# INTEREST RATE MODELS

## Homework assignment #1

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### Problems

1. Assume an interest rate model with a constant instantaneous OIS rate $f_0$, and a constant instantaneous LIBOR rate $l_0$. Consider a spot starting swap maturing $T$ years from now ($T$ is an integer). For simplicity, assume that the coupon dates on both fixed and floating legs are equally spaced with all day count fractions equal to 0.5 and 0.25, respectively. Also, for simplicity, neglect the 2 business day lag between LIBOR fixing and start of an accrual period.

    (i) Find an explicit expression for the values of both legs of of the swap.

    (ii) Determine the par coupon on the swap.

2. Prove formula (31) on page 48 of Lecture Notes #1.

3. Consider a frictionless market $\big(S_1(t), \ldots, S_N(t)\big)$ and a self-financing portfolio with weights $\big(w_1(t), \ldots, w_N(t)\big)$. Given a numeraire $\mathcal{N}(t)$, show that the portfolio expressed in terms of the relative prices $\big(S_1^{\mathcal{N}}(t), \ldots, S_N^{\mathcal{N}}(t)\big)$ is frictionless.

**This assignment is due on February 19**