

Derivative Securities: Assignment 2
Professor Avellaneda
Due October 8 2013

Problem 1. Estimate the forward price of INTC and its annualized dividend yield.

Trade Date: 9/13/2013

Settlement date: 9/13/2014

INTC closing price on 9/13/2013 : \$23.44

Dividend stream over the last 2 years:

Date	Dividend (\$)
Aug 5, 2013	0.225
May 3, 2013	0.225
Feb 5, 2013	0.225
Nov 5, 2012	0.225
Aug 3, 2012	0.225
May 3, 2012	0.21
Feb 3, 2012	0.21
Nov 3, 2011	0.21
Aug 3, 2011	0.21
May 4, 2011	0.181
Feb 3, 2011	0.181
Nov 3, 2010	0.158

Assume interest rates flat at 15pbs. State your assumptions on future dividends clearly. Calculate the equivalent continuously compounded annualized dividend yield for 1 year. [Hint: check with *Yahoo! Finance* for the annualized dividend yield. Try to explain the difference with your result, if any].

Problem 2. Give a concise definition of a futures contract, with an example from the US markets. Explain the main differences between futures and forward contracts in the context of your example.

Problem 3. A German car manufacturer wishes to hedge on Monday September 23, 2013 his forward exposure to USD arising from a stream of cash-flows arising from his US export business, which are as follows:

December 15 2013: USD 50,000,000

March 15 2014: USD 40,000,000

June 15 2014: USD 60,000,000

Describe as precisely as possible a hedging strategy using CME currency futures (number of contracts, tailing (?)), to perform this hedge. Assume some future FX scenarios to illustrate how the strategy might work out.

Problem 4. An interest rate swap (IRS) is a “strip” or portfolio of Forward Rate Agreements, in which there are n cash-flow dates. The dates are approximately 6 months apart. A notional amount (N) is stipulated (e.g. $N = \text{USD } 100 \text{ million}$). On each of the cash-flow dates, the buyer pays the seller a fixed rate (the swap rate) times the notional amount and the seller pays the buyer the 3-month LIBOR rate on the same notional amount. Interest payments are pro-rated for the 6-month period. The contract is cash-settled on the difference between the payments.

According to the above definition, the cash-flow for buyer on date T_i (measured in years as days/360 or other convention) is:

$$N * (T_i - T_{i-1}) * (LIBOR3M(T_{i-1}) - Swap Rate).$$

(Notice that payments are made *in arrears*: the 3M Libor paid on date T_i was set on the previous date.)

- a. Let F_i be the forward rate associated with 3M LIBOR. Show that at the inception of the swap, we should have ($F_0 = \text{spot 3M Libor}$):

$$\sum_{i=1}^n (T_i - T_{i-1}) * D_i * (F_{i-1} - Swap Rate) = 0,$$

where D_i is the present value of \$1 paid at date T_i . Derive a formula for the fair value of the swap rate.

- b. Give a formula for the value of a swap (for the buyer), V_t at an intermediate date t , where $T_0 \leq t < T_1$.
- c. Suppose now that the IRS swap is to be **marked-to-market daily**. This is done as follows: the buyer is debited or credited on date t at the close, the amount $V_t - V_{t-1}$ in cash, where V_t was defined in the previous question. What are the financial consequences of marking to market the swap? Does the economics (for the buyer’s point of view or the seller’s) works out the same if the swap is marked to market or not? Are there any parallels with this situation and the comparison between FRAs and futures made in class? [Suggestion: try with a 1 or two period swap first to see what the answer would be.]