HW 4.5 (a) Key

1. The following are the current prices of 1000 par-value, zero-coupon bonds:

Term to Maturity	Price
1	944.9
2	X
3	760.9

If the one-year forward rate for year 2 (i.e., the one-year effective rate during year 2) is 5%, determine X. [9.a-b #03]

$f_1 = 5\%$

[A] 899.90 B) 908.00 C) 916.10 D) 924.20 E) 932.30

$944.9(1+s_1) = 1000 \rightarrow s_1 = 5.8313\%$

$X(1+s_1)(1+f_1) = 1000 \rightarrow X = \boxed{899.90}$

2. The yield rate on a one year zero-coupon bond is currently 3.5% and the yield rate on a two year zero coupons bond is currently 5%. The Treasury plans to issue a two year bond with 5.5% annual coupons, maturing at 100 par value. Determine the yield-to-maturity of the two year coupon bond. [9.a-b #04]

[A] 4.96% B) 5.24% C) 5.52% D) 5.81% E) 6.09%

$s_1 = 3.5\% \qquad s_2 = 5\%$

$P = \frac{5.5}{1+s_1} + \frac{105.5}{(1+s_2)^2} = 101.0056$

$101.0056 = 5.5\,a_{\overline{2}|i} + 100v^2 \rightarrow i = \boxed{4.9595\%}$

3. A one year \$1000 Treasury bond with 8% semiannual coupons sells for \$962.02. A one year \$1000 Treasury bill sells for \$888.32. Determine the forward price applicable to the six-month period starting six months from now, expressed as a nominal annual rate convertible semiannually. [9.a-b #05]

[A] 14.80% B) 11.50% C) 12.30% D) 13.10% E) 14.00%

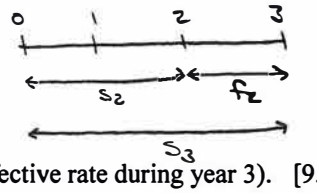
$888.32(1+s_2)^2 = 1000 \rightarrow s_2 = 6.09997\%$

$962.02 = \frac{40}{1+s_1} + \frac{1040}{(1+s_2)^2} \rightarrow s_1 = 4.802\%$

$(1+s_1)(1+f_1) = (1+s_2)^2 \rightarrow f_1 = 7.414\% \rightarrow \boxed{14.828\%}$

4. The following are the prices for zero-coupon bonds with par value of \$1000, maturing at par:

Term In Years	Price
1	\$956.57
2	\$895.04
3	\$800.25
4	\$717.47



Determine the one-year forward rate for year 3 (i.e., the one-year effective rate during year 3). [9.a-b #06]

[A)] 11.85% B) 12.40% C) 12.96% D) 13.52% E) 14.07%

$895.04(1+s_2)^2 = 1000 \rightarrow s_2 = 5.7\%$

$800.25(1+s_3)^3 = 1000 \rightarrow s_3 = 7.71\%$

$(1+s_2)^2(1+f_2) = (1+s_3)^3 \rightarrow f_2 = \boxed{11.85\%}$

5. You are given the following information about three zero-coupon bonds:

	Price on	Maturity Value On:		
Bond	January 1, 2011	July 1, 2011	July 1, 2012	January 1, 2013
A	\$97	\$100		
B	\$140		\$150	
C	\$167			\$190

Determine the forward rate for the period from July 1, 2012 to January 1, 2013, expressed as a nominal annual rate of interest convertible semiannually. [9.a-b #07]

[A)] 12.38% B) 11.61% C) 13.14% D) 13.91% E) 14.68%

$140(1+s_2)^2 = 150 \rightarrow s_2 = 3.5098\%$

$167(1+s_3)^3 = 190 \rightarrow s_3 = 4.3948\%$

$(1+s_2)^2(1+f_2) = (1+s_3)^3 \rightarrow f_2 = 6.1876\%$ $\boxed{12.38\%}$