

Problem Set 1

Instructions: This problem set is due on Thursday 1/22 at 11:59 pm CST and is an individual assignment. All problems must be handwritten. Scan your work and submit a PDF file.

Statistics of Asset Returns

Problem 1. An investor purchased a bond one year ago for \$980. He received \$17 in interest and sold the bond for \$987. What is the holding-period return on his investment?

Problem 2. Consider a risky portfolio. The end-of-year cash flow derived from the portfolio will be either \$70,000 or \$200,000 with equal probabilities of 50%. The alternative risk-free investment in T-bills pays 6% per year.

- If you require a risk premium of 8% so that the discount rate is $6 + 8 = 14\%$, how much will you be willing to pay for the portfolio?
- Suppose that the portfolio can be purchased for the amount you found in a. What will be the expected rate of return on the portfolio?
- Now suppose that you require a risk premium of 12%. What is the price that you will be willing to pay?

Problem 3. The stock of company XYZ currently trades at \$100 and just paid a dividend of \$1.8. Suppose that your expectations regarding the stock price and dividends next year are as follows:

State of the Market	Probability	Dividend	Price
Boom	0.3	\$3	\$120
Normal growth	0.5	\$2	\$100

State of the Market	Probability	Dividend	Price
Recession	0.2	\$1	\$80

Compute the mean and standard deviation of the returns for company XYZ.

Bond Pricing

Problem 4. Your company aims to raise \$10 million by issuing 20-year zero-coupon bonds. With a yield to maturity of 6% per year, compounded annually, what should be the total face value of the bonds to achieve this goal?

Problem 5. Suppose a seven-year, \$1,000 bond with an 8% coupon rate and semiannual coupons is trading with a yield to maturity of 6.75%.

- Is this bond currently trading at a discount, at par, or at a premium? Explain.
- If the YTM of the bond suddenly rises to 7% (APR with semiannual compounding), what price will the bond trade for?

Problem 6. Suppose that General Motors Acceptance Corporation issued a bond with 10 years until maturity, a face value of \$1,000, and a coupon rate of 7% (annual payments). The yield to maturity on this bond when it was issued was 6%.

- What was the price of this bond when it was issued?
- Assuming the yield to maturity remains constant, what is the price of the bond immediately before it makes its first coupon payment?

Problem 7. Your company currently has \$1,000 par, 6% coupon bonds with 10 years to maturity and a yield-to-maturity of 5% per year with semi-annual compounding. If you want to issue new 10-year coupon bonds at par, what coupon rate do you need to set? Assume that for both bonds, the next coupon payment is due in exactly six months.

Problem 8. Derive the probability distribution of the 1-year HPR on a 30-year U.S. Treasury bond with an 8% coupon if it is currently selling at par and the probability distribution of its YTM a year from now is as follows:

Economy	Probability	YTM	Price	HPR
Boom	0.2	11%		
Normal	0.5	8%		
Recession	0.3	7%		

Assume that the entire 8% coupon is paid at the end of the year rather than every 6 months over a principal of \$100.