

DSC5211C QUANTITATIVE RISK MANAGEMENT

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Workshop 9: V@R and CV@R Optimization

You were asked to apply your portfolio management skills to the American stock market. You look at the last two years of monthly data on AAPL, MCD, QQQ, SPY and TLT prices from yahoo finance, summarized in the next three tables.

Average monthly returns.

AAPL	MCD	QQQ	SPY	TLT
0.029478	0.013227	0.02166	0.012339	-0.0013

Covariance matrix.

	AAPL	MCD	QQQ	SPY	TLT
AAPL	0.002374				
MCD	0.000171	0.001352			
QQQ	0.000696	0.000242	0.00080387		
SPY	0.00025	-0.00024	-6.62207E-05	0.000361	
TLT	0.000281	0.000124	6.47748E-05	5.01E-05	0.000861

Correlation matrix.

	AAPL	MCD	QQQ	SPY	TLT
AAPL	1				
MCD	0.095551	1			
QQQ	0.50372	0.231975	1		
SPY	0.270314	-0.33785	-0.122940107	1	
TLT	0.196171	0.115051	0.077843985	0.089938	1

Task 1 – Probabilistic Constraints

You have prepared the GAMS code in file “portfolioProb.gms” to analyse this problem, as you are keen to include risk aversion.

- A) What is the optimal policy and the V@R for a level of significance (probability of the loss exceeding the V@R) of 1%, 5%, 10%, in a given month?
- B) What is the different between the risk-averse and the risk-neutral optimal policies?
- C) What is the impact of the target on the monthly return on the V@R and on the optimal policy?

Task 2 – CV@R Optimization

After considering your knowledge of risk management and CV@R you decided that a more reliable option would be to attempt a CV@R optimization. After some effort you managed to write the GAMS code on file “portfolioCVaR.gms”.

- A) What is the optimal policy for beta of 0.9, 0.95 and 0.99?
What is the CV@R, V@R, and expect return of the optimal policies?
- B) How does the number of scenarios influence the previous solution?
- C) You believe that the historical correlations between the security returns and the SPY are not representative. Choose a correlation matrix that, in your view better represents the future behaviour of the stock returns and re-address question A).