EC303: Money and Banking

Worksheet 3

Spring 2023

Through these exercises, you will learn how to compute Yield to Maturity (YTM) on four popular types of credit market instruments: simple loan, fixed-payment loan, coupon bond, and discount bond. Recall that YTM is the most accurate measure of interest rates. Therefore, you are essentially learning how to compute interest rates. You will also learn about the interest rate risk.

Exercise 1

YTM on a Simple Loan: *You borrow \$100 from your friend and next year your friend wants \$110 back from you. What is the yield to maturity of this loan?*

Exercise 2

YTM and Yearly Payment on a Fixed-Payment Loan: *You decide to buy a new home for which you need a \$100,000 mortgage. You take a loan from bank at a yearly interest rate of 7%. Assuming you want to pay off the loan in 20 years, what is your yearly payment?*

Exercise 3

YTM and Bond Price for a Coupon Bond: *What is the price of a 10% coupon bond with a face value of \$1000, a 12.25% YTM and eight years to maturity?*

Exercise 4

YTM on a Discount Bond: *What is the YTM on a one-year, $1,000 Treasury bond with a current price of $900?*

Exercise 5

Difference between YTM and the rate of return on bond: *Consider a $1,000-face-value 10-year coupon bond with a coupon rate of 10% that is bought for $1,000. Answer the following questions*

1. What is its YTM? (note that YTM means we are holding this bond until its maturity, 10 years, that is, holding period and maturity are the same).

2. Now assume that instead of holding this bond until its maturity, you hold it just for one year and then sell for $1,200. What is rate of return

3. Why are they different?

Exercise 6

Interest rate risk: *Interest rate changes makes investment in long term bonds quite risky. Let's see this in the following table.*

Table 2 One-Year Returns on Different-Maturity 10%-Coupon-Rate Bonds When Interest Rates Rise from 10% to 20%

(1) Years to Maturity When Bond Is Purchased	(2) Initial Current Yield (%)	(3) Initial Price ($)	(4) Price Next Year* ($)	(5) Rate of Capital Gain (%)	(6) Rate of Return [col (2) + col (5)] (%)
30	10	1,000	503	–49.7	–39.7
20	10	1,000	516	–49.7	–39.7
10	10	1,000	597	–48.4	–38.4
5	10	1,000	741	–40.3	–30.3
2	10	1,000	917	–25.9	–15.9
1	10	1,000	1,000	–8.3	+10.0

*Calculated with a financial calculator, using below equation:

$$P = \frac{C}{1+i} + \frac{C}{(1+i)^2} + \frac{C}{(1+i)^3} + \ldots + \frac{C}{(1+i)^n} + \frac{F}{(1+i)^n}$$

- Which bond has the returns that equal its initial YTM (initial current yield)?

- What happens when to bond prices when interest rates rise? What happens to capital losses when interest rates rise?

- What do you observe about the relationship between bond's maturity date and the effect of interest rate rise on percentage price change?

- What do you observe about the relationship between bond's maturity date and the effect of interest rate rise on the rate of return?

- Why could the rate of return turn negative when interest rates rise even though initial YTM is positive?