# CHAPTER 4

## Solutions to Exercises

**Solution to Exercise 4.1.**

(a) Before FAS 133, if companies qualified for hedge accounting, their hedges were assumed to be perfect–no valuation or testing required. Now, under FAS 133, risk managers seeking hedge accounting treatment have to thoroughly document each hedge from the outset and explain why they are undertaking the transaction. They have to mark their derivatives to market every quarter (no small feat for many instruments), then prove they are effectively hedging the underlying exposure. It's this sense of having to pay for the sins of others that accounts for the deep resentment toward FAS 133. Many finance executives suspect the new rules have less to do with improving financial statements than with discouraging treasury departments from speculating with derivatives.

(b) Constructing synthetic swaps will involve replication of a swap by portfolios of bonds. These do not come under the considerations of FAS 133. So all the work that FAS 133 brings with it needs not be done now.

**Solution to Exercise 4.2**

a) Note that as Italian Government buys back 30-year bonds, the sovereign curve will shift "down", relatively more than the swap curve. Or, the sovereign curve will shift up, less than the swap curve, depending on the direction of the movement. The typical investor is receiving fixed 30-year government yield and paying fixed in the swap market. There is also the spread received over Euribor. Such an investor will realize capital gains if yield curve movements occur as expected.

To see this, note that one can approximate the value, $V_t$, of the position described in the second paragraph using:

$$V_{t_0} = \sum_{i=1}^{30} \left(R_{t_0} - \left(R_{t_0} + s_{t_0}\right) + 0.00105\right) \times B(t_0 + t_i) = 100$$

where we assume, unrealistically, that the $t_i$ run over years. The $R_t$ and $s_t$ are the sovereign yield, and swap spread, respectively. (This is approximate, since we are applying the same discount factors to Euribor-based payments and the sovereign interest payments. Normally, these are related to different discounts.) The Libor-based payments have the present value of 100, which is shown as the last term on the right hand side. It is for this reason that no $L_{t_i}$ appear on the right hand side.

Now, if the Italian government buys back the 30-year bonds, we expect the $B(t, t_i)$ to increase. Ceteris Paribus, this will leave the $s_t$ unchanged and the position will gain. If the spread over Euribor falls in addition to this, the gains will be even higher.

b) Yes, the trade in the reading will benefit most if 30-year bonds are repurchased.

c) This is the standard cash flow diagram. The implied graph will be similar to parts (a) and (b) of Figure 4-4 (Payoff of a generic swap).

d) Ignoring any differences in day counts and other conventions, this makes the swap rate equal $.06 - .00105$ if paid against Euribor flat.

e) Investors enter more of such positions and the swap rate will increase due to supply-demand, this is equivalent to a decrease in the spread over Euribor.

**Solution to Exercise 4.3.**

a) You will draw three separate cash flow diagrams, each representing a different swap. Assume for simplicity, that the swaps are against 12-month Libor. Remember that the notional amounts are different.

b) For the net payments,one can simply add vertically the cash flows at each $t_i$.

c) Once these cash flows are determined for each $t_i$, one would multiply them with the appropriate discount factors, obtained from the swap curve.

For example, the cash flows two years later, at $t_2$, will be given approximately by:

$$\frac{(.0675\ -\ .0675)(50\text{m})\ +\ (.07\ -\ .0688)(10\text{m})\ -\ (.0755\ -\ .0745)(10\text{m})}{(1+0.0675)^2}$$

The point to remember is that, the unknown Libor-based payments can be replaced by the corresponding values measured using the current swap rate given in the Table. Note that the Swap curve starts at year 2 and some form of interpolation is needed for the first year cash flows. Alternatively a Libor curve will be needed.

d) This will be positive as the above example shows.

e) One could hedge the net position that has a five year maturity with a 4-year swap only in an approximate sense. One would calculate the durations of the two swaps and then take a position that equates the first order sensitivities of the net position and the hedge.

f) An exact hedge can be put together by entering into 5 different FRA contracts.