

Discount factors	τ	0.5	1
	$\delta(\tau)$	0.99	0.98
	$\sigma(\tau)$	0.99	1.97

Bond Parameters	Bond	Matures	Coupon Rate	Current Price
	A	0.50	0.04	1005.00
	B	1.00	0.04	1021.00

1. The present value of a zero, which matures in a half year and one year respectively are:

$$1000 * \delta(1/2) = 990$$

$$1000 * \delta(1) = 980$$

2. The par yields for the two bonds can be determined from the formula

$$\rho(\tau) = 2(1 - \delta(\tau)) / \sigma(\tau)$$

Thus, for bonds A and B we have

Bond	par yield
A	0.020202
B	0.020305

3. The present value of a coupon bond can be calculated by use of the formula

$$\text{Present Value} = Z + (a/\rho)(P - Z)$$

One could also use the defining formula, but since we have already computed Z for each date of maturity, we will use this formula.

Bond	Present Value
A	1009.80
Bond	1019.40

a is 0.04 for both bonds, but ρ and Z change

4. Short selling one bond B leads to the following cash positions (no reinvestment)

Time	Cash	
0	1021.00	Price of bond B
0.50	1001.00	Coupon payment of \$20 made
1	-19.00	Coupon payment of \$20 made along with par value

5. Short selling one bond B leads to the following cash positions (reinvestment at 2% allowed)

Time	Cash	
0	1021.00	Price of bond B
0.50	1011.21	coupon payment of \$20, but 1021 earned \$10.21
1	1.32	coupon payment plus par value paid out but 1% of 1011.21 was earned