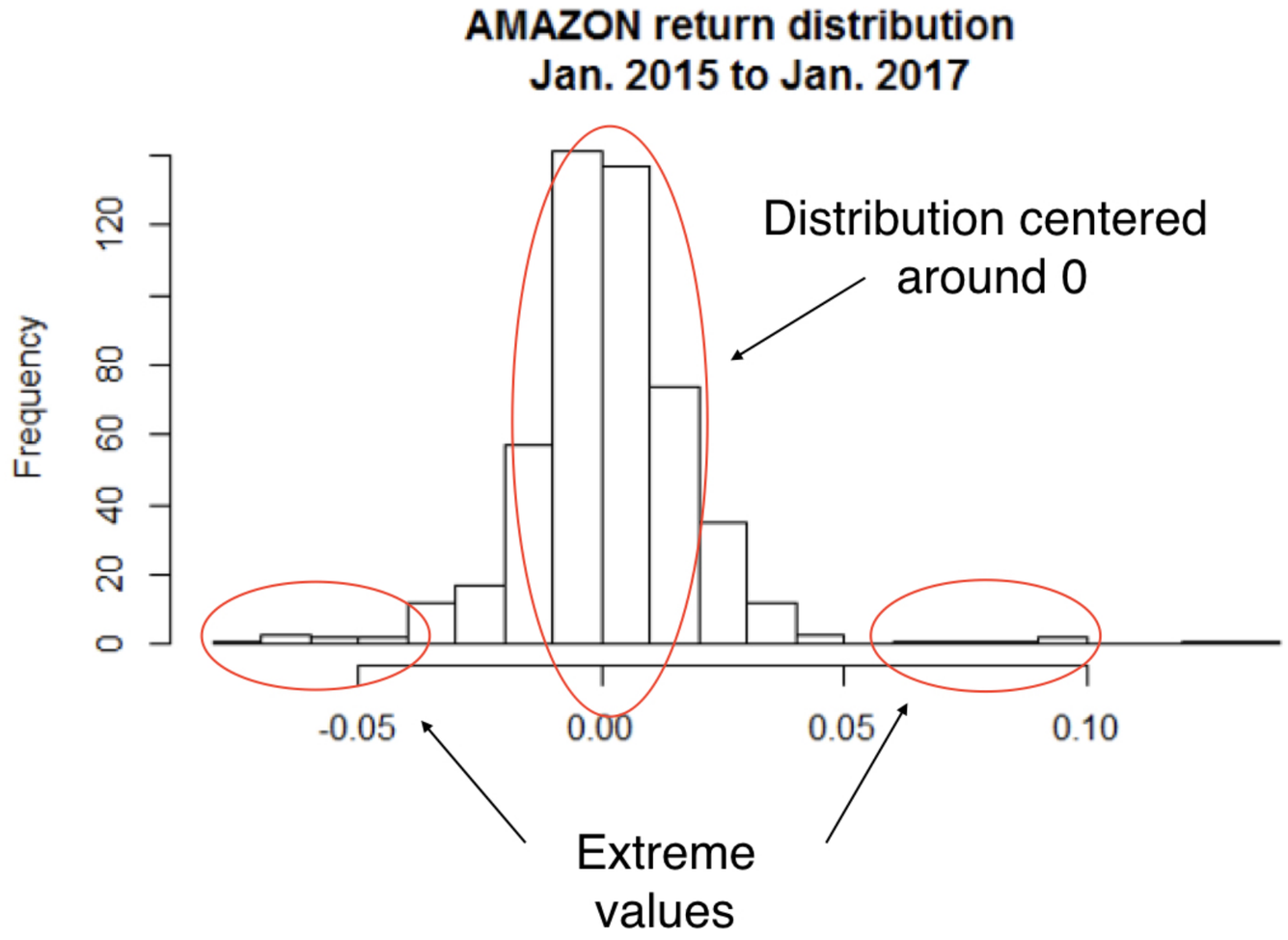
Histograms


AMAZON return distribution
Jan. 2015 to Jan. 2017
Frequency
0
20
40
60
80
120
-0.05
0.00
0.05
0.10

Histograms


AMAZON return distribution
Jan. 2015 to Jan. 2017
Distribution centered
around 0
Frequency
0
20
40
60
80
120
-0.05
0.00
0.05
0.10

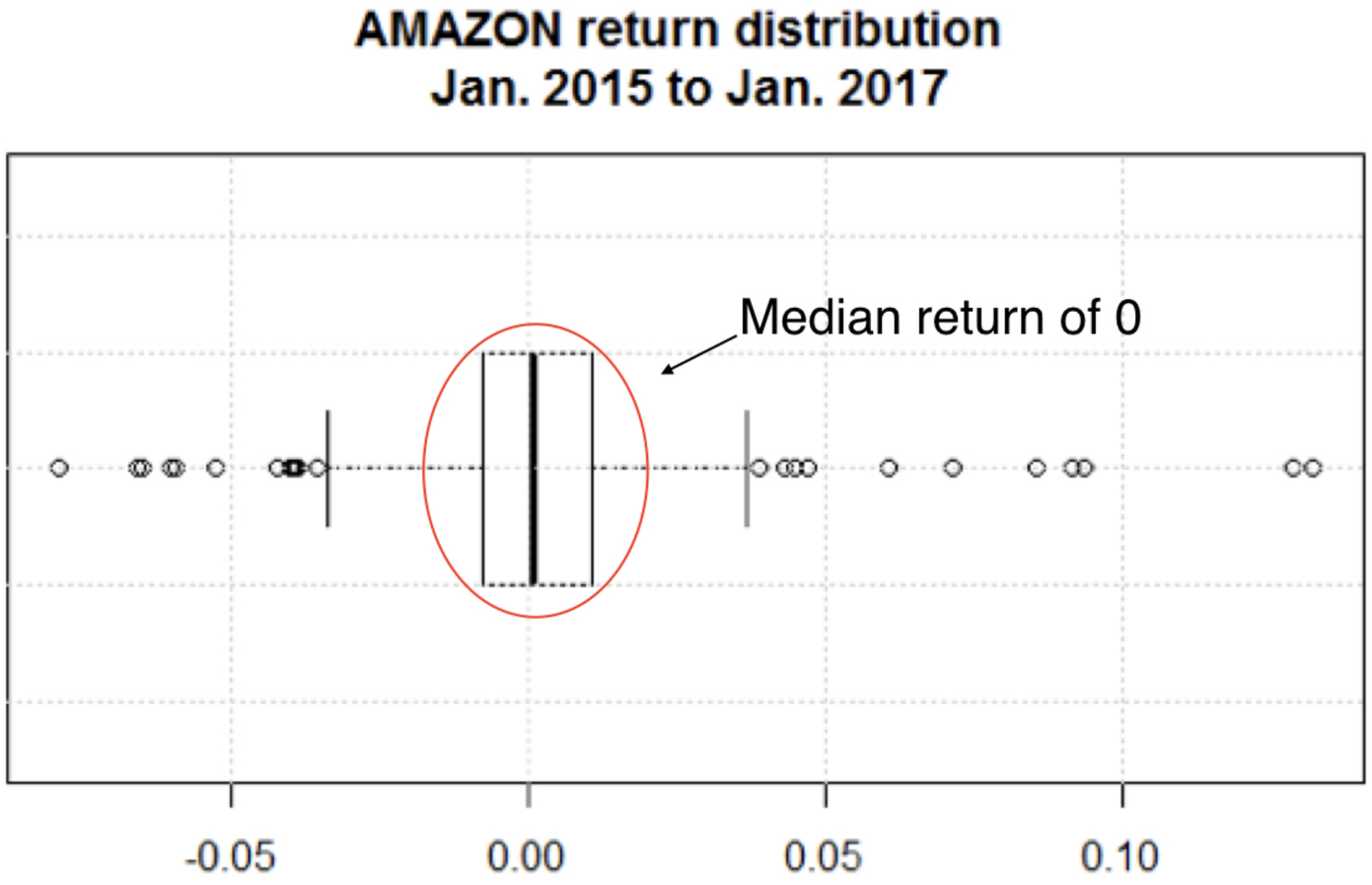
Histograms


AMAZON return distribution
Jan. 2015 to Jan. 2017
Frequency
0
20
40
60
80
120
-0.05
0.00
0.05
0.10
Distribution centered around 0
Extreme values

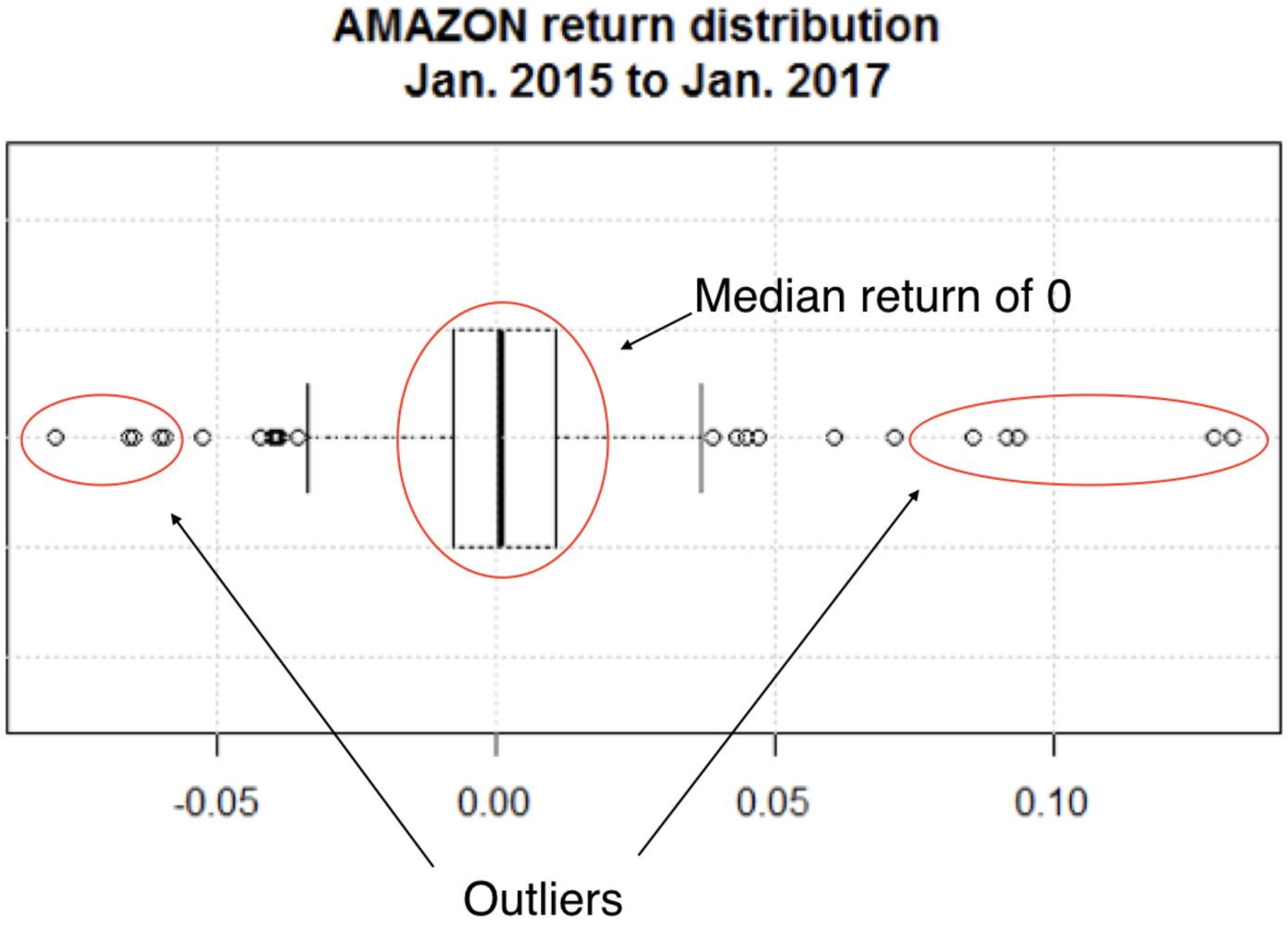
Box and whisker

- Median return of 0
- Outliers

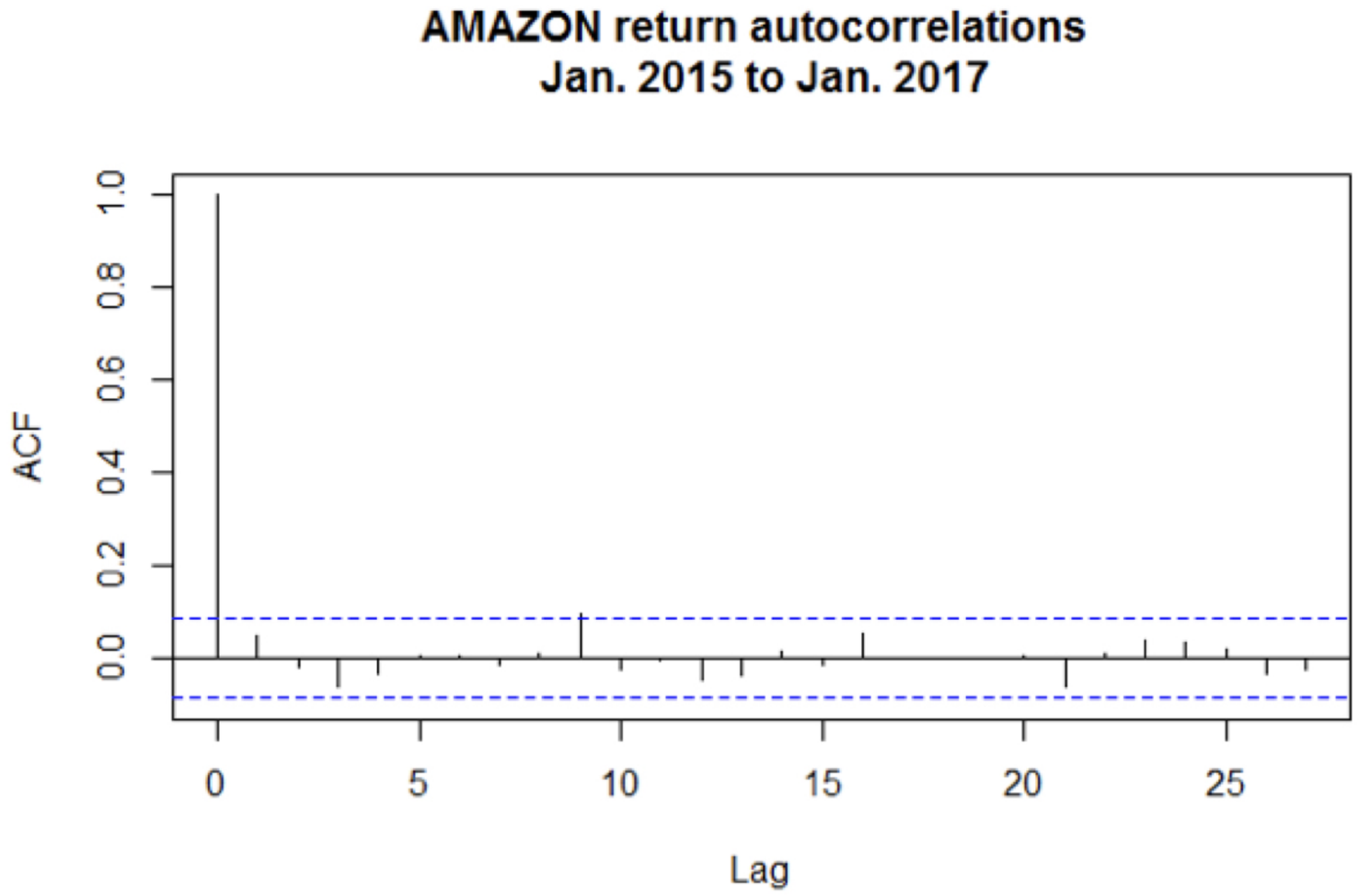
Box and whisker



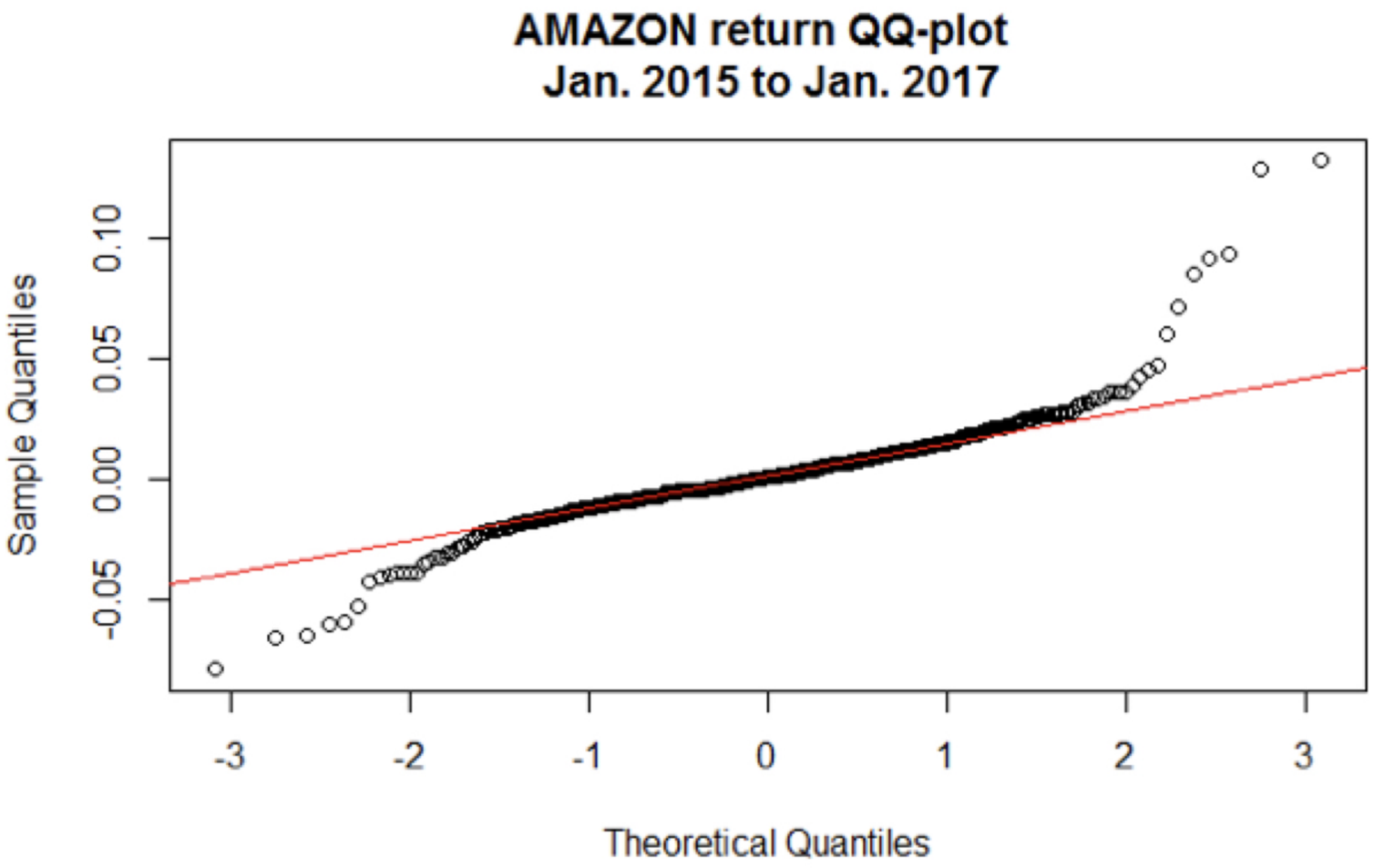
Box and whisker



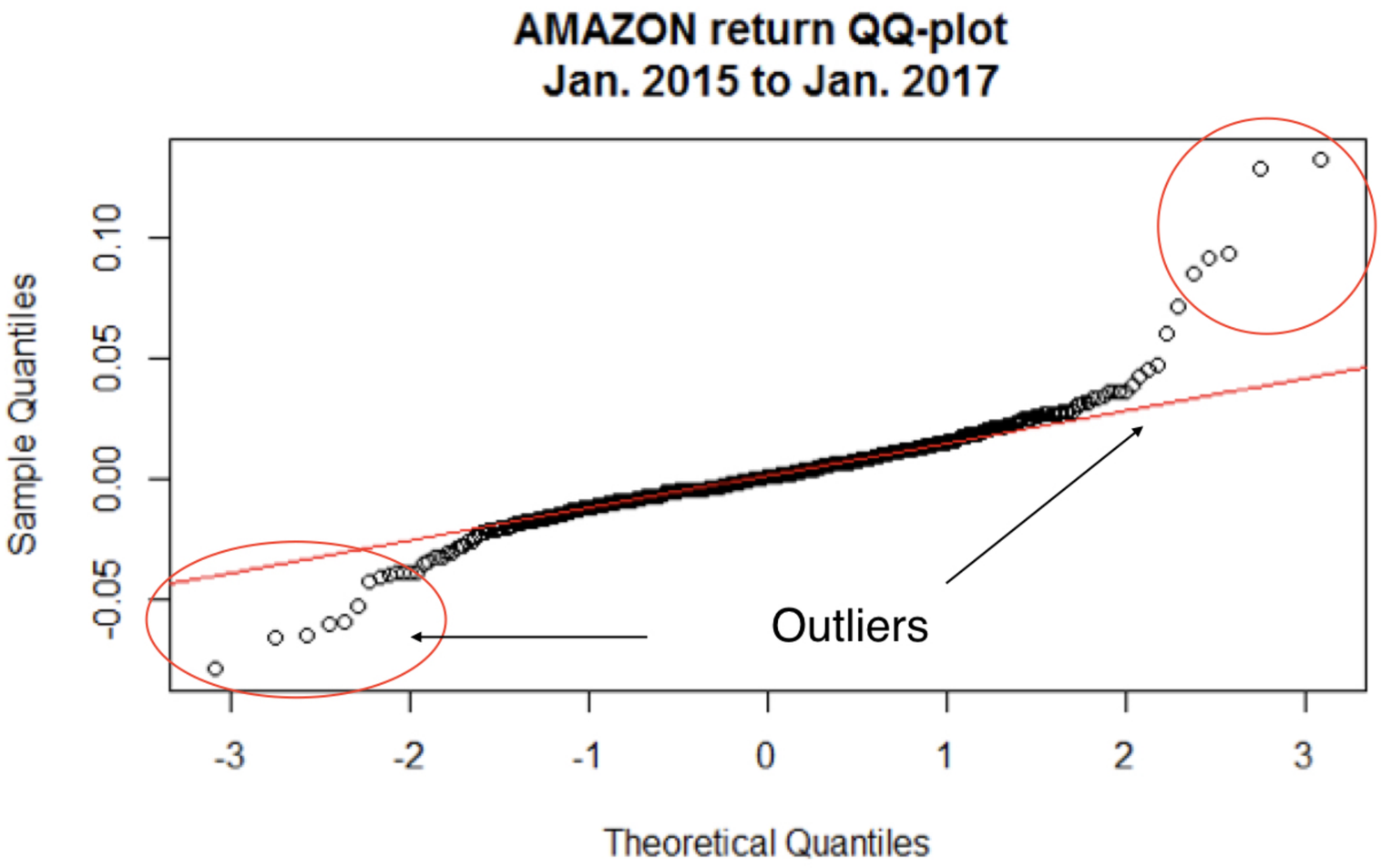
Autocorrelation



QQ-plot


AMAZON return QQ-plot
Jan. 2015 to Jan. 2017
Sample Quantiles
-0.05
0.00
0.05
0.10
-3
-2
-1
0
1
2
3
Theoretical Quantiles

QQ-plot


AMAZON return QQ-plot
Jan. 2015 to Jan. 2017
Sample Quantiles
-0.05
0.00
0.05
0.10
-3
-2
-1
0
1
2
3
Theoretical Quantiles
Outliers

Let's practice!

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