hw2

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R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```r
#1
pnorm(0.1,mean=0.05,sd=0.1,lower.tail=FALSE)
```

```
## [1] 0.3085375
```

```r
pnorm(-0.1,mean=0.05,sd=0.1)
```

```
## [1] 0.0668072
```

```r
a=pnorm(0.15,mean=0.05,sd=0.1)
b=pnorm(-0.05,mean=0.05,sd=0.1)
a-b
```

```
## [1] 0.6826895
```

```r
qnorm(0.01,mean=0.05,sd=0.1)
```

```
## [1] -0.1826348
```

```r
qnorm(0.05,mean=0.05,sd=0.1)
```

```
## [1] -0.1144854
```

```r
qnorm(0.95,mean=0.05,sd=0.1)
```

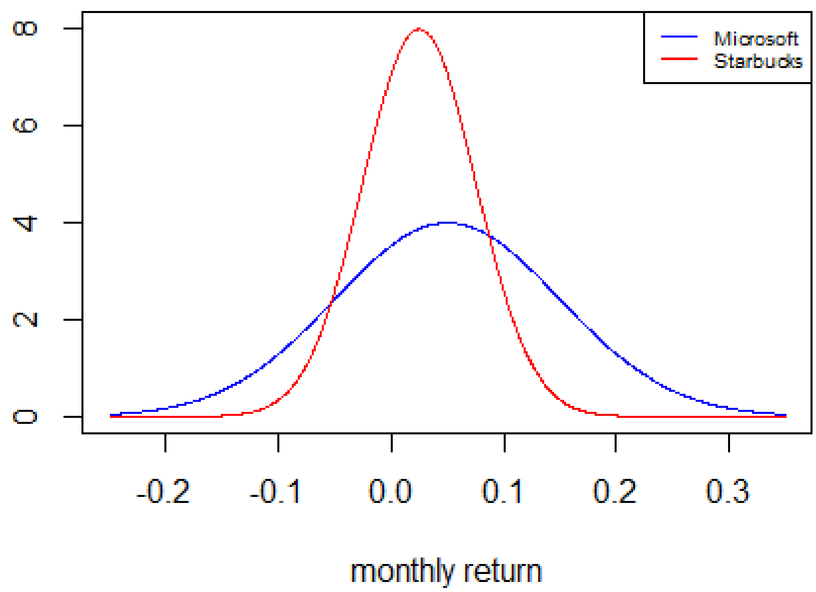
```
## [1] 0.2144854
```

```r
qnorm(0.99,mean=0.05,sd=0.1)
```

```
## [1] 0.2826348
```

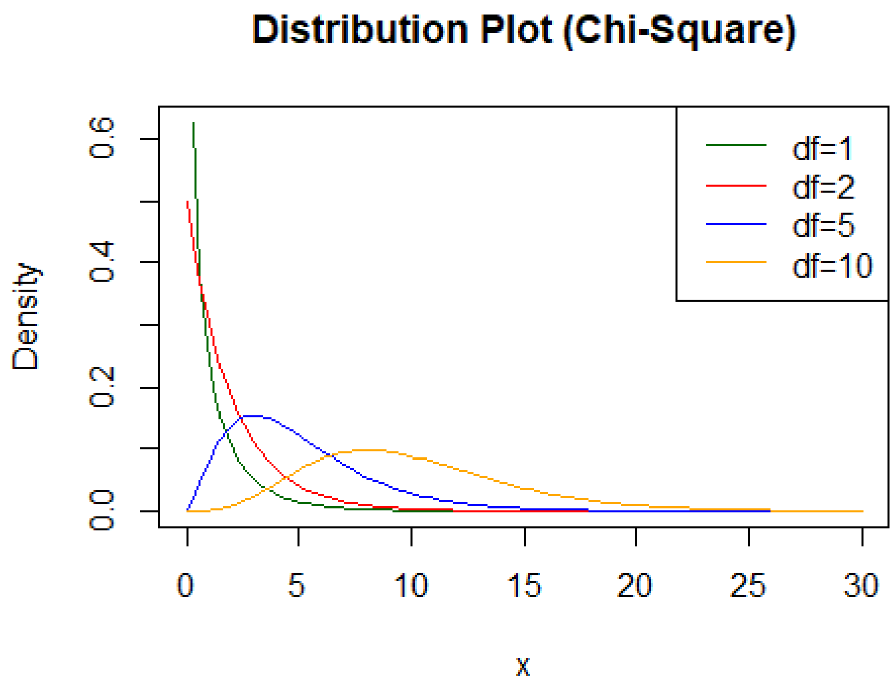
```r
#2
intervals <- seq(-0.25, 0.35,length=1000)
hx <- dnorm(intervals,0.05,0.1)
hy <- dnorm(intervals,0.025,0.05)
```

```r
plot(intervals, hx ,xlab="monthly return", ylab="",type="l", col="blue",
ylim = c(0,8))
lines(intervals, hy, type="l", col="red")
legend("topright",legend=c("Microsoft","Starbucks"),col=c("blue","red"),
lty=1,cex=0.6)
```

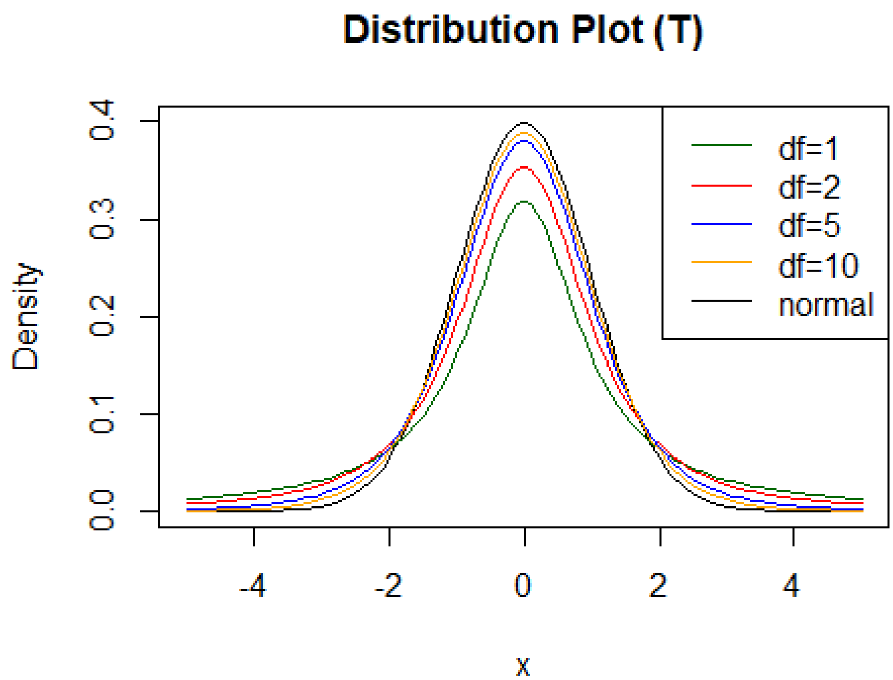



```r
#Starbucks 的變異較小，且其預期的 return 較高，所以有較低的風險

#3
w0 = 100000
#VaR= SimpleReturn * w0
qnorm(0.01, mean=0.04, sd=0.09) * w0

## [1] -16937.13

qnorm(0.05, mean=0.04, sd=0.09) * w0

## [1] -10803.68

#4
w0 = 100000;
# r = ln(1+R),R=e^r-1
#1
#Compounded Return
r.01 = qnorm(0.01, mean=0.04, sd=0.09)
r.05 = qnorm(0.05, mean=0.04, sd=0.09)
#Simple Retern
R.01 = exp(r.01)-1
```

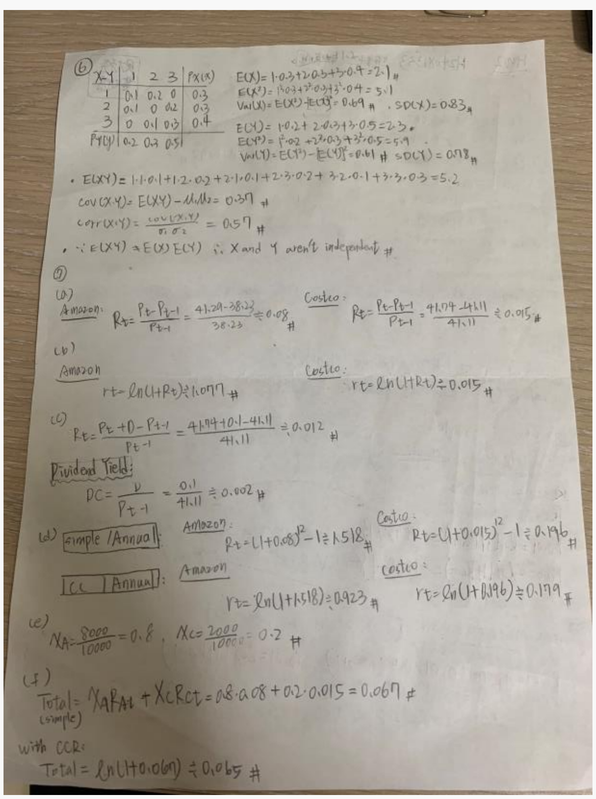
```r
R.05 = exp(r.05)-1

R.01*w0

## [1] -15580.46

R.05*w0

## [1] -10240.55

#2
#For annual
#mean and standard deviation
x=12*0.04
y=sqrt(12*(0.09)^2)

#Compounded Return
ra.01 = qnorm(0.01,x,y)
ra.05 = qnorm(0.05,x,y)
#Simple retern
Ra.01 = exp(ra.01)-1

Ra.05 = exp(ra.05)-1

Ra.01*w0

## [1] -21751.73

Ra.05*w0

## [1] -3228.205

#5-1
curve(dchisq(x, df=1),0,30,col='darkgreen',main= 'Distribution Plot (Ch
i-Square)',ylab = 'Density',lwd =1)
curve(dchisq(x, df=2), col='red',lwd=1, add=TRUE)
curve(dchisq(x, df=5), col='blue',lwd=1, add=TRUE)
curve(dchisq(x, df=10), col='orange',lwd=1, add=TRUE)
legend("topright",legend=c("df=1","df=2","df=5","df=10"),col=c("darkgre
en","red","blue","orange"),lty=1,cex=1)
```




```
#5-2
curve(dnorm(x),-5,5,col='black',main= 'Distribution Plot (T)',ylab = 'D
ensity',lwd =1)
curve(dt(x, df=1), col='darkgreen',lwd=1,add=TRUE)
curve(dt(x, df=2), col='red',lwd=1, add=TRUE)
curve(dt(x, df=5), col='blue',lwd=1, add=TRUE)
curve(dt(x, df=10), col='orange',lwd=1, add=TRUE)
legend("topright",legend=c("df=1","df=2","df=5","df=10","normal"),col=c
("darkgreen","red","blue","orange","black"),lty=1,cex=1)
```




```r
#q6 and q7
knitr::include_graphics("./q6_q7.jpeg")
```



⑥

X\Y	1	2	3	$P_X(x)$
1	0.1	0.2	0	0.3
2	0.1	0	0.2	0.3
3	0	0.1	0.3	0.4
$P_Y(y)$	0.2	0.3	0.5	

$E(X) = 1\cdot0.3+2\cdot0.3+3\cdot0.4 = 2.1$ #
$E(X^2) = 1^2\cdot0.3+2^2\cdot0.3+3^2\cdot0.4 = 5.1$
$Var(X) = E(X^2) - [E(X)]^2 = 0.69$ # . $SD(X) = 0.83$ #

$E(Y) = 1\cdot0.2+2\cdot0.3+3\cdot0.5 = 2.3$
$E(Y^2) = 1^2\cdot0.2+2^2\cdot0.3+3^2\cdot0.5 = 5.9$
$Var(Y) = E(Y^2) - [E(Y)]^2 = 0.61$ # $SD(Y) = 0.78$ #

• $E(XY) = 1\cdot1\cdot0.1+1\cdot2\cdot0.2+2\cdot1\cdot0.1+2\cdot3\cdot0.2+3\cdot2\cdot0.1+3\cdot3\cdot0.3 = 5.2$
$cov(X,Y) = E(XY) - \mu_1\mu_2 = 0.37$ #
$corr(X,Y) = \frac{cov(X,Y)}{\sigma_1\sigma_2} = 0.57$ #
• $\because E(XY) \neq E(X)E(Y)$ $\therefore$ X and Y aren't independent #

⑦
(a)
Amazon: $R_t = \frac{P_t - P_{t-1}}{P_{t-1}} = \frac{41.29-38.23}{38.23} \doteq 0.08$ #
Costco: $R_t = \frac{P_t - P_{t-1}}{P_{t-1}} = \frac{41.74-41.11}{41.11} \doteq 0.015$ #

(b)
Amazon
$r_t = \ln(1+R_t) \doteq 1.077$ #
Costco:
$r_t = \ln(1+R_t) \doteq 0.015$ #

(c)
$R_t = \frac{P_t + D - P_{t-1}}{P_{t-1}} = \frac{41.74+0.1-41.11}{41.11} \doteq 0.012$ #

Dividend Yield:
$DC = \frac{D}{P_{t-1}} = \frac{0.1}{41.11} \doteq 0.002$ #

(d) $\boxed{\text{simple / Annual}}$: Amazon:
$R_t = (1+0.08)^{12} - 1 \doteq 1.518$ #
Costco:
$R_t = (1+0.015)^{12} - 1 \doteq 0.196$ #

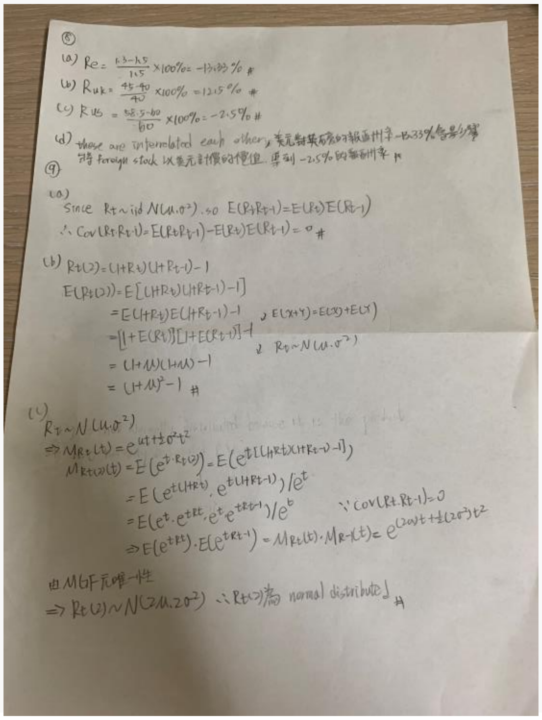
$\boxed{\text{CC / Annual}}$: Amazon
$r_t = \ln(1+1.518) \doteq 0.923$ #
Costco:
$r_t = \ln(1+0.196) \doteq 0.179$ #

(e)
$X_A = \frac{8000}{10000} = 0.8$, $X_C = \frac{2000}{10000} = 0.2$ #

(f)
Total (simple) $= X_A R_{At} + X_C R_{Ct} = 0.8\cdot0.08 + 0.2\cdot0.015 = 0.067$ #

with CCR:
Total $= \ln(1+0.067) \doteq 0.065$ #

```r
#q8 and q9
knitr::include_graphics("./q8_q9.jpeg")
```



⑧

(a) $R_e = \frac{1.3-1.5}{1.5} \times 100\% = -13.33\%$ #

(b) $R_{uk} = \frac{45-40}{40} \times 100\% = 12.5\%$ #

(c) $R_{us} = \frac{58.5-60}{60} \times 100\% = -2.5\%$ #

(d) these are interrelated each other, 美元對英磅的報酬率 -13.33% 會影響將 foreign stock 以美元計價的價值，導到 -2.5% 的報酬率 #

⑨

(a)

Since $R_t \sim iid\ N(\mu, \sigma^2)$, so $E(R_t R_{t-1}) = E(R_t)E(R_{t-1})$

$\therefore Cov(R_t, R_{t-1}) = E(R_t R_{t-1}) - E(R_t)E(R_{t-1}) = 0$ #

(b) $R_t(2) = (1+R_t)(1+R_{t-1}) - 1$

$E(R_t(2)) = E[(1+R_t)(1+R_{t-1}) - 1]$

$= E(1+R_t)E(1+R_{t-1}) - 1$, $E(X+Y) = E(X) + E(Y)$)

$= [1+E(R_t)][1+E(R_{t-1})] - 1$, $R_t \sim N(\mu, \sigma^2)$)

$= (1+\mu)(1+\mu) - 1$

$= (1+\mu)^2 - 1$ #

(c)

$R_t \sim N(\mu, \sigma^2)$

$\Rightarrow M_{R_t}(t) = e^{\mu t + \frac{1}{2}\sigma^2 t^2}$

$M_{R_t(2)}(t) = E(e^{t \cdot R_t(2)}) = E(e^{t[(1+R_t)(1+R_{t-1}) - 1]})$

$= E(e^{t(1+R_t)} \cdot e^{t(1+R_{t-1})}) / e^t$

$= E(e^t \cdot e^{tR_t} \cdot e^t e^{tR_{t-1}}) / e^t$ $\because Cov(R_t, R_{t-1}) = 0$

$\Rightarrow E(e^{tR_t}) \cdot E(e^{tR_{t-1}}) = M_{R_t}(t) \cdot M_{R_{t-1}}(t) = e^{(2\mu)t + \frac{1}{2}(2\sigma^2)t^2}$

由 MGF 之唯一性

$\Rightarrow R_t(2) \sim N(2\mu, 2\sigma^2)$ $\therefore R_t(2)$ 為 normal distributed #