Untitled

Hiba Majdoubi

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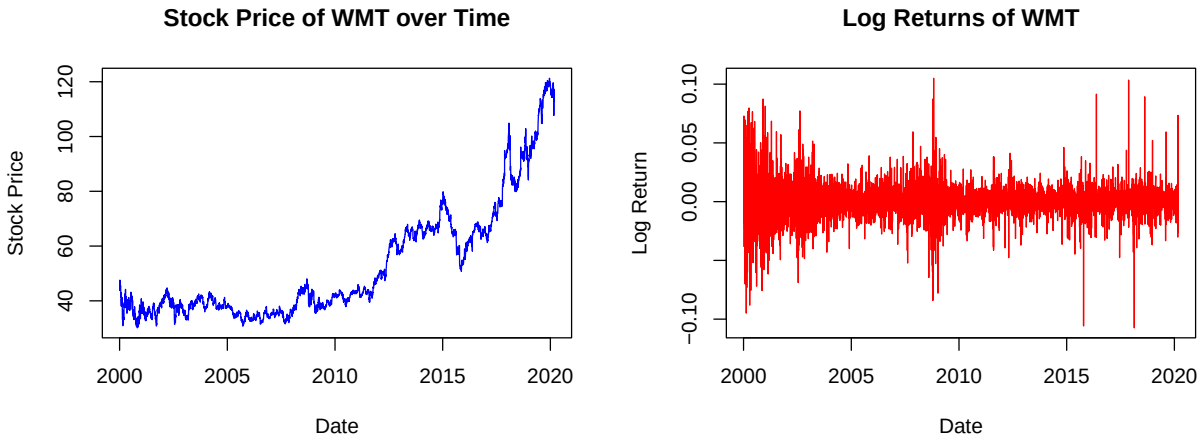
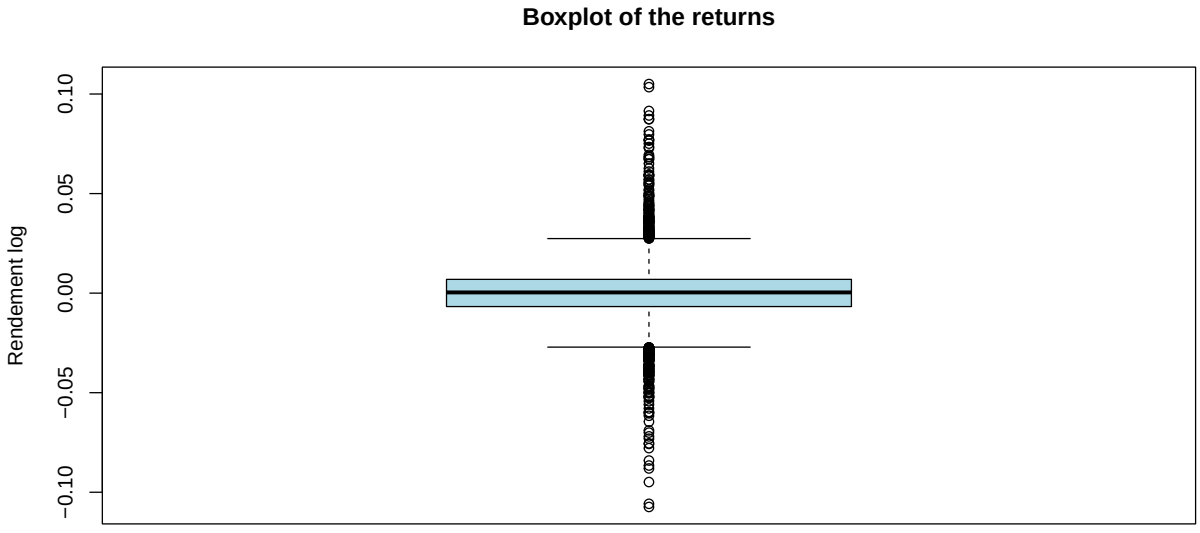
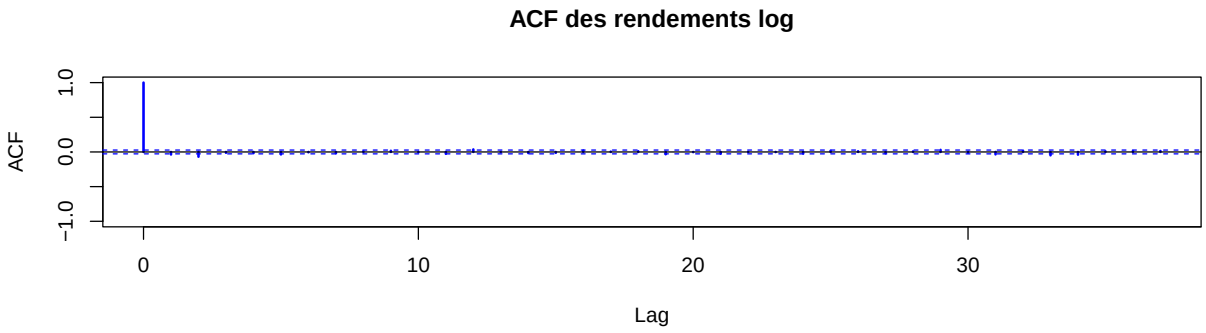


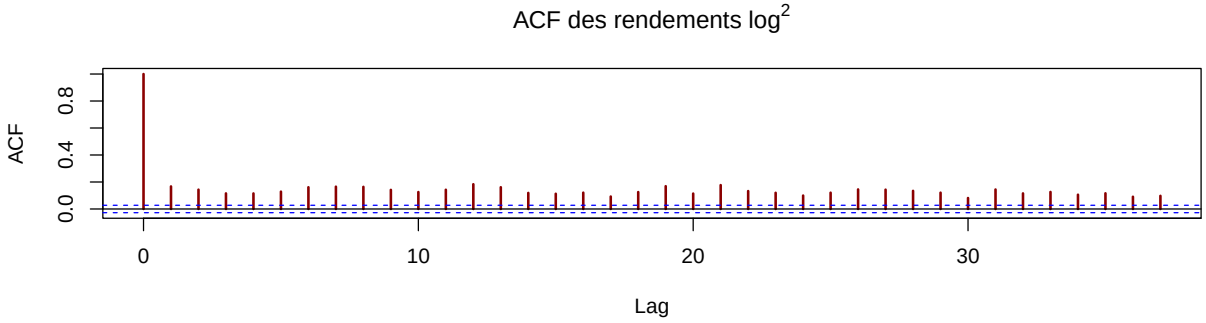


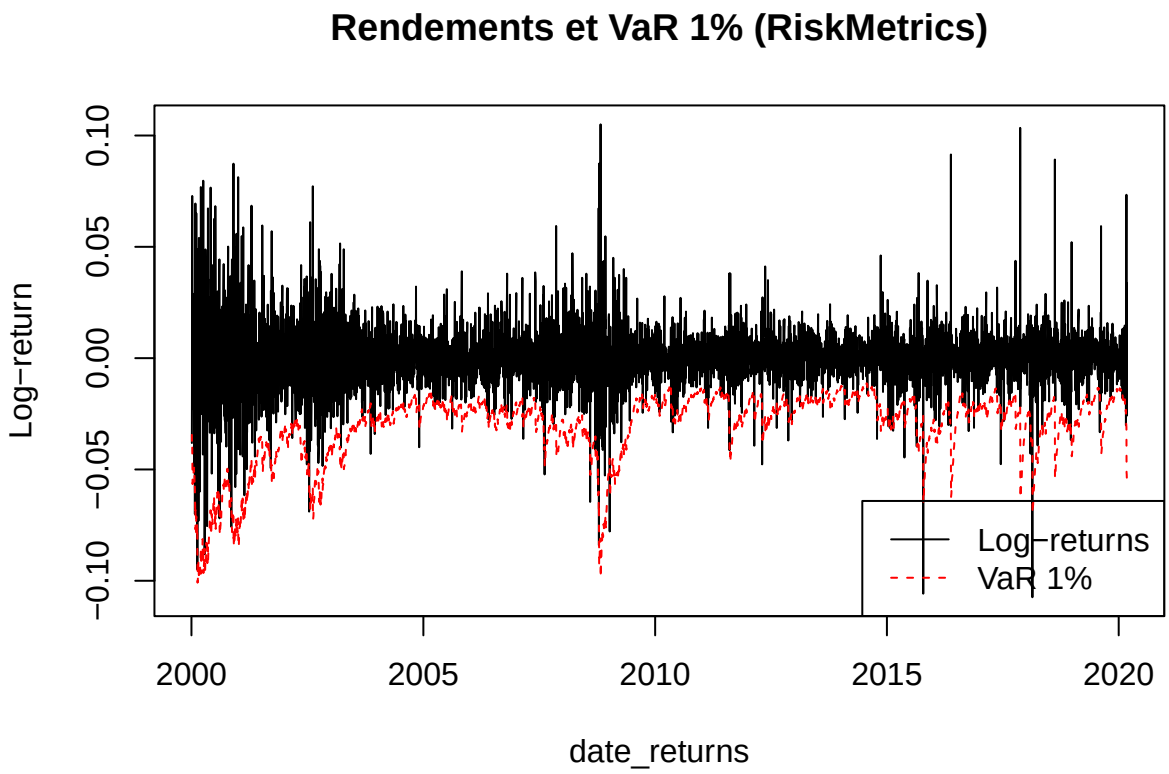
The boxplot shows several outliers, which implies that the distribution has heavy tails. The result of the Jarque-Bera test leads us to reject the hypothesis of normality. These results highlight characteristics of non-normality, which motivates the use of conditional volatility models, such as GARCH.

##

```
##  Jarque Bera Test
##
## data:  log_returns
## X-squared = 11216, df = 2, p-value < 2.2e-16
```








```
##
## Call:
## glm(formula = y_target ~ X - 1, family = binomial(link = "logit"))
##
## Coefficients:
##    Estimate Std. Error z value Pr(>|z|)
## X1  -3.5673     0.2495 -14.296  < 2e-16 ***
## X2  -0.4986     1.0134  -0.492  0.62273
## X3   1.1279     0.4779   2.360  0.01827 *
## X4   0.7106     0.5991   1.186  0.23560
## X5   1.3541     0.4407   3.072  0.00212 **
## X6 -13.5207   401.7561  -0.034  0.97315
## X7 -16.5145     8.2305  -2.006  0.04480 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 7028.51  on 5070  degrees of freedom
## Residual deviance:  915.89  on 5063  degrees of freedom
## AIC: 929.89
##
## Number of Fisher Scoring iterations: 16
```

Coefficient	Interpretation
X1 (Constant)	Highly significant ($p < 2e\text{-}16$) $\rightarrow$ indicates a non-zero average probability of exception.
X2 to X6 (Lags of past exceptions)	Some are not significant (e.g. X2, X4, X6), but others are (X3, X5, X7).
X7 (VaR)	Significant at the 5% level ($p = 0.04480$) $\rightarrow$ the probability of exception depends on the VaR itself, which is not desirable.