Slides 14 - Bond Prices and Yields

1. a. Bonds are _____.

   Check all that apply:

   - [x] issued by governments or corporations
   - [x] loans from investors to issuers
   - [ ] riskier than stocks
   - [x] less costly than bank loans for the borrower

   Stocks are riskier than bonds, since stock prices are more volatile than bond prices and bondholders have precedence over stockholders in the case of bankruptcy.

2. a. Which term has a meaning different from the other ones?

   - ○ Face value
   - ○ Par value
   - ◉ Price
   - ○ Amount to be repaid on the maturity date

   The price of a bond fluctuates over time, while the face value or par value is fixed and represents the amount to be repaid on the maturity date of the bond.

3. a. The main risk of owning Treasury bonds is the risk of _____.

   - ○ default
   - ◉ changing market interest rates
   - ○ changing coupon rates
   - ○ decreased liquidity

   If market interest rates go up, the price of bonds falls. Treasury bonds have no risk of default and coupon rates are fixed once a bond has been issued. Treasury bonds are the most liquid security of all, even in a financial crisis.

4. a. Which are elements of the indenture?

   Check all that apply:

   - [x] Basic terms of the bonds, such as coupon rate and maturity date
   - [x] Description of collateral
   - [x] Description of protective covenants
   - [ ] Price of the bond
   - [x] Repayment arrangements

   The indenture will specify the par or face value of the bond, but not its price, since prices fluctuate over time and in line with market interest rates.

5. a. A callable bond is a bond that _____.

   - ◉ can be repurchased by the issuer before the maturity date
   - ○ can be repurchased by the issuer on the maturity date
   - ○ can be sold back to the issuer before the maturity date

- ○ can be sold back to the issuer on the maturity date

A callable bond is a bond that can be repurchased by the issuer before the maturity date. The price at which the bond can be repurchased is the call price, which is usually above the par value. The difference between the call price and the par value is the call premium.

A bond issuer has an incentive to call a bond if market interest rates have fallen significantly since the issue date, allowing the issuer to issue a new bond with a lower coupon rate and paying off the old bond.

6. a. Why would an investor buy an unsecured corporate bond instead of a comparable secured corporate bond?

- ○ The unsecured bond has a higher face value.
- ○ The unsecured bond has higher priority in the case of bankruptcy.
- ○ The unsecured bond is more liquid and thus easier to sell.
- ◉ The unsecured bond offers a higher yield to maturity.

The unsecured bond is riskier than a secured bond. To compensate investors for the greater risk of default, the company offers a higher yield to maturity.

b. Why do bonds with lower seniority have higher yields to maturity than comparable bonds with higher seniority?

- ◉ To compensate investors for greater default risk.
- ○ To compensate investors for less time to maturity.
- ○ To compensate investors for lower coupons.
- ○ To compensate investors for lower liqudity.

Lower seniority means lower priority in the case of bankruptcy, thus increasing the risk of default.

7. a. Which types of loans or securities are secured by collateral?

Check all that apply:

- ☑ Asset-backed securities
- ☑ Auto loans
- ☐ Debentures
- ☑ Mortgage securities

Debentures are unsecured bonds.

8. a. The invoice (or dirty) price of a bond equals the _____.

- ○ bond price on the issue date
- ○ bond price on the maturity date
- ◉ flat (clean) price plus accrued interest
- ○ flat (clean) price minus accrued interest

The invoice price is the price an investor has to pay to buy the bond. If she buys the bond between coupon payments, she'll get the full coupon on the next coupon date, but is only entitled to the interest for the time between the purchase date and the next coupon date. Therefore, the interest that has already accrued in this coupon period is added to the purchase price.

9. A corporate bond has a coupon rate of 11% (paid semiannually) and matures on November 15, 2025. Its quoted price is 108. Assume 30 days per month.

a. It is now July 15, 2015. What is the invoice (or dirty) price (in $)?

Coupon:

`"Coupon" = "Coupon rate"/2 * "Face value" = 0.11/2*1,000 = 55`

The invoice price equals the clean price plus accrued interest. The quoted price is the clean (or flat) price expressed as a percentage of par value, $1,000. In this case, the clean price is $1,080.

Most corporate bonds pay interest twice a year: in this case on Nov. 15 and May 15. Accrued interest is the interest accumulated since the last coupon payment, commonly based on the assumption of 180 days per half-year.

Accrued interest

= `"# of days since last coupon" /"Days in coupon period" * "Coupon" = (2 * 30) /180 * 55= 18.333`

Invoice price = Clean price + Accrued interest
= 1,080 + 18.333
= **1,098.33**

10. You purchase the following bond. The bond makes interest payments on May 15 and Nov. 15 of every year:

	A	B
1	Purchase date	4/7/2023
2	Price (% of par)	$89.85
3	Face value	$1,000
4	Coupon rate	8.8%
5	Maturity date	11/15/2033
6	Payment frequency	Semiannual
7	Day count basis	Actual/actual

a. What amount of interest has accrued?

	A	B	C
1	Purchase date	4/7/2023	
2	Price (flat)	89.85	
3	Face value	$1,000	
4	Coupon rate	8.8%	
5	Maturity date	11/15/2033	
6	Payment frequency	Semiannual	
7	Day count basis	Actual/actual	
8			
9	6-monthly coupon	44	=B4*B3/2
10	Last coupon date	11/15/2022	
11	Next coupon date	5/15/2023	
12	Days since coupon	144	=B1-B10
13	Days in period	182	=B11-B10
14	Accrued interest	**34.81**	=B12/B13*B9

b. What is the invoice price of the bond (in $)?

	A	B	C
1	Purchase date	4/7/2023	
2	Price (flat)	89.85	
3	Face value	$1,000	
4	Coupon rate	8.8%	
5	Maturity date	11/15/2033	
6	Payment frequency	Semiannual	
7	Day count basis	Actual/actual	
8			
9	6-monthly coupon	44	=B4*B3/2
10	Last coupon date	11/15/2022	
11	Next coupon date	5/15/2023	
12	Days since coupon	144	=B1-B10
13	Days in period	182	=B11-B10
14	Accrued interest	34.81	=B12/B13*B9
15	Invoice price	**933.28**	=B2/100*B3+B14

11. One of IBM's bond issues has an annual coupon rate of 4.4%, a face value of $1,000 and matures in 14 years.

a. What is the value of the bond if the required return is 5%?

The value (or price) of a bond is the present value of all cash flows. We can use the annuity formula to find the present value of the interest payments (coupons) and then add the present value of the face value.

`P = Coupon [(1 - 1//(1+r)^T)/(r)] + ("Par value")/(1+r)^T`

= `44 [(1- 1//(1+0.05)^14)/0.05] + 1,000/(1+0.05)^14`

= 940.61

Using a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	14	5		44	1,000
Compute			-940.61		

Calculating PV gives a value of $940.61.

Using Excel (do not enter the thousands separators):
=PV(rate, nper, pmt, fv)
=PV(0.05, 14, -44, -1,000)
=**940.61**

b. What is the value of the bond if the required return is 6%?

`P = Coupon [(1 - 1//(1+r)^T)/(r)] + ("Par value")/(1+r)^T`

= `44 [(1- 1//(1+0.06)^14)/0.06] + 1,000/(1+0.06)^14`

= 851.28

Using a financial calculator:

	N	I/Y	PV	PMT	FV

	N	I/Y	PV	PMT	FV
Inputs	14	6		44	1,000
Compute			-851.28		

Calculating PV gives a value of $851.28.

Using Excel (do not enter the thousands separators):
=PV(rate, nper, pmt, fv)
=PV(0.06, 14, -44, -1,000)
=**851.28**

A higher required return always implies a lower bond value.

12. A year ago, you bought a bond with a coupon rate of 5.2%, just after it paid its semiannual coupon. The bond had 22 years to maturity, a face value of $1,000 and a yield to maturity of 3.3%.

    a. Shortly after buying the bond, yields changed to 4.5%. What is your realized yield if you sell the bond now, one year after buying it?

    Initial price:

    `P_0 = (Coupon)/(r) [1 - 1/(1+r)^T] + ("Par value")/(1+r)^T`

    = `26/0.0165 [1- 1/(1+0.0165)^44] + 1,000/(1+0.0165)^44`

    = `1,295.53`

    Alternatively, we can use a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	44	1.65		-26	-1,000
Compute			1,295.53		

Using Excel (do not enter the thousands separators):
=PV(rate, nper, pmt, fv)
=PV(0.0165, 44, -26, -1,000)
=1,295.53

Price after one year:

`P_1 = (Coupon)/(r) [1 - 1/(1+r)^T] + ("Par value")/(1+r)^T`

= `26/0.0225 [1- 1/(1+0.0225)^42] + 1,000/(1+0.0225)^42`

= `1,094.46`

Alternatively, we can use a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	42	2.25		-26	-1,000
Compute			1,094.46		

Using Excel (do not enter the thousands separators):
=PV(rate, nper, pmt, fv)
=PV(0.0225, 42, -26, -1,000)
=1,094.46

Holding period yield:

`HPY = (P_1 - P_0 + Coupon(1+r) + Coupon) / P_0= (1,094.46 - 1,295.53 + 26(1+0.0225) + 26) / 1,295.53`

= **-0.11461**

13. A corporate bond has 19 years to maturity, a face value of $1,000, a coupon rate of 5.3% and pays interest twice a year. The annual market interest rate for similar bonds is 3.1%.

    a. What is the value of the bond (in $)?

    Since the bond pays interest twice a year, we have to double the number of years to get the number of payments, while halving the coupon rate and yield to maturity.

    Semiannual interest payment (coupon):

    `Coupon = "Coupon rate"/2 * "Face value" = 0.053/2 * 1,000 = 26.5`

    Semiannual discount rate:

    `r = 0.031/2 = 0.0155`

    Number of 6-month periods:

    `T = 19*2 = 38`

    The bond's value is the present value of all its expected cash flows. We can use the annuity formula to find the present value of the interest payments (coupons) and then add the present value of the face value.

    `P = Coupon [(1 - 1//(1+r)^T)/(r)] + ("Par value")/(1+r)^T`

    = `26.5 [(1- 1//(1+0.0155)^38)/0.0155] + 1,000/(1+0.0155)^38`

    = 1,314.11

    Alternatively, we can use a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	38	1.55		26.5	1,000
Compute			-1,314.11		

    Entering the four values and then computing the present value gives the bond price of $1,314.11 (note that the price is positive, even though financial calculators show a negative number).

    Using Excel (do not enter the thousands separators):
    =PV(rate, nper, pmt, fv)
    =PV(0.0155, 38, -26.5, -1,000)
    =**1,314.11**

14. A corporate bond with a coupon rate of 8% pays interest semiannually and has a maturity date of May 28, 2030. The trade settles on March 20, 2023. The yield to maturity is 11%.

    a. What is the flat (or clean) price of the bond (in percent of par) on the settlement date? Use Excel's PRICE() function. Dates must be entered with Excel's DATE() function.

    Function arguments:

    - Settlement is the settlement date, i.e., the date the bond was purchased
    - Maturity is the bond's maturity date
    - Rate is the annual coupon rate
    - Yield is the bond's annual yield to maturity
    - Redemption is the money paid to the bondholder on the maturity date, in percent of par value: usually 100
    - Frequency is the number of coupons per year: usually 2

- Basis is the day count convention: Use 0 or omit for 30/360

= PRICE(settlement, maturity, rate, yield, redemption, frequency, basis)
= PRICE(DATE(2023,3,20), DATE(2030,5,28), 0.08, 0.11, 100, 2, 0)
= **85.33**

15. A corporate bond with a face value of $1,000 and a coupon rate of 4.4% pays interest semiannually and has a maturity date of May 6, 2027. The trade settles on January 22, 2023. The yield to maturity is 6.1%.

    a. How many days have passed since the last coupon payment? Use Excel's COUPDAYBS() function. Dates must be entered with Excel's DATE() function.

    = COUPDAYBS(settlement, maturity, frequency, basis)
    = COUPDAYBS(DATE(2023,1,22), DATE(2027,5,6), 2, 0)
    = **76**

    b. How many days are in the current coupon period? Use Excel's COUPDAYS() function. Dates must be entered with Excel's DATE() function.

    = COUPDAYS(settlement, maturity, frequency, basis)
    = COUPDAYS(DATE(2023,1,22), DATE(2027,5,6), 2, 0)
    = **180**

    c. What is the accrued interest on the bond (in $)?

    Accrued interest is the interest that has accumulated since the last interest payment (coupon) and that belongs to the current owner of the bond if the bond is sold today to someone else. It's a fraction of the coupon that is proportionate to the number of days since the last coupon payment.

    The coupon is the 6-monthly interest payment. With a coupon rate of 0.044 and a par value of $1,000, the coupon is:
    coupon = 0.044/2 * $1,000 = $22

    `"Accrued interest" = "Number of days since last coupon"/"Number of days in coupon period" * "Coupon"`

    = `76 / 180 * 22`

    = **9.289**

    d. What is the flat (or clean) price of the bond (in percent of par) on the settlement date? Use Excel's PRICE() function. Dates must be entered with Excel's DATE() function.

    Function arguments:

    - Settlement is the settlement date, i.e., the date the bond was purchased
    - Maturity is the bond's maturity date
    - Rate is the annual coupon rate
    - Yield is the bond's annual yield to maturity
    - Redemption is the money paid to the bondholder on the maturity date, in percent of par value
    - Frequency is the number of coupons per year
    - Basis is the day count convention: Use 0 or omit for 30/360

    = PRICE(settlement, maturity, rate, yield, redemption, frequency, basis)
    = PRICE(DATE(2023,1,22), DATE(2027,5,6), 0.044, 0.061, 100, 2, 0)
    = **93.66**

    e. What is the invoice (or dirty) price of the bond (in $) on the settlement date?

    The invoice price is the sum of clean price (in $) and accrued interest:

$P_{invoice} = P_{clean}$ + Accrued interest
= 936.61 + 9.289
= **945.9**

16. a. What is a bond's yield to maturity (YTM)?

- ○ The expected return you'll earn if the bond issuer defaults
- ○ The return you have made if you sell the bond today
- ○ The same as the bond's coupon rate
- ◉ The return you'll earn if you hold the bond to maturity and yields stay the same

The YTM equals the return for an investor who buys the bond today, holds it until maturity and is able to reinvest all coupons at the current yield. In an efficient market, expected returns must be the same for similar securities. Therefore, the YTM can also be interpreted as the market interest rate for similar bonds.

17. a. When market interest rates (i.e., yields) increase, the price of existing bonds _____.

- ○ increases
- ◉ decreases
- ○ moves sideways
- ○ is unaffected

Since the yield to maturity is the rate used to discount all future payments from a bond, rising yields lead to lower present values and thus a lower bond price. Alternatively, a rise in market interest rates makes existing bonds with fixed coupon rates less attractive, thus leading to lower prices.

18. Fisher Corp. and Hunter Inc. issued the bonds below:

	Fisher bond	Hunter bond
Bond rating	AAA	A
Issue size	$150m	$600m
Coupon rate	4%	5%
Original time to maturity	15 years	20 years
Time to maturity	10 years	15 years
YTM	5.3%	6.6%

a. Which factors could explain the higher yield to maturity on the Hunter bond?

Check all that apply:

- ☑ Bond rating
- ☐ Issue size
- ☐ Coupon rate
- ☐ Original time to maturity
- ☑ Time to maturity

1. Bond rating: An A-rated bond is riskier than an AAA-rated bond. Therefore, the A-rated bond must have a higher YTM (or lower price) in order to compensate investors for the additional risk.
2. Issue size: The larger issue might be more liquid, thus requiring a lower liquidity premium.
3. Coupon rate: Similar bonds (same time to maturity, bond rating, options) have the same YTM, independent of their coupon rates. Therefore, different coupon rates cannot explain differences in YTM.

4. Original time to maturity is irrelevant for the YTM.
5. Time to maturity: Since the yield curve is normally upward sloping, bonds with longer time to maturity usually have higher yields than shorter-term bonds.

19. One year ago, Gangnam Inc. issued a 12-year, 6% semiannual coupon bond at its par value of $1,000. The bond can be called in 8 years at a price of $1,100 and it now sells for $855.49. The bond has a yield to maturity of 8%.

    a. What is the current yield?

    Current yield = Annual interest / Bond price
    = Coupon rate * Face value / Bond price
    = 0.06 * 1,000 / 855.49
    = **0.07014**

    b. What is the expected capital gains yield for the coming year?

    There are two sources of income from owning a bond:
    Total dollar return = Interest + Capital gains

    Dividing by the price of the bond:
    Total return (YTM) = Current yield + Capital gains yield
    ⇔ Capital gains yield = YTM - Current yield
    = 0.08 - 0.07014
    = **0.009865**

20. A bond has an annual coupon rate of 3.8%, a face value of $1,000, a price of $907.34, and matures in 10 years.

    a. What is the bond's YTM?

    The bond's value (or price) is the present value of all its expected cash flows. We can use the annuity formula to find the present value of the interest payments (coupons) and then add the present value of the face value.

    `P = Coupon [(1 - 1//(1+r)^T)/(r)] + ("Par value")/(1+r)^T`

    ⇔ `907.34 = 38 [(1 - 1//(1+r)^10)/(r)] + 1,000/(1+r)^10`

    Since this equation is non-linear in `r` (the YTM), we have to use trial and error, a financial calculator or Excel (the RATE() or YIELD() functions) to find `r`.

    Using a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	10		-907.34	38	1,000
Compute		5			

    Note that the current price of the bond (the PV) must be entered as a negative number. Calculating I/Y gives a value of `r=5%`, or 0.05.

    Using Excel (do not enter the thousands separators):
    = RATE(nper, pmt, pv, fv)
    = RATE(10, 38, -907.34, 1,000)
    = **0.05** (if you get a rounded number, display more decimal places)

21. A GM and a Ford bond both have 4 years to maturity, a $1,000 par value, a BB rating and pay interest semiannually. GM has a coupon rate of 6.7%, while Ford has a coupon rate of 5%.

    a. The GM bond trades at 92.41 (percent of par). What is the yield to maturity (YTM)?

The general bond pricing equation is:

`P = (Coupon)/(r) [1 - 1/(1+r)^T] + ("Par value")/(1+r)^T`

Remember that prices are quoted as a percentage of par value. For this particular GM bond:

`924.15 = 33.5/(r) [1 - 1/(1+r)^8] + 1,000/(1+r)^8`

We can use trial and error, a financial calculator or Excel (using the RATE() or YIELD() functions) to find `r`:

Using a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	8		-924.15	33.5	1,000
Compute		4.5			

Using Excel (don't enter the thousands separators):
=RATE(nper, pmt, pv, fv)
=RATE(8, 33.5, -924.15, 1,000)
=0.045

Since YTM is always quoted as an APR with semiannual compounding, we need to **double the period rate**:
YTM = 2 * 0.045 = **0.09**

b. What should be the price of the Ford bond (in $)?

Since the yield to maturity is equal for similar bonds, we can use GM's YTM (or rather half the YTM) as the discount rate to find the price of the Ford bond:

`P = (Coupon)/(r) [1 - 1/(1+r)^T] + ("Par value")/(1+r)^T`

= `25/0.045 [1 - 1/(1+0.045)^8] + 1,000/(1+0.045)^8`

= `868.08`

Alternatively, we can use a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	8	4.5		-25	-1,000
Compute			868.08		

Using Excel (do not enter the thousands separators):
=PV(rate, nper, pmt, fv)
=PV(0.045, 8, -25, -1,000)
=**868.08**

22. A corporate bond with a coupon rate of 7% pays interest semiannually and has a maturity date of May 28, 2030. The trade settles on March 20, 2023. The flat (or clean) price of the bond on the settlement date is 117.21 (in percent of par).

a. What is the yield to maturity? Use Excel's YIELD() function. Dates must be entered with Excel's DATE() function.

Function arguments:

- Settlement is the settlement date, i.e., the date the bond was purchased
- Maturity is the bond's maturity date
- Rate is the annual coupon rate
- Price is the price of the bond

- Redemption is the money paid to the bondholder on the maturity date, in percent of par value
- Frequency is the number of coupons per year
- Basis is the day count convention: Use 0 or omit for 30/360

= YIELD(settlement, maturity, rate, price, redemption, frequency, basis)
= YIELD(DATE(2023,3,20), DATE(2030,5,28), 0.07, 117.21, 100, 2, 0)
= **0.042**

23. A corporate bond pays interest annually and has 4 years to maturity, a face value of $1,000 and a coupon rate of 3.8%. The bond's current price is $1,003.66. It is callable at a call price of $1,050 in one year.

    a. What is the bond's yield to maturity?

    The annual coupon payment is:

    `Coupon` = Coupon rate * Face value = 3.8% * 1,000 = 38

    To find the YTM, we have to use trial and error, a financial calculator or Excel (the RATE() or YIELD() functions).

    Using a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	4		-1,003.66	38	1,000
Compute		3.7			

    Note that the current price of the bond (the PV) must be entered as a negative number. Calculating I/Y gives a value of 3.7%, or 0.037 for YTM.

    Using Excel (do not enter the thousands separators):
    = RATE(nper, pmt, pv, fv)
    = RATE(4, 38, -1,003.66, 1,000)
    = **0.037**

    b. What is the bond's yield to call?

    To find the yield to call, we assume that the bond will be called as soon as it becomes callable and that the bondholder will receive the call price.

    As before, we can use trial and error, a financial calculator or Excel to find the YTC.

    Using a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	1		-1,003.66	38	1,050
Compute		8.404			

    Note that the current price of the bond (the PV) must be entered as a negative number. Calculating I/Y gives a value of 8.404%, or 0.08404.

    Using Excel (do not enter the thousands separators):
    = RATE(nper, pmt, pv, fv)
    = RATE(1, 38, -1,003.66, 1,050)
    = **0.08404**

24. A corporate bond pays interest twice a year and has 17 years to maturity, a face value of $1,000 and a coupon rate of 6.1%. The bond's current price is $1,381.18. It is callable starting 11 years from now (years to call) at a call price of $1,083.

    a. What is the bond's (annualized) yield to maturity?

Since the bond pays interest twice a year, we have to double the number of years to get the number of payments, while halving the coupon rate. The 6-monthly interest payment, or coupon, is:

`Coupon` = Coupon rate/2 * Face value
= 0.061/2 * 1,000
= 30.5

The bond's value (or price) is the present value of all its expected cash flows. We can use the annuity formula to find the present value of the interest payments (coupons) and then add the present value of the face value.

`P = (Coupon)/(r) [1 - 1/(1+r)^T] + ("Par value")/(1+r)^T`

⇔ `1,381.18 = 30.5/(r) [1 - 1/(1+r)^34] + 1,000/(1+r)^34`

Unfortunately, this equation is non-linear in `r`, so we cannot just solve for the discount rate. Instead, we have to use trial and error, a financial calculator or Excel (the RATE() or YIELD() functions) to find `r`.

Using a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	34		-1,381.18	30.5	1,000
Compute		1.59			

Note that the current price of the bond (the PV) must be entered as a negative number. Calculating I/Y gives a value of `r=1.59%`, or 0.0159.

Using Excel (do not enter the thousand separators):
= RATE(nper, pmt, pv, fv)
= RATE(34, 30.5, -1,381.18, 1,000)
= 0.0159

To find the YTM, we need to **double the discount rate**, as bond yields are annualized as APRs:
`YTM = 2 * 0.0159 =` **0.0318**

b. What is the bond's (annualized) yield to call?

To find the yield to call, we assume that the bond will be called as soon as it becomes callable and that the bondholder will receive the call price. The bond has 11 years to call, or 22 periods.

`1,381.18 = (Coupon)/(r) [1 - 1/(1+r)^"Periods to call"] + "Call price"/(1+r)^"Periods to call"`

⇔ `1,381.18 = 30.5/(r) [1 - 1/(1+r)^22] + 1,083/(1+r)^22`

As before, we have to use trial and error, a financial calculator or Excel to find `r`.

Using a financial calculator:

	N	I/Y	PV	PMT	FV
Inputs	22		-1,381.18	30.5	1,083
Compute		1.36			

Note that the current price of the bond (the PV) must be entered as a negative number. Calculating I/Y gives a value of `r=1.36%`, or 0.0136.

Using Excel (do not enter the thousand separators):
= RATE(nper, pmt, pv, fv)
= RATE(22, 30.5, -1,381.18, 1,083)
= 0.0136

To find the YTC, we need to **double the discount rate**, as bond yields are annualized as APRs:
`YTC = 2 * 0.0136 =` **0.0272**

c. If you buy the bond today and hold it as long as possible, which rate of return can you expect to earn?

- ○ The yield to maturity (YTM)
- ◉ The yield to call (YTC)

Since interest rates have fallen significantly since the bond was issued (the YTM is much lower than the coupon rate), the company is likely to call and refinance the bond as soon as possible. Therefore, you can expect to earn only the lower yield to call.

25. You purchase the following bond. The bond makes interest payments on April 10 and Oct. 10 of every year:

	A	B
1	Purchase date	8/19/2022
2	Maturity date	10/10/2038
3	First call date	4/10/2030
4	Coupon rate	2.9%
5	Price	87.01
6	Face value	100
7	Payment frequency	2
8	Day count basis	30/360
9	Call price	137.35

a. What is the bond's yield to maturity using Excel's YIELD function?

	A	B	C
1	Purchase date	8/19/2022	
2	Maturity date	10/10/2038	
3	First call date	4/10/2030	
4	Coupon rate	2.9%	
5	Price	87.01	
6	Face value	100	
7	Payment frequency	2	
8	Day count basis	30/360	
9	Call price	137.35	
10	Yield to maturity	**0.04**	=YIELD(B1,B2,B4,B5,B6,B7)

b. What is the bond's yield to call using Excel's YIELD function?

	A	B	C
1	Purchase date	8/19/2022	
2	Maturity date	10/10/2038	
3	First call date	4/10/2030	
4	Coupon rate	2.9%	
5	Price	87.01	

6	Face value	100	
7	Payment frequency	2	
8	Day count basis	30/360	
9	Call price	137.35	
10	Yield to maturity	0.04	=YIELD(B1,B2,B4,B5,B6,B7)
11	Yield to call	**0.088**	=YIELD(B1,B3,B4,B5,B9,B7)