Homework assignment #3

Andrew Lesniewski

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Problems

1. Using the market data sets provided for the previous homework assignments, calculate the following CMS rates:
   - 10 year CMS settling in 1 year and paying 3 months later, and
   - 10 year CMS settling in 5 years and paying 3 months later.

   What fraction of the CMS convexity correction comes from the payment delay?

2. Derive the formula for valuation of a zero coupon bond in the two-factor Hull-White model (formula (21) of lecture notes #5). You may find the following fact useful:

\[
E_t \left[ e^{\int_t^T \left( \phi_1(s)dW_1(s)+\phi_2(s)dW_2(s) \right)} \right] = e^{\frac{1}{2} \int_t^T \left( \phi_1(s)^2 + 2\rho\phi_1(s)\phi_2(s) + \phi_2(s)^2 \right) ds},
\]

where \( \rho \) is the correlation coefficient between the Brownian motions \( W_1(t) \) and \( W_2(t) \).

3. We do not have time to discuss the issues of calibrating the Hull-White model in detail, and therefore the objective of this problem is to do a ballpark calculation only. Assume constant mean reversion level \( \mu \) and instantaneous volatility \( \sigma \), and carry out the integration in formula (25) of lecture notes #5 for the Eurodollar / FRA convexity correction. Assuming reasonable values of the parameters (say, \( \mu = 0.05 \), \( \lambda = 0.1 \), \( \sigma = 0.008 \)), calculate the magnitudes of these convexity corrections for the first 20 Eurodollar contracts.

This assignment is due in two weeks