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Consistent Pricing and Hedging of an FX Options Book

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Abstract: In the foreign exchange (FX) options market away-from-the-money options are quite actively traded, and quotes for the same type of instruments are available everyday with very narrow spreads (at least for the main currencies). This makes it possibleto devise a procedure for extrapolating the implied volatilities of non-quoted options, providing us with reliable data to which to calibrate our favorite model.
In this article, we test the goodness of the Brigo, Mercurio and Rapisarda (2004) model as far as some fundamental practical implications are concerned. This model, which is based on a geometric Brownian motion with time-dependent coefficients that are not known initially and whose value is randomly drawn at an infinitesimal future time, can accommodate very general volatility surfaces and, in case of the FX options market, can lead to a perfect fit to the main volatility quotes.
We first show the fitting capability of the model with an example from real market data. We then support the goodness of our calibration by providing a diagnostic on the forward volatilities implied by the model. We also compare the model prices of some exotic options with the corresponding ones given by a market practice. Finally, we show how to derive bucketed sensitivities to volatility and how to hedge accordingly a typical options book.

Keywords: foreign exchange options market; uncertain Black-Scholes parameters; calibration; forward volatilities; bucketed sensitivities; options book hedging

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