

Homework 4: Bonds and risk

Due Monday October 28 5pm (in TA or instructor boxes).

1. Financial Literacy: Answer these questions in 3 steps. (1) give an answer to the question, (2) look over the material assigned for class and find a definition (3) modify, if need be, your first answer. The goal is not for you to memorize a given answer but to be sure you can explain the concept to someone. If you can't, then you do not control that concept.
 - a. Riskless bond
 - b. Default
 - c. Winner's curse
 - d. Market failure
 - e. Coupon
 - f. State dependence.

3. Riskless bonds

- A. The yield on the 1 year T-Bill was 0.1% on May 7 2013, the yield on the 5 year T-Bill was 0.75%. Both have a coupon of 0.25% paid once a year. What is the expected interest rate from year 2 to 5?
- B. On July 1 2013 the yield on the 10 year T-Bill hit 2% up from 1.1% May 1 before. If those T-bills had a 1% coupon (paid annually). What were their prices on July 1 and May 1.

- 3 Government default

- A. On 10/9/2013 the yield of the zero coupon one month T-Bill was 0.26%. Supposing that market actors thought that repudiation was out of the question and given that the 6 Month T-Bill was 0.08% was the expected delay in payment (beyond the month of the contract), implied by the premium on the one month bonds)? In other words when did investors expect to get paid?
- B. Conversely suppose that repudiation was the only alternative to extending the debt ceiling. Given the jump from 0.01% on 10/1/2013 to 0.26% how likely was repudiation to occur.

- 4 Personal finance

Using the linked CSV file that you can import into Excell or a statistical package consider the situation where you start working on January 1 of year 2018 aged 25, your initial salary is \$100,000, and your income grows at 2.5% a year until you decide to retire. You intend to retire as long as you have saved enough money to buy an annuity that pays as much as you earn your last year of paid work. You expect to be able to buy an annuity that will pay 8% of its capital value for the rest of your life provided you are at least 65 when you buy it.

- A. Your only investment choice is to invest in the S&P 500. Based on the time series of the S&P in the CSV file what saving's rate allows you to reach that goal by 2058 (after 40 years of work

- B. Suppose, however, that this exact sequence of returns is not guaranteed to occur but that the returns have the same mean and variance. How likely is it that you will reach that goal by 2058?
- C. Now fix your target income at what you earn at 65. How likely is it that you will have to continue working until age 70 (2063).
- D. How likely is it that you will face two consecutive years of negative returns (assuming that returns are independent over time? If these should occur when you are 64 and 65, how long would you delay retirement (again to reach target retirement income = income at 65)
- E. From the data how likely are two consecutive negative returns? Do you think this violates independence, how would you revise your answer to 4.D.
- F. Would the option to revise your savings' rate at the end of 2037 be a valuable option if the structure of return was known? What about more generally.