Eklipx.io Quantitative Engineer Technical Test - Solutions

Steve Nguoghia
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1) Create a volatility surface from the clean.csv file suitable for use with the pricing exercises below.

Model: SABR model
We choose the SABR model for the implied volatility dynamics, given its strong theoretical foundation and its ability to capture the volatility smile. Additionally, it is more likely to be arbitrage-free, contrary to models such as polynomial regression models. There is of course the issue of mean reversion is a concern, but given that the contract is relatively short dated (expiring on 26 Jul 2024), it should hopefully not become a major one.

Calibration: The SABR parameters are calibrated based on the input curve (clean.csv), using the ***scipy*** function ***minimize***.

Implementation: We create the ***SABRVolatility*** class (in *vol_model_sabr.py*), which inherits from the volatility interface ***VolatilityModel*** (base for potential additional volatility models to be implemented in a latter stage, in *ivol_model.py*).
Objects can be created by providing either SABR parameters, or a volatility curve by strike for a specific maturity, which then allows to calibrate the SABR parameters using the method ***fit_to_volatility_curve***.

Results: The SABR parametrisation and calibration of the clean curve is implemented in ***clean_vol_surface.py***. However, the SABR parameters extracted and the curve obtained does not fit the original curve. Further investigation is required to properly calibrate the parameters.

2) Parse the noisy.csv file and based on your knowledge clean and interpolate the curve so it is suitable for pricing (propose and implement an interpolation method).
Here as well we propose to model the dynamics using SABR as above, once the calibration has been sorted. However in this case, outliers need to be removed, in particular for the strike prices between 40 and 100, a part from the minimum, for the strike of K=70.

3) Plot the interpolated curve and comment on any pertinent transformations where you see fit.
Similar process to clean curve.

Pricing
This has not been possible due to issues encountered during QuantLib installation.