

## Midterm: Short Answers

(March 4, 1998)

1. It's a eurobond. (a) 68 days of accrued interest is 0.76. (b) The invoice price is 99.03. (c) The yield is 4.67%. (d) Duration is 2.58 years.
2. Arbitrage and discount factors.
  - (a) Find discount factors "recursively": bond A implies  $d_1 = 0.9756$  and bond B implies  $d_2 = 0.9350$ . This follows the one-at-a-time method described in class.
  - (b) With bond C,  $d_2$  changes to 0.9335.
  - (c) Bond B places more value on second-period payments than C. You might guess that you would therefore want to buy C ("buy low") and sell B ("sell high"). In fact, a 50-50 combination of C and D has the same cash flows as B and costs  $(97.17 + 100.99)/2 = 99.08$ . If you sell B, then, and buy the combination, you get the same cash flows and pocket 0.15 in the process.
3. Fixed income strategy.
  - (a) Increase: booming economy, tight monetary policy, recovery in Asia, signs of inflation, larger government deficits. Decrease: the reverse.
  - (b) Anything that drives rates down temporarily, and therefore effects short rates more than long rates. A classic example is a monetary expansion, perhaps triggered by fear of financial collapse in Asia or a US recession.
  - (c) Your call.
  - (d) Classic spread trade: short the long end and go long the short end.
4. Risk management with swaps.
  - (a) Duration is
$$D = 0.25 \times 1.8 + 0.75 \times 7.4 = 6.$$
The loss is  $D/2$  percent (D percent for a rise of 100 BPs) or 15mm.
  - (b) Find  $w$  solving
$$D = w \times 1.8 + (1 - w) \times 7.4 = 5.$$
The answer is  $w = 0.429$ , meaning you invest 214mm in 2-years and 286mm in 10-years. Basically, you need to increase the fraction invested in 2-years to get the duration down to 5.

- (c) You want to pay fixed, since this makes you short the long-duration part of the swap. Let's say that the duration of the floating rate leg of the swap is 0.5. Then the duration of the portfolio with a swap of notional  $x$  attached to it is

$$D = 0.25 \times 1.8 + 0.75 \times 7.4 + \left(\frac{x}{500}\right) \times 0.5 - \left(\frac{x}{500}\right) \times 2.8.$$

The answer is  $x = 217\text{mm}$ .

- (d) The overall duration is 5, but with the swap you have different exposure to various parts of the yield curve. You're long 125mm at 2 years, long 375mm at 10 years, and *short* 217mm at 3 years. Anything that (say) raises the 2-year and 10-year rates relative to the 3-year rate can lose you money. Ditto anything that reduces the spread between swap rates and whatever the investments are (treasuries?).