Problem set 5

Due date: Tuesday, October 27^{th}, 11:15 am.

Exercise 1

Build the implied volatility surface of the STOXX50E index using the Andreasen-Huge algorithm. The surface will contain implied vols for strikes from 40% to 200%, matching as closely as you can the market data in the spreadsheet.
First derive the implied vols for the expirations in the spreadsheet, and then for the expirations $T = 1$ and $T = 1.5$. Since the market data (taken by the original Andreasen-Huge paper) refers to March 2010, when interest rates were very close to 0 and the dividend rate was also very low, you can set $r = q = 0$.

Suppose that the stock follows a process

$$dS_t = S_t \sigma(S_t, t) dW_t \tag{1}$$

with

$$\sigma(S_t, t) = \frac{\tilde{\sigma}(S_t, t)}{S_t} \tag{2}$$

and $\tilde{\sigma}$ is a piecewise-constant function in S_t and t. Follow the steps in the paper and/or in the slides.