Problems for Lecture 2

Problem 1

(a) A zero-coupon bond with 3 years to maturity.

$$\text{Price} = \frac{100}{(1+6\%)^3} = 83.96$$

(b) A bond with coupon rate 6% and 2 years to maturity.

$$\text{Price} = \frac{6}{1+5\%} + \frac{106}{(1+5.5\%)^2} = 100.95$$

(c) A bond with coupon rate 8% and 4 years to maturity.

$$\text{Price} = \frac{8}{1+5\%} + \frac{8}{(1+5.5\%)^2} + \frac{8}{(1+6\%)^3} + \frac{108}{(1+6.3\%)^4} = 106.11$$

Problem 2

For the 6-month bond X with semiannual coupon rate of 4%, the price is written as

$$\text{Price}_{\text{X}} = \frac{102}{1+r_{0.5}/2} = 100.98$$

The 6-month spot rate is calculated as $r_{0.5} = 2.02\%$.

For the 1-year bond Y with semiannual coupon rate of 6%, the price is written as

$$\text{Price}_{\text{Y}} = \frac{3}{1+r_{0.5}/2} + \frac{103}{(1+r_1/2)^2} = 103.59$$

Therefore, the 1-year spot rate is calculated as $r_1 = 2.35\%$.

Problem 3

For the 1-year bond A with zero coupon, the price is written as

$$\text{Price}_{\text{A}} = \frac{100}{1+r_1} = 95.238$$

The 1-year spot rate is calculated as $r_1 = 5.0\%$.

For the 2-year bond B with annual coupon rate of 5%, the price is written as

$$\text{Price}_{\text{Y}} = \frac{5}{1+r_1} + \frac{105}{(1+r_2)^2} = 98.438$$

Therefore, the 2-year spot rate is calculated as $r_2 = 5.87\%$.

For the 2-year bond C with annual coupon rate of 7%, the price can be calculated as

$$\text{Price}_{\text{C}} = \frac{7}{1+r_1} + \frac{107}{(1+r_2)^2} = 102.127$$

The bond C is therefore overpriced at $103.370 in the market. Since Jerry is buying and selling the bonds, we can construct an arbitrage and earn a free lunch.