



P1.T4. Valuation & Risk Models

Bionic Turtle FRM Practice Questions

Chapter 11. Bond Yields and Return Calculations

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Chapter 11. Bond Yields and Return Calculations

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P1.T4.905. Gross versus net bond returns, bond spread and bond yield

Learning objectives: Distinguish between gross and net realized returns, and calculate the realized return for a bond over a holding period including reinvestments. Define and interpret the spread of a bond, and explain how a spread is derived from a bond price and a term structure of rates. Define, interpret, and apply a bond's yield-to-maturity (YTM) to bond pricing.

905.1. On June 1st, 2018, Jack borrowed the entire purchase price to buy a bond with a price of \$103.20 which matures on November 30th, 2019. The bond pays a semi-annual coupon with a coupon rate of 5.50% per annum; this bond can be referred to as "5 1/2 of November 30, 2019." On November 30, 2018, the price of the bond was \$106.90. At that time, Jack collected the coupon and sold the bond. His borrowing rate was 40 basis points per annum. Compound frequency is semi-annual to match the coupon cash flows (consistent with the entirety of Tuckman). What was Jack's net realized return?

- a) 6.050%
- b) 8.715%
- c) Infinite due to 100% financing
- d) Cannot solve because we need the bond's full/flat price at time of sale

905.2. Let the two-year term structure of zero rates include the following four spot rates: 1.0% @ 0.5 years, 2.0% @ 1.0, 3.0% @ 1.5, and 4.0% @ 2.0 years. Using these discount rates, the price of a two-year \$100.00 face value bond with 4.0% coupon rate is \$100.10 (see blue cell) as shown in the exhibit below, where \$100.10 is the sum of four discounted cash flows:

Assume the term structure above (i.e., 1.0% @ 0.5 years, 2.0% @ 1.0, 3.0% @ 1.5, and 4.0% @ 2.0 years) remains valid, but a different bond trades at a price of only \$95.12. Which of the following is **nearest** to this bond's spread?

- a) 30 basis points
- b) 90 basis points
- c) 140 basis points
- d) 270 basis points

Face: \$100.00
 Coupon: 4.0%

Years	0.5	1.0	1.5	2.0	
FV cash flows	\$2.00	\$2.00	\$2.00	\$102.00	
Spot rates, r	1.0%	2.0%	3.0%	4.0%	
PV cash flows	\$1.99	\$1.96	\$1.91	\$94.23	\$100.10

905.3. Peter paid \$93.40 to purchase a bond on June 1st, 2018; the bond pays a semi-annual coupon with a coupon rate of 3.0% per annum and matures in 10.0 years on June 1st, 2028. One year later, on June 1st, 2019, the bond's yield is unchanged; aka, unchanged yield assumption. Peter can reinvest his received coupons at a rate of 4.0% per annum. If Peter were to sell the bond on June 1st, 2019, which of the following is **nearest** to his gross realized return over the one year period since he purchased the bond?

- a) -1.09%
- b) 2.50%
- c) 3.84%
- d) 4.11%

Answers:

905.1. A. True: 6.050%

The cost to repay the loan = $\$103.20 * (1 + 0.0040/2) = \103.406400 . The net realized return = $(\$106.90 + 2.750 - \$103.40640)/103.20 = 6.050\%$. This is also equal to the gross return of 6.250% minus 0.20% financing cost.

905.2. D. 270 basis points

See below: adding a spread of 2.70% to the term structure returns a present value of \$95.12. However, the quicker method is simply to compute the yields of the two bonds and use the difference as an approximation! Especially for a short-term bond, the approximation will be good as most of the difference concerns the 2.0-year cash flow. The yield of the original bond = $RATE(4, 2, -100.10, 100) * 2 = 3.95\%$ and the yield of the second bond = $RATE(4, 2, -95.12, 100) * 2 = 6.65\%$, for a difference of 2.69615%. Although please be mindful of the difference between yield and spread and why this is an approximation: the yields are single factors that incorporate the entire (multi-factor) spot rate curve; this approximately works in large part because each bond's yield is near to the final spot rate at 2.0 year where the final cash flow dominates the price.

Face: \$100.00
Coupon: 4.0%

Years	0.5	1.0	1.5	2.0	
FV cash flows	\$2.00	\$2.00	\$2.00	\$102.00	
Spot rates, r	1.0%	2.0%	3.0%	4.0%	
Spread, z	2.7%	2.7%	2.7%	2.7%	
Discount @ r+z	3.7%	4.7%	5.7%	6.7%	
PV cash flows	\$1.96	\$1.91	\$1.84	\$89.40	\$95.12

905.3. C. True: 3.84% (or more exactly 3.83718%) is the gross realized return, which includes one reinvested (at 4.0%) coupon.

At the time of purchase, when the bond's price was \$93.40, its yield was = $RATE(10*2, 100*0.030/2, -93.40, 100)*2 \approx 3.80\%$. After one year, if the yield is unchanged, then we only need to re-price with a shorter maturity such that the price is $PV(0.0380/2, 9*2, 100*0.030/2, 100) = \93.954 . Notice how the bond pulled to par. The gross realized return includes the interim coupon compounded for six months at 4.0% and, therefore is given by $[\$93.954 + \$1.50 + \$1.50*(1 + 0.040/2) - 93.40]/93.40 = 3.8372\%$.

Discuss here in the forum: <https://www.bionicturtle.com/forum/threads/p1-t4-905-gross-versus-net-bond-returns-bond-spread-and-bond-yield-tuckman-ch-3.22128/>