Formula Sheet

1. Call Value at expiration: $C = \max(S - K,\ 0)$

2. Put value at expiration: $P = \max(K - S,\ 0)$

3. Put-Call Parity: $S + P = C + PV(K)$

Solution of Mean-Variance optimization

Let $\sum$ denote the variance/covariance matrix, w the portfolio vector, and $\overline{\mathbf{R}}$ the vector of expected returns. The solution to the following optimization problem:

$$\min_{\mathbf{w}} \frac{1}{2}\mathbf{w}'\Sigma\mathbf{w}$$

$$s.t.\mathbf{w}'\overline{\mathbf{R}} = R_p$$

$$\mathbf{w}'\mathbf{e} = 1$$

Is given by $\mathbf{w} = \lambda_1\Sigma^{-1}\overline{\mathbf{R}} + \lambda_2\Sigma^{-1}\mathbf{e}.$ where λ_1, λ_2 are Lagrange multipliers,

In the case when there is a risk free asset we consider excess returns (i.e., subtract the risk free rate) . We also focus first on the weights on the risky assets so remove the second constraint. The solution to the following optimization problem:

$$\min_{\mathbf{w}} \frac{1}{2}\mathbf{w}'\Sigma\mathbf{w}$$

4. $$s.t.\ \mathbf{w}'\overline{\mathbf{R}}^e = R_p^e$$

Is given by $\mathbf{w} = \lambda\Sigma^{-1}\overline{\mathbf{R}}^e$