Report 5
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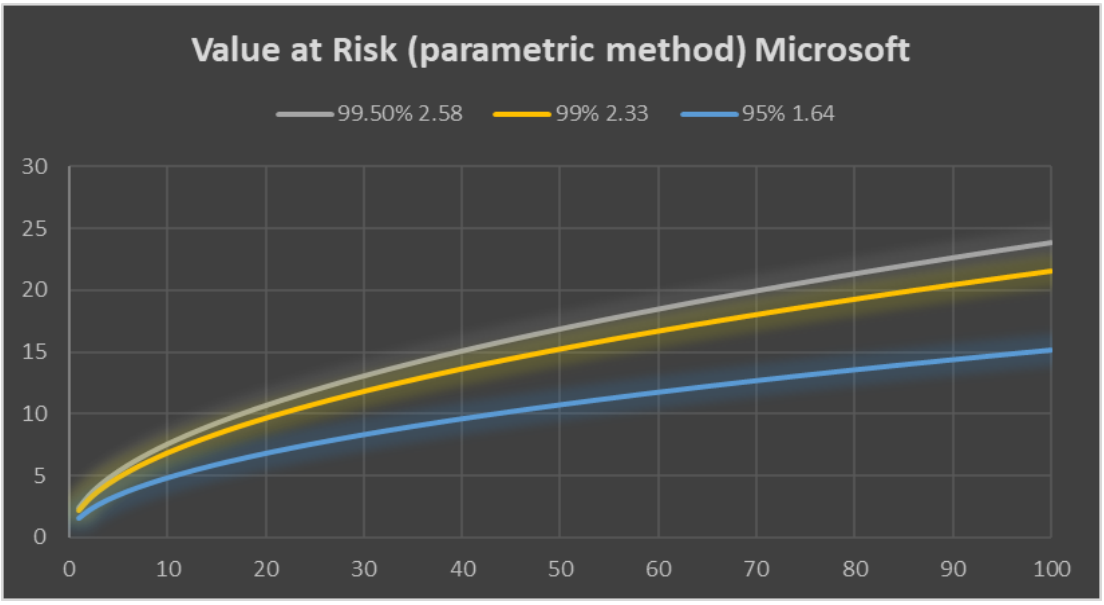
1.
Calculate the Value ar Risk of an equibalanced portfolio of two assets (Apple and Microsoft) and check the (non) additivity of the VaR.
The portfolio is determined daily by the combination of the shares previously following the assumption of an equibalanced combination.
A six months time window has been chosen to collect the daily returns in order to calculate averages and standard deviation.

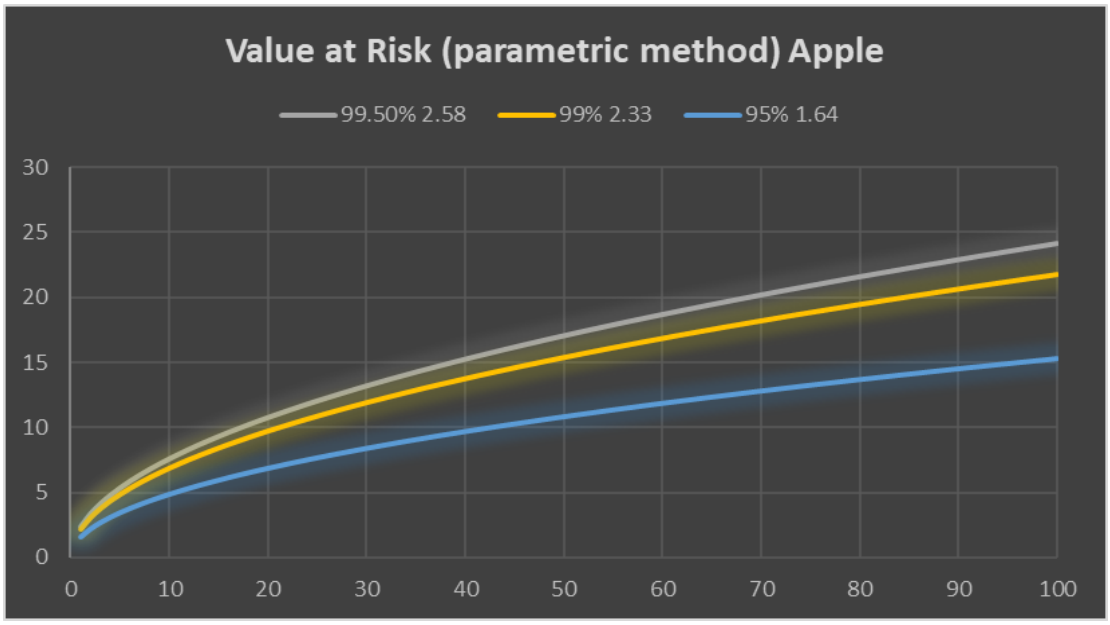
	Average return	Volatility
Microsoft	-0.000772665	0.019732
Apple	0.000941335	0.019082
Portfolio	-9.63048E-06	0.017971
Stat	6.60111E-05	0.018038

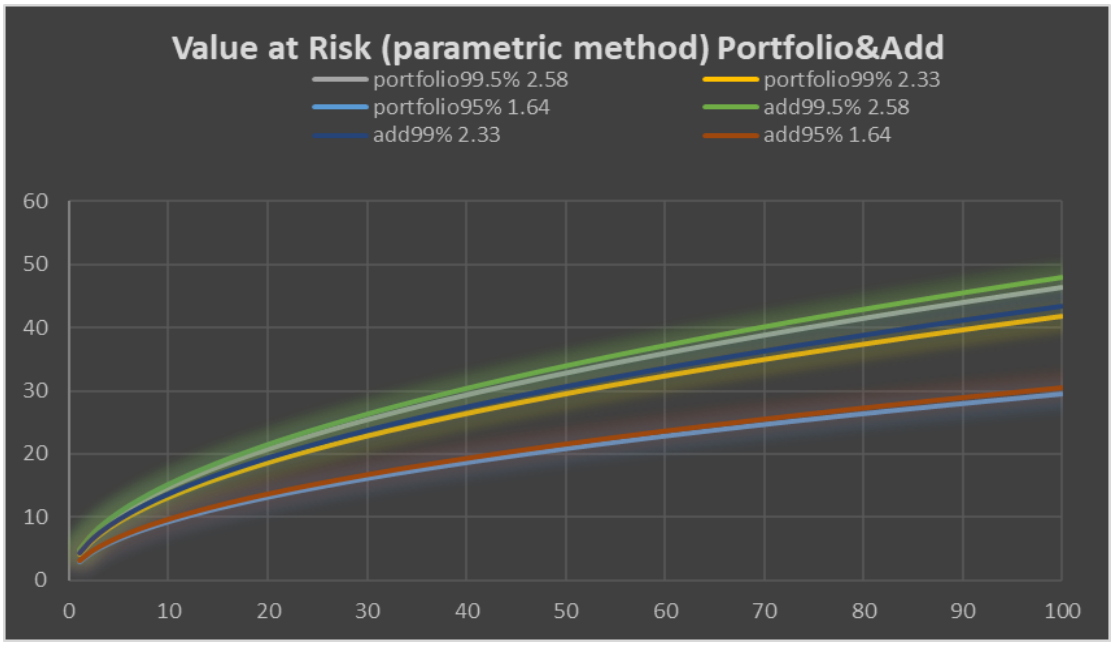
$$Portfolio\ variance = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2Cov_{1,2}$$

$$\text{Covariance} = \frac{\sum (\text{Return}_{ABC} - \text{Average}_{ABC}) * (\text{Return}_{XYZ} - \text{Average}_{XYZ})}{(\text{Sample Size}) - 1}$$

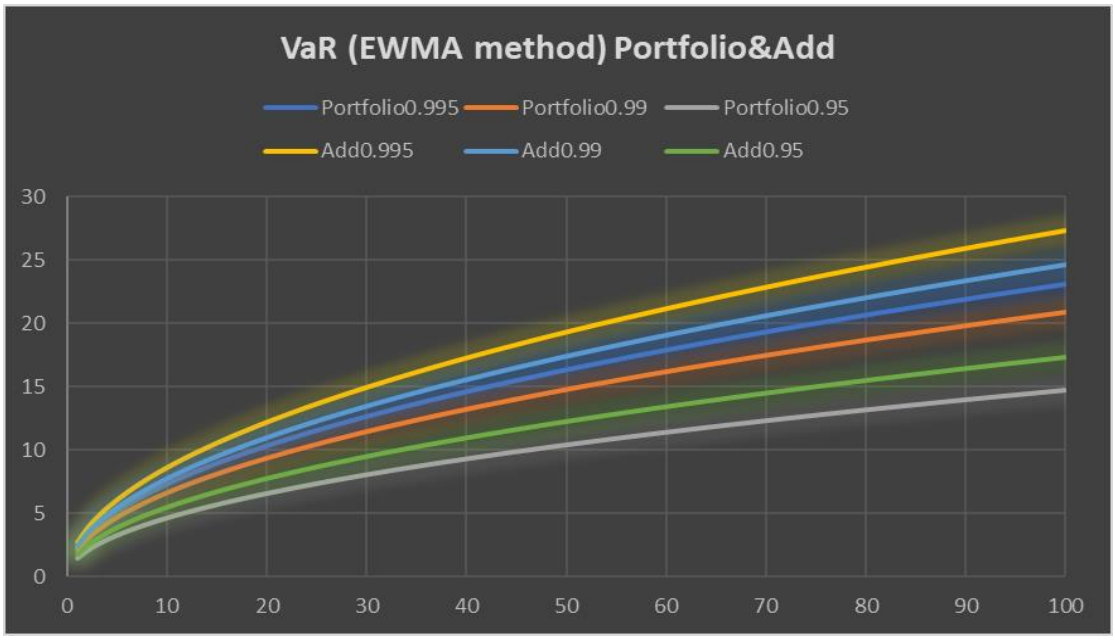
2.
Compute the parametric single and joint Normal VaR at different confidence levels (99.5%, 99%, 95%) with T=1..100 time window; the parametric method depends on sigma and value of the portfolio.
VaR of the two assets, their sum and of the whole portfolio is plotted against T with different confidence levels.



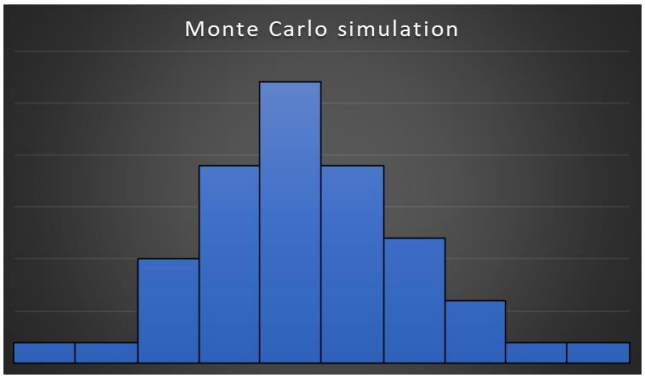

Value at Risk (parametric method) Apple
99.50% 2.58
99% 2.33
95% 1.64
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100


Value at Risk (parametric method) Portfolio&Add
portfolio99.5% 2.58
portfolio99% 2.33
portfolio95% 1.64
add99.5% 2.58
add99% 2.33
add95% 1.64
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
100

3.
Compute the VaR with the sigma estimated following riskmetric EWMA (with lambda=0.94). Need to compute the weighted historical returns so that the contribution scales with time.



4.
Compute the MonteCarlo VaR with N (100) simulations with T (10) at different confidence levels (99%,99,5%,95%), different seeds has been used for the simulations.



		vol_y
portfolio	100	0.017971
microsoft	0.5	0.019732
apple	0.5	0.019082
T	10	
R	0	
portfolio	Per.Loss	Abs.Loss
95%	0.005088	0.508779
99%	0.005816	0.581642
99.50%	0.005088	0.508779
microsoft		
95%	0.007133	0.356666
99%	0.00997	0.498499
99.50%	0.007133	0.356666
apple		
95%	0.006213	0.310646
99%	0.007764	0.388191
99.50%	0.006213	0.310646

5.
Computation of the historical VaR (according to the historical value of the returns) considering the historicl data in order to compute the averages and sigma. Those values have been used as input for a normal distribution to compute the Value at Risk at different confidence levels.