

---

# MGT-482 Principles of Finance

## Assignment 3

Prof. Erwan Morellec

Team:

Grégoire Clément - [gregoire.clement@epfl.ch](mailto:gregoire.clement@epfl.ch)

Senri Tatara - [senri.tatara@epfl.ch](mailto:senri.tatara@epfl.ch)

Timothée-Florian Bronner - [timothee-florian.bronner@epfl.ch](mailto:timothee-florian.bronner@epfl.ch)

February 16, 2019

---

## 1 Warm-up

- (a) 0.020092057
- (b) 0.003644652
- (c) 0.120205899
- (d) 55543.81465
- (e) 125.2742857
- (f) 56863.94813

## 2 Part I

### 1. Results

See Table [1](#)

### 2. Plots

See Figure [1](#)

### 3. Discussions

The equally-weighted portfolio (Equal Portfolio #1) reduces volatility by diversification. The more diverse the less it will be sensible to firm specific risk, hence the more stable it becomes. Concerning the returns, it simply is the average of all the stocks' returns.

Though one can also see that some stocks are not really useful in this portfolio, C and GE has high volatility and low returns. Ignoring these two results in an even better equally-weighted portfolio (Equal Portfolio #2).

### 3 Part II

1. Results  
See Table 2
2. Plots  
See Figure 2
3. Discussions

We can get the efficient frontier by minimizing the standard deviation for differing values of return.

According to Figure 2, the portfolios including short sales are more efficient than those without short sales.

### 4 Part III

1. Results

mean	variance	std deviation	skewness	kurtosis	maximum	minimum
0.005657058	0.001803651	0.04246941	-0.782208811	1.959914339	0.107723039	-0.169424524

2. Histogram  
See Figure 3
3. Graph  
We see that the distribution of the S&P 500 is indeed close to a normal one. See Figure 4
4. Results  
The following formula is used to obtain the Jensen's  $\alpha$

$$\alpha_i = E[R_i] - r_f - \beta_i(E[M_{kt}] - r_f) \quad (1)$$

See Table 3

5. The coefficient  $\beta$  is the amount of expected relative change in a stock when the S&P500 change. For example, 1.5% means that for a change of 1% in the S&P500 we expect 1.5% of the other asset which is given by the slope of the linear regression.
6. R-Square tells us how well the model fits the data. It goes from zero to one where one means a perfect fit. By 'adjusted' it means that it also takes into account the number of predictors used in the model.
7. Jensen's  $\alpha$  tells use if a stock is outperforming a benchmark here the S&P500.
8. The risk premium is the return in excess of the risk-free rate, it represents a sort of compensation of taking the risk. Hence  $2\% + 4.5\% = 6.5\%$  should be close to the return of our asset (6.8%), which is true and hence a reasonable assumption.

### 5 Plots & Tables

Stocks	annual mean of returns	annual std dev of returns
AAPL	0.302423	0.309286
JNJ	0.108937	0.144703
JPM	0.136637	0.292511
PG	0.072975	0.148012
XOM	0.051045	0.161052
PFE	0.088625	0.183895
MSFT	0.147253	0.244197
T	0.072189	0.178905
C	-0.042016	0.506158
ORCL	0.128468	0.229721
GE	0.012418	0.289243
WFC	0.126930	0.319553
Equal Portefolio #1	0.100490	0.170839
Equal Portefolio #2	0.123548	0.142128

Table 1: Results of part 1

return	std dev with constraint	std dev without constraint
0.05	0.137467795	0.115718404
0.09	0.113615935	0.104424314
0.11	0.118301760	0.101952171
0.13	0.126863637	0.101846429
0.15	0.138539089	0.104114135
0.20	0.179092147	0.118933729
0.25	0.236779767	0.143195258
0.30	0.305467219	0.172969497
0.40	-	0.240640065

Table 2: Results of part 2

Stocks	constant	beta	t-stat	adjusted $R^2$	N	alpha	expected return
AAPL	0.018456	1.192537	7.823264	0.316521	131	0.050609	0.302423
JNJ	0.005640	0.607761	8.925960	0.377015	131	-0.059864	0.108937
JPM	0.004043	1.298071	9.789261	0.421784	131	0.053821	0.136637
PG	0.003406	0.472934	6.049110	0.214937	131	-0.084614	0.072975
XOM	0.000952	0.583584	7.156456	0.278639	131	-0.068589	0.051045
PFE	0.003022	0.771335	8.906645	0.375985	131	-0.035165	0.088626
MSFT	0.006452	1.028732	8.969561	0.379336	131	0.011250	0.147253
T	0.003020	0.529634	5.495245	0.183405	131	-0.075532	0.072189
C	-0.016928	2.373360	10.822308	0.471807	131	0.212424	-0.042016
ORCL	0.004598	1.079728	10.871844	0.474104	131	0.017912	0.128468
GE	-0.007367	1.485234	13.094980	0.567357	131	0.073667	0.012419
WFC	0.003594	1.234499	7.845505	0.317771	131	0.042755	0.126930

Table 3: Results of part 3.4

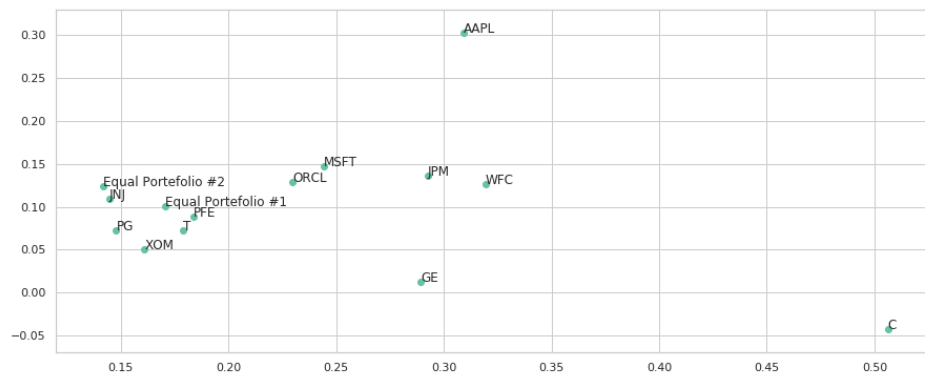


Figure 1: Plot of the standard deviation of the stocks (and two portfolios) w.r.t. their annual returns

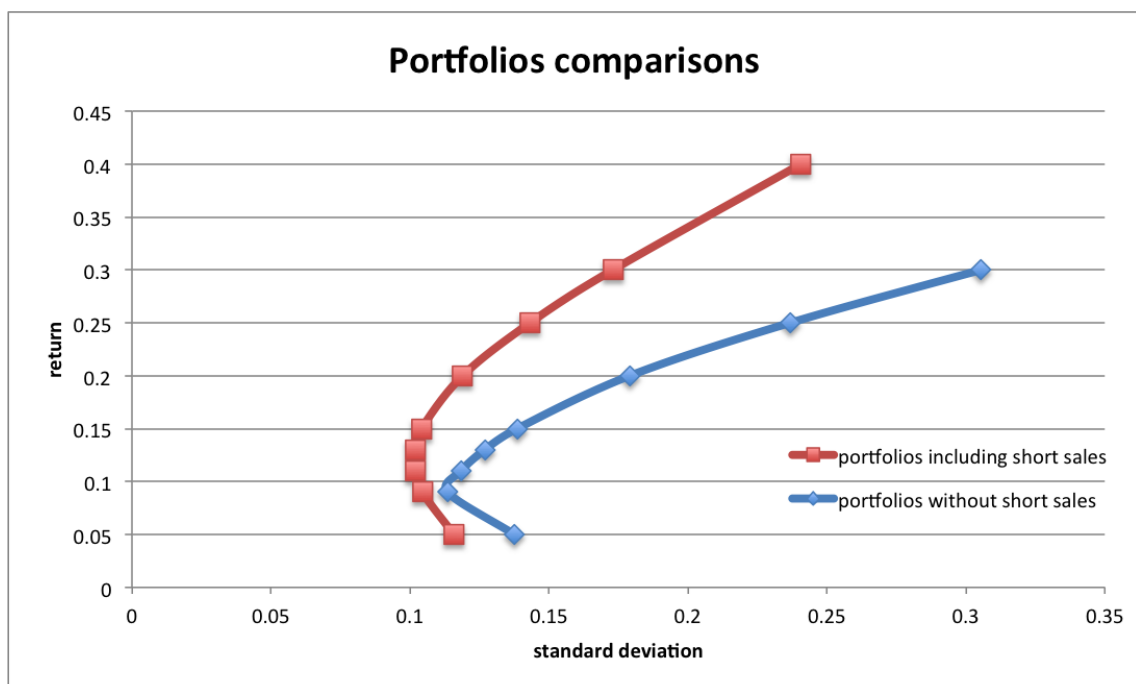


Figure 2: Plot of the standard deviation of the portfolios w.r.t. their annual returns

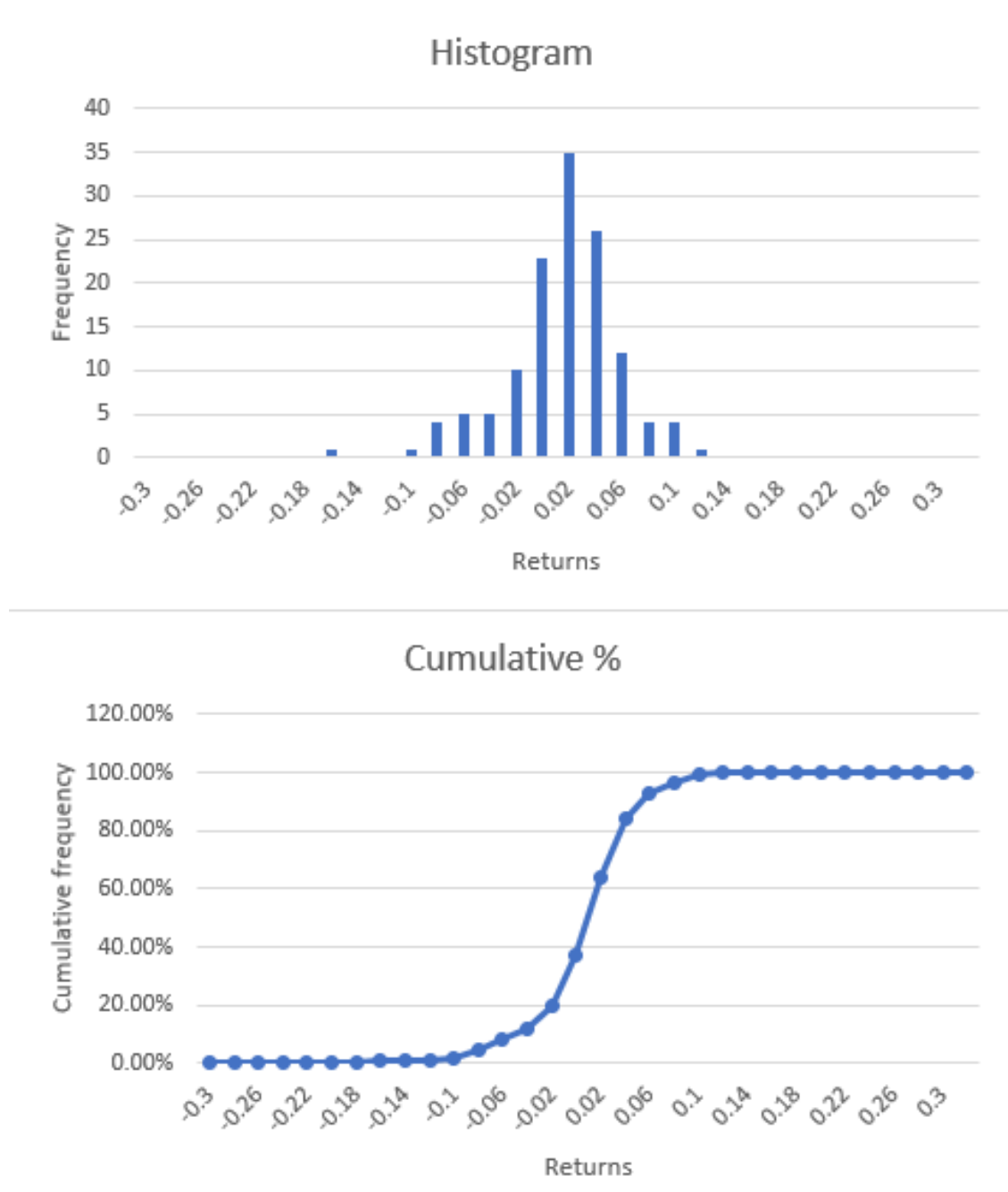


Figure 3: S&P 500 returns histogram and empirical cumulative function

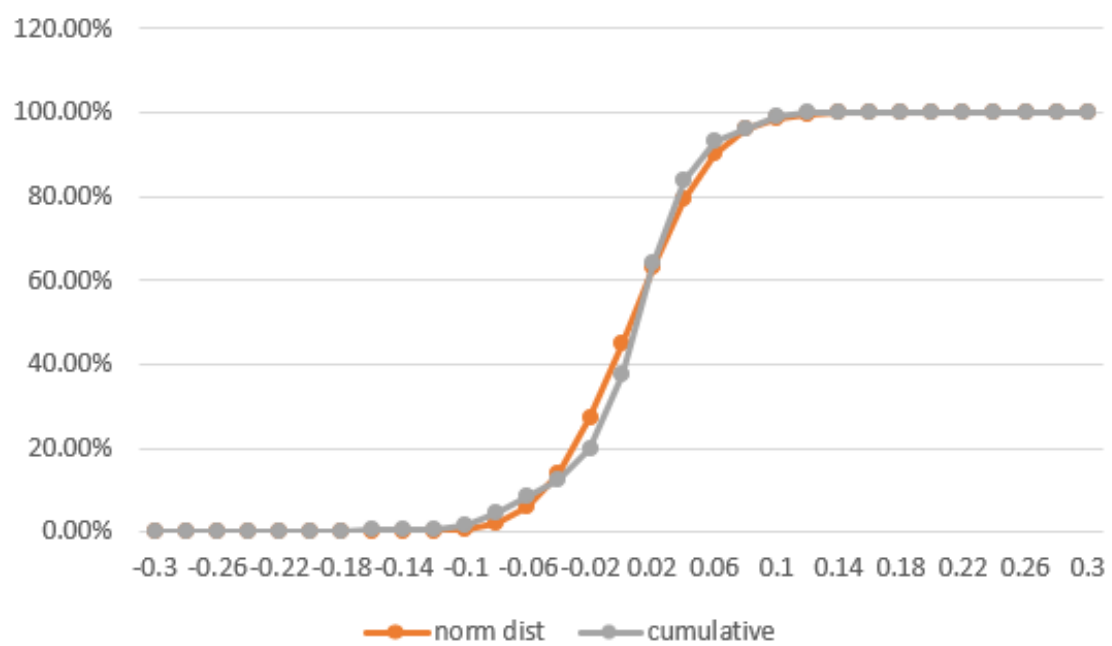


Figure 4: Comparison between a Gaussian CDF and the obtained empirical