Homework assignment #3

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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:

$$\mathsf{E}_t\left[e^{\int_t^T\left(\varphi_1(s)dW_1(s)+\varphi_2(s)dW_2(s)\right)}\right]=e^{\frac{1}{2}\int_t^T\left(\varphi_1(s)^2+2\rho\varphi_1(s)\varphi_2(s)+\varphi_2(s)^2\right)ds},$$

   where ρ 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 μ and instantaneous volatility σ, 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