

Homework assignment #3

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March 5, 2007

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:

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

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