

# Gestion de Portefeuille

## TP-2: Droite de Marchés des Capitaux

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### Données

Séries de rendement quotidien pour 11 valeurs:

```
daily.ret.file <- file.path(get.data.folder(), "daily.ret.rda")
load(daily.ret.file)
kable(table.Stats(daily.ret), "latex", booktabs=T) %>% kable_styling(latex_options="scale_down")
```

Rendement annuel moyen:

```
kable(252*100*colMeans(daily.ret), "latex", booktabs=T, digits=1, col.names=c("Rendement (%)"),
      caption="Rendement annuel moyen")
```

Matrice de corrélation des rendements:

```
correl <- cor(daily.ret)
correl[lower.tri(correl)] <- NA
```

	AAPL	AMZN	MSFT	F	SPY	QQQ	XOM	MMM	HD	PG	KO
Observations	3308.0000	3308.0000	3308.0000	3308.0000	3308.0000	3308.0000	3308.0000	3308.0000	3308.0000	3308.0000	3308.0000
NAs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Minimum	-0.1792	-0.1278	-0.1171	-0.2500	-0.0984	-0.0896	-0.1395	-0.1295	-0.0822	-0.0790	-0.0867
Quartile 1	-0.0077	-0.0094	-0.0073	-0.0103	-0.0038	-0.0047	-0.0068	-0.0055	-0.0067	-0.0046	-0.0047
Median	0.0010	0.0008	0.0005	0.0000	0.0006	0.0010	0.0001	0.0008	0.0006	0.0004	0.0007
Arithmetic Mean	0.0012	0.0015	0.0008	0.0005	0.0004	0.0006	0.0001	0.0004	0.0008	0.0004	0.0005
Geometric Mean	0.0010	0.0012	0.0006	0.0001	0.0003	0.0005	0.0000	0.0003	0.0006	0.0003	0.0004
Quartile 3	0.0112	0.0123	0.0088	0.0106	0.0056	0.0070	0.0073	0.0070	0.0082	0.0055	0.0059
Maximum	0.1390	0.2695	0.1860	0.2952	0.1452	0.1216	0.1719	0.0988	0.1407	0.1021	0.1388
SE Mean	0.0003	0.0004	0.0003	0.0005	0.0002	0.0002	0.0003	0.0002	0.0003	0.0002	0.0002
LCL Mean (0.95)	0.0005	0.0006	0.0002	-0.0005	0.0000	0.0002	-0.0004	-0.0001	0.0002	0.0000	0.0001
UCL Mean (0.95)	0.0019	0.0023	0.0013	0.0014	0.0008	0.0011	0.0006	0.0009	0.0013	0.0007	0.0009
Variance	0.0004	0.0006	0.0003	0.0007	0.0001	0.0002	0.0002	0.0002	0.0003	0.0001	0.0001
Stdev	0.0196	0.0243	0.0170	0.0266	0.0121	0.0130	0.0150	0.0140	0.0162	0.0109	0.0113
Skewness	-0.2151	1.4889	0.4319	0.7627	0.1379	-0.0084	0.4199	-0.3815	0.5114	0.0555	0.5004
Kurtosis	6.2706	16.8872	10.2176	20.9458	15.2824	7.3976	15.4203	7.3856	6.4641	8.1017	14.3236

Table 1: Rendement annuel moyen

	Rendement (%)
AAPL	30.2
AMZN	37.2
MSFT	19.0
F	11.4
SPY	9.9
QQQ	15.3
XOM	3.5
MMM	9.9
HD	19.2
PG	9.3
KO	12.5

Table 2: Corrélation des rendements quotidiens

	AAPL	AMZN	MSFT	F	SPY	QQQ	XOM	MMM	HD	PG	KO
AAPL	1	0.46	0.49	0.37	0.61	0.75	0.40	0.45	0.42	0.32	0.32
AMZN		1.00	0.50	0.33	0.56	0.66	0.39	0.41	0.44	0.27	0.30
MSFT			1.00	0.39	0.71	0.76	0.53	0.53	0.49	0.44	0.46
F				1.00	0.56	0.53	0.37	0.44	0.46	0.30	0.31
SPY					1.00	0.92	0.77	0.75	0.71	0.62	0.60
QQQ						1.00	0.64	0.69	0.66	0.52	0.52
XOM							1.00	0.60	0.47	0.52	0.49
MMM								1.00	0.55	0.50	0.47
HD									1.00	0.45	0.44
PG										1.00	0.57
KO											1.00

```
options(knitr.kable.NA = '')
kable(correl, "latex", booktabs=T, digits=2, caption="Corrélation des rendements quotidiens") %>%
kable_styling(latex_options="scale_down")
```

## Droite de Marché des Capitaux (Capital Market Line)

- A partir des calculs présentés en cours, mettre en oeuvre une méthode numérique pour déterminer le portefeuille tangent quand les poids des actifs risqués sont contraints à être positifs:  $w_i \geq 0$ .
- Même calcul en ajoutant des contraintes supplémentaires qui vous semblent pertinentes (ex: pas plus de 20% de l'actif risqué alloué à un seul titre, etc.)

## Question 1

```

rate = 0.03
assets <- colnames(daily.ret)
moy = colMeans(daily.ret)
sigma = colStdevs(daily.ret)
moments = rbind(moy, sigma)
moments[1,] = moments[1,]*252
moments[2,] = moments[2,]*sqrt(252)
rho.1 = cor(daily.ret)
colnames(moments) <- assets
mean.1 = matrix(moments[1,],11,1)
sigma.1 = matrix(moments[2,],11,1)
sigma.2 = sigma.1 %*% t(sigma.1) * rho.1
alpha <- seq(from=-0.4, to=1.4, by=0.1)
w_1 <- matrix(rep(1/11,11),11,1)
w_2 <- 1 - w_1
w <- w_1 %*% alpha + w_2 %*% (1-alpha)
mean.1.frontier = as.vector(t(mean.1) %*% w)
sigma.1.frontier = sqrt(diag(t(w) %*% sigma.2 %*% w))

w.nomi <- solve(sigma.2, mean.1-rate)
w.denomi <- sum(w.nomi)
w.t <- w.nomi/sum(w.nomi)

cex.val = 1.5
mean.t <- as.vector(t(mean.1) %*% w.t)
sigma.1.t <- sqrt(t(w.t) %*% sigma.2 %*% w.t)

```

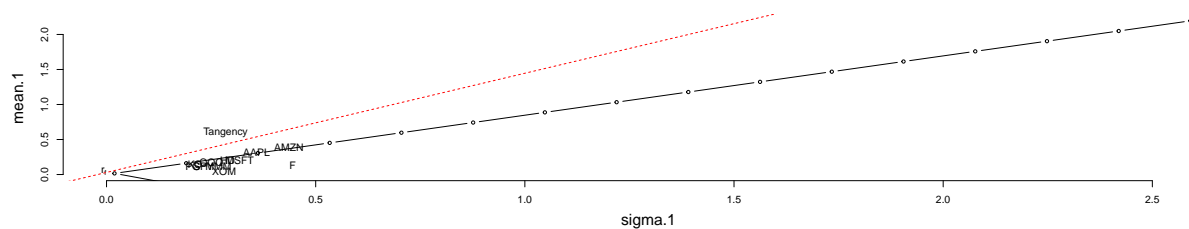


Figure 1: frontieres

## Ajout d'un actif sans risque

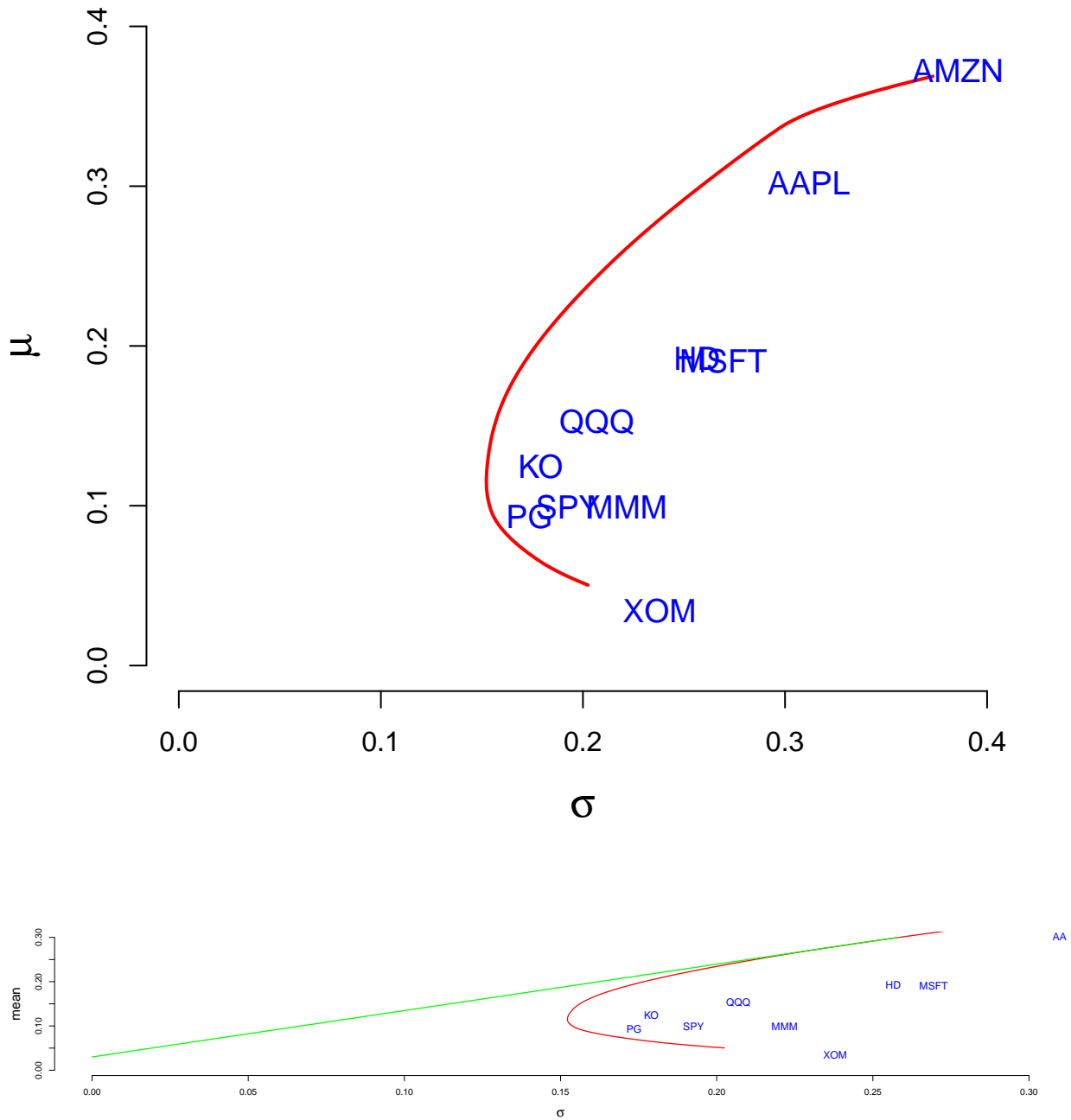


Figure 2: frontieres