

No.

Date.

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Q1

Cash flows:

Time	0	0.5	1	1.5	2
Swap 1	100	100.35			
Swap 2	100	0.4	100.4		
Swap 3	100	0.5	100.5	100.5	
Swap 4	100	0.6	0.6	0.6	100.6

$$d(0.5) = \frac{100}{100.35} = 0.996512$$

$$d(1) = \frac{(100 - 0.4d(0.5))}{100.4} = 0.992046$$

$$d(1.5) = \frac{(100 - 0.5d(0.5) - 0.5d(1))}{100.5} = 0.985132$$

$$d(2) = \frac{(100 - 0.6d(0.5) - 0.6d(1) - 0.6d(1.5))}{100.6} = 0.9763$$

$$f(0.5) = 2(d(0.5)^{\frac{1}{2 \times 0.5}} - 1) = 0.007$$

$$f(1) = 2(d(1)^{\frac{1}{2 \times 1}} - 1) = 0.008002$$

$$f(1.5) = 2(d(1.5)^{\frac{1}{2 \times 1.5}} - 1) = 0.010012$$

$$f(2) = 2(d(2)^{\frac{1}{2 \times 2}} - 1) = 0.012029$$

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$$f(0.5) = \hat{f}(0.5) = 0.007$$

$$f(1) = 2 \left(\frac{\frac{1}{d(1)}}{1 + \frac{f(0.5)}{2}} - 1 \right) = 2 \left(\frac{0.99246}{1 + 0.007} - 1 \right) = 0.009005$$

$$f(1.5) = 2 \left(\frac{\frac{1}{d(1.5)}}{1 + \frac{f(0.5)}{2} + \frac{f(1)}{2}} - 1 \right) = 0.014037$$

$$f(2) = 2 \left(\frac{\frac{1}{d(2)}}{1 + \frac{f(0.5)}{2} + \frac{f(1)}{2} + \frac{f(1.5)}{2}} - 1 \right) = 0.018072$$

Time	0	0.2	1	2.1	2.2	2.3
Price	1000	980	960	940	920	900
Vol	1000	30	30	30	30	30

There is arbitrage opportunity of arbitrage and
 looking for bond, we can get better and then
 the future.

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Q2. Cash flow of "5s of Oct 16, 2017" is $(7.0) \times 1 = (7.0)$

Time 0 0.5 1.5 2

Bond P 2.5 2.5 2.5 102.5

$$\text{when } P = 2.5(0.996512) + 2.5(0.992046) + 2.5(0.985182)$$

$$+ 102.5(0.9763)$$

$$P = \$107.5050$$

Q3. Cash flow for par bond and swap:

Time	0	0.5	1	1.5	2	2.5
Date	Oct 16, 2015	Apr 16, 2016	Oct 16, 2016	Apr 16, 2017	Oct 16, 2017	Apr 16, 2018
Par Bond	1000	35	35	35	35	1035
Swap	1000	30	30	30	30	1030

There is arbitrage opportunity, by shorting Swap and longing Par Bond, we can get positive cash flow in the future.