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Financial Markets and Institutions

Study Questions: Credit and interest rates (Answers on the next page)

1. Biff can buy a coupon bond from Zippy for $500. This bond pays a yearly coupon of $100, beginning 1 year from now, for 2 years. At the end of the two years the bondholder receives the face value of bond--$400. Zippy claims that the yield to maturity of this bond is 20%. Is Zippy being truthful?

2. Janet can buy a discount bond for $500 from Britney which matures exactly 5 years from now. The bond's par value is $1000.

Britney claims that this bond's yield to maturity is 20%. Is she being truthful?

3. On January 23, 2001, the yield to maturity of Treasury bonds that mature on 1-10-2031 fell from 5.58% to 5.51%. What happened to the price of these bonds on this day—did it rise, fall, or stay the same?

4. Today you buy a newly-issued 3-year coupon bond for its face value of $10,000. This bond's coupon rate is 10% (paid yearly, beginning one year from now) and interest rates today are 10%. Calculate the duration of this bond.

1. Biff can buy a coupon bond from Zippy for $500. This bond pays a yearly coupon of $100, beginning 1 year from now, for 2 years. At the end of the two years the bondholder also receives the face value of bond--$400. Zippy claims that the yield to maturity of this bond is 20%. Is Zippy being truthful?

No. Let's use the yield to maturity equation—the equation calculating the present value of a stream of future cash flows—to show that the yield to maturity is not 20%

If Zippy's claim is correct, then it should be true that:

$$\frac{100}{(1.20)^1}+\frac{100}{(1.20)^2}+\frac{400}{(1.20)^2}=500 \quad ???????? \quad \leftarrow \text{but this ain't true!!! Actually:}$$

$$\frac{100}{(1.20)^1}+\frac{100}{(1.20)^2}+\frac{400}{(1.20)^2}=\$430.56$$

Only if Biff bought the bond for $430.56 would it have a yield to maturity of 20%

2. Janet can buy a discount bond for $500 from Britney which matures exactly 5 years from now. The bond's par value is $1000.
Britney claims that this bond's yield to maturity is 20%. Is she being truthful?

No. Let's use the yield to maturity equation—the equation calculating the present value of a stream of future cash flows—to show that the yield to maturity is not 20%

If Britney's claim is correct, then it should be true that:

$$\frac{1000}{(1.20)^5}=500 \quad ???????? \quad \leftarrow \text{but this ain't true!!! Actually:}$$

$$\frac{1000}{(1.20)^5}=\$401.88$$

Only if Janet bought the bond for $401.88 would it have a yield to maturity of 20%

3. On January 23, 2001, the yield to maturity of Treasury bonds that mature on 1-10-2031 fell from 5.58% to 5.51%. What happened to the price of these bonds on this day—did it rise, fall, or stay the same?

Rise. Remember—when bond prices rise, bond yields fall. (This makes sense, I hope; if you have to pay more to buy a bond, then its coupon payment and face value payment are not as attractive.)

4. Today you buy a newly-issued 3-year coupon bond for its face value of $10,000. This bond's coupon rate is 10% (paid yearly, beginning one year from now) and interest rates today are 10%. Calculate the duration of this bond.

Do I have to? What a pain in the booty.

Step 1: Calculate the present value of each future payment

First coupon payment (1 year from now) $PV_a = \$1000/(1.1) = \$909.09$

Second coupon payment (2 years from now) $PV_b = \$1000/(1.1)^2 = \$826.45$

Last coupon payment (3 years from now) $PV_c = \$1000/(1.1)^3 = \$751.32$

Payment of face value (3 years from now) $PV_d = \$10000/(1.1)^3 = \$7513.15$

Step 2: Sum all of the present values:

$PV_a+PV_b+PV_c+PV_d = \$10,000$

Step 3: Calculate the percentage that each of the present values contributes to the sum that you calculated in step 2

PV_a weight = $909.09/$10000 = .090909

PV_b weight = $826.45/$10000 = .082645

PV_c weight = $751.32/$10000 = .075132

PV_d weight = $7513.15/$10000 = .751315

Step 4: Multiply each weight that you calculated in step 3 by the number of years that it's in the future:

PV_a weighted duration = .090909 x 1 = .090909

PV_b weighted duration = .082645 x 2 = .165289

PV_c weighted duration = .0751315 x 3 = .225394

PV_d weighted duration = .751315 x 3 = 2.25394

Step 5 (the last step): Sum the weighted durations calculated in step 4; the sum is the duration of your bond!

Duration = .090909 + .165289 + .225394 + 2.25394 = **2.735537 years**