

§9. BOND BASICS AND DEFINITIONS

FIN 360: PRINCIPLES OF FINANCIAL MANAGEMENT
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BONDS

Recall that firms can raise money for capital budgeting projects (ideally those with positive NPVs) in one of two ways: issuing debt or equity.

Bonds are debt instruments issued by firms or governments to borrow money for their investments. It is a contractual relationship between the borrower (the **debtor** or the firm) and the lender (the **bondholder** or **bond investor** or **creditor**).



EXAMPLE: In 2017, Microsoft’s Statement of Cash Flows indicated it received proceeds from issuance of debt of \$44.34 billion.¹ This included a \$4 billion, 10-year bond issuance with a 3.3% **coupon** (or $3.3\% \div 2 = 1.65\%$ every 6 months) for “general corporate purposes”² including the repayment of short-term debt and acquiring LinkedIn. One bond of the issuance had a **face value** of \$1,000.

The cash flow to the bond investor, the **lender** would be:

Figure 1: Bond Cash Flows



Year	0	0.5	1	1.5	2	...	8	8.5	9	9.5	10
Coupon		\$16.50	\$16.50	\$16.50	\$16.50	...	\$16.50	\$16.50	\$16.50	\$16.50	\$16.50
Face Value											\$1,000
Cash Flow	(\$1,000)	\$16.50	\$16.50	\$16.50	\$16.50	...	\$16.50	\$16.50	\$16.50	\$16.50	\$1,016.50

- **Face Value** or **Principal** or **Par Value** is the amount borrowed now, to be repaid at the end of the bond’s term to the bondholder, the bond’s **maturity**.
- **Coupons** are the interest payments made on the bond, determined by the **coupon rate**. Coupons are established based on the *prevailing interest rates* in the economy at the time the bond is issued. This rate generally remains fixed throughout the life of the bond.

- **Yield to maturity** or **yield** is the *annual* rate of return one earns when buying a bond at a given price, collecting all coupon payments, and receiving the face value at the end. This rate of return can differ from the coupon rate.

*Paying \$900 for the 3.3% coupon \$1,000 bond, a **discount bond**:*

If the 10-year \$1,000 bond pays you a 3.3% annual coupon, but you only paid \$900 for the bond, your rate of return in collecting all payments and receiving the par at the end will be more than 3.3%: you'll make 3.3% per year in coupons, but you implicitly earn an *additional* \$100 (or \$1,000 par minus the \$900 you paid). Your **yield to maturity**, or your rate of return, would be 4.556%. We'll learn how to calculate this later.

*Paying \$1,100 for the 3.3% coupon \$1,000 bond, a **premium bond**:*

If you paid \$1,100 for the bond, your yield to maturity would be 2.182%. This is less than the coupon rate you are paid each year, because you pay more for this bond up front (\$1,100) than you collect at the end (\$1,000). Notice, you are still "making money" with the positive rate of return.

Therefore, the yield to maturity can be thought of as an **effective annual rate** (EAR).



Coupons rates are established at issuance and remain fixed. Firms offer coupons based on prevailing interest rates in the economy.

Yields are a function of coupons *and* the price an investor pays.

- If interest rates in the economy have risen above the coupon rate offered on a bond, investors generally pay *less* than the face value for the bond (a **discount bond**) so that the bond's total yield reflects the rates in the economy overall.
- If interest rates in the economy have fallen below the coupon rate offered on a bond, investors generally pay *more* than the face value for the bond (a **premium bond**) so that the bond's total yield reflects the rates in the economy overall.

THE INDENTURE

The bond's **indenture** is the written agreement between the borrower and the lender. This document is often several hundred pages and includes:

- Basic terms (coupon rate, principal)
- Total amount of the bond issued by the firm (the amount of money raised)
- Repayment schedule

Table 1: Components of a Bond Indenture

Bond Feature	Definition
Face Value or Par Value	Principal or Par Value is the amount borrowed for each bond, to be paid at the end of the bond's term, the bond's maturity
Coupon Rate	Percentage of the par or face value, generally paid in <u>fixed semiannual</u> installments, but quoted as an <u>annual rate</u> .
Collateral	Property or rights the lenders get if the borrowers cannot pay – assuming the bond is “ secured ”. Debentures are unsecured in that they have no collateral. Most corporate debt is unsecured.
Sinking Fund	An account managed by the trustee (financial institution) into which the borrowing firm can make payments to retire portions of the debt early. The trustee can, on behalf of the firm, purchase the bonds from holders that wish to get the par value back early and retire the bonds.
Call Provisions	Allow the firm to “call” a bond and repay it early, often at a call premium , an amount higher than the principal. Here, the bondholder has no option and must accept the payment from the company earlier. Deferred call provisions prohibit call-protected bonds from being called within a set number of years after the bond is issued for the first time.
Seniority	The order of which bondholders are paid in the event of default, with senior debt holders paid before junior or subordinate debtholders. Note that bondholders are still “senior” to the residual claimants: equity holders .

Protective Covenants	Limit certain actions the firm may undertake during the term of the loan. Negative covenants prohibit actions, such as limiting the amount of dividends the firm can pay, limiting additional debt issuance, preventing mergers with another company, or pledging of collateral to another lender. Positive covenants require certain actions, such as keeping working capital above certain levels or maintaining the collateral.
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Callable bonds are not as desirable as **noncallable bonds** to the bond investor. The borrower (the firm) will “call” bonds when interest rates are falling so they can reissue at a lower rate. This is at a disadvantage to the lender (the bondholder). Yet, a majority of corporate debt issuances are callable, nearing 70%³

Bonds will need to offer higher yields if they have features that make them riskier or less favorable to investors.



[S&P Net Advantage](#) allows you to look up corporate bonds, read indentures, and examine a firm’s bond characteristics.

BOND RATINGS

CREDIT RATING AGENCIES

Moody’s, S&P Global, and Fitch are **credit rating agencies** that assign ratings to borrowers (the issuing firm or issuing government) based on their riskiness and probability of **default** – or failure to make payments to lenders. They use firm and industry research, including ratio analysis, to determine scores. The riskier the issuer, the higher their bonds will have to yield for investors to take on the risk of lending to them.

Different securities offerings by the same firm can have different credit ratings. For example, senior secured debt might have a better rating than that of senior unsecured debt within the same firm.⁴

INVESTMENT GRADE VERSUS SPECULATIVE GRADE

Investment grade bonds are safer and offer lower rates of return while **speculative** or **junk bonds** are riskier and offer higher rates of return.

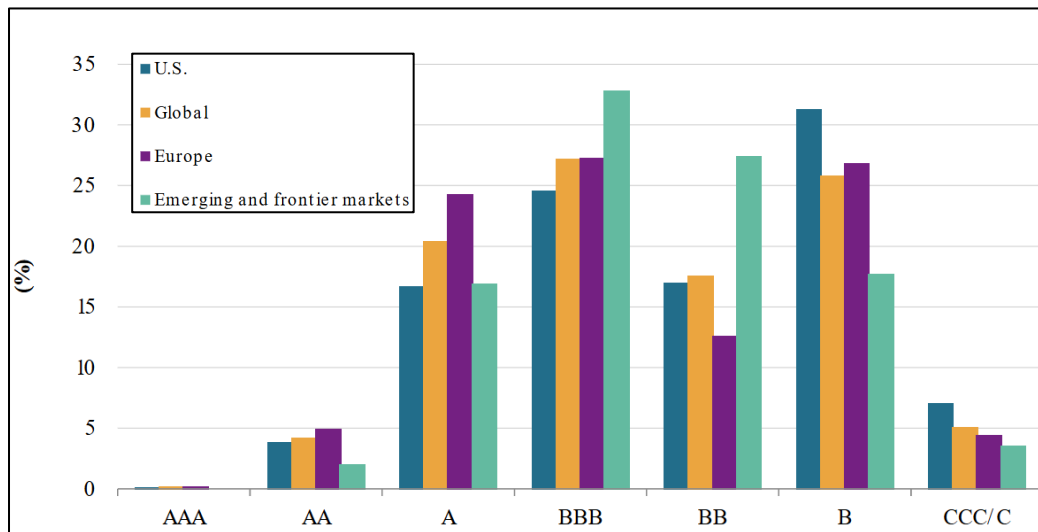


If a company is riskier, what do we expect about the yield it will be expected to pay? What else might determine the yield a company pays on its debt (senior vs. subordinate, callable vs. non-callable, debenture, etc.)?

Figure 2: Bond Ratings⁵

Credit Risk	Moody's	Standard & Poor's	Fitch
Investment Grade			
Highest quality	Aaa	AAA	AAA
High quality	Aa	AA	AA
Upper medium grade	A	A	A
Medium grade	Baa	BBB	BBB
Below Investment Grade			
Lower medium grade	Ba	BB	BB
Low grade (speculative)	B	B	B
Poor quality (may default)	Caa	CCC	CCC
Most speculative	Ca	CC	CC
No interest being paid or bankruptcy petition filed	C	C	C
In default	C	D	D

Figure 3: Distribution of Corporate Issuer Ratings⁶



GOVERNMENT BONDS

FEDERAL GOVERNMENT BONDS (TREASURIES)

U.S. Government bonds are issued by the Federal government, the largest borrower in the world.

- **Treasury Bills (T-Bills)** have a maturity of up to a year. They are **discount bonds** or “sell at a discount”, paying no coupons. Example: you pay \$98 today to the government today and receive \$100 in one year from the government, implying a 2.045% rate of return.
- **Treasury Notes** (up to 10 years) and **Treasury Bonds** (from 10 to 30 years) have longer maturities and pay coupons twice yearly.

Given these bonds are issued by the federal government, they are assumed to be free of **default risk** – the Federal government prints money and has taxable authority. Nevertheless, the credit rating on Federal debt is not always AAA by credit rating agencies.

TREASURY MARKETS

We may lend to the US government directly by buying Treasury bonds from them in the **primary market** (on www.TreasuryDirect.gov), but often, we might buy bonds in the **secondary market** from other bondholders. Bonds are traded **over the counter**, or among **dealers** who buy and sell bonds from various parties to add to their inventory, much like a dealer in other markets (cars, art, antiques, etc.).

Dealers quote their **bid** prices (the price they will pay *you the investor* for a bond if you have one to sell) and their **ask** prices (the price they ask that *you the investor* pay them for the bond – their “asking” price). The **bid-ask spread** is the difference between these prices, and how the dealer makes their money, by selling a bond for slightly more than they pay for it (because the ask > bid).

Figure 4: Treasury Bond Quotes

The screenshot shows the WSJ Markets website with a header for U.S. Treasury Quotes. Below the header is a table of Treasury bond data. The table has columns for Maturity, Coupon, Bid, Asked, Change (CHG), and Asked Yield. The row for maturity 8/15/2052 is highlighted with a red border.

MATURITY	COUPON	BID	ASKED	CHG	ASKED YIELD
11/15/2051	1.875	68.1000	68.1100	0.8400	3.671
2/15/2052	2.250	74.2600	74.2700	0.1800	3.670
5/15/2052	2.875	85.2660	85.2760	0.1660	3.669
8/15/2052	3.000	88.0400	88.0500	0.8580	3.661
11/15/2052	4.000	106.1540	106.1740	0.9300	3.637
2/15/2053	3.625	99.1820	99.2020	0.8780	3.645

In the highlighted row above, the bond matures in August of 2052. It pays a 3% coupon (or $3\% \div 2 = 1.5\%$ of par every six months). The dealer will buy this bond from you if you have one to sell for 88.04% of whatever its par value is (i.e., if it is a \$10,000 face value bond, they'll pay you \$8,804). If you want to buy this bond from their inventory, you'll pay them 88.05% of par. Today's ask price is 0.8580% higher than yesterday, and your *annual* rate of return if you buy this bond at its ask price and hold it to maturity is 3.661% per year, the **asked yield**.



You can find government bond quotations on the [Wall Street Journal's Treasury Quotations page](#).

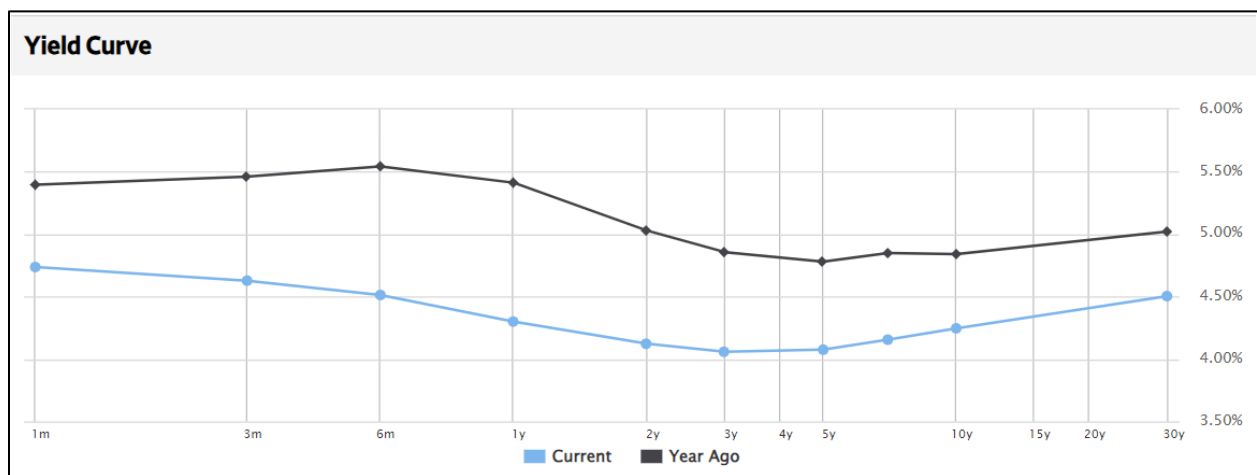
MUNICIPAL BONDS

Municipal bonds or **munis** are issued by state and local governments, but *can* default. They are used to build projects such as stadiums, schools, bridges, and roads. The coupon payments made to lenders are exempt from federal income taxes, making them attractive investments for high tax-bracket investors.

THE YIELD CURVE

The **yield curve** shows the relationship between interest rates and time to maturity on government bonds. The yield curve is therefore a graph of the **term structure of interest rates**, or the relationship between interest rates and time to maturity.

Figure 5: The Yield Curve (Fall 2024)



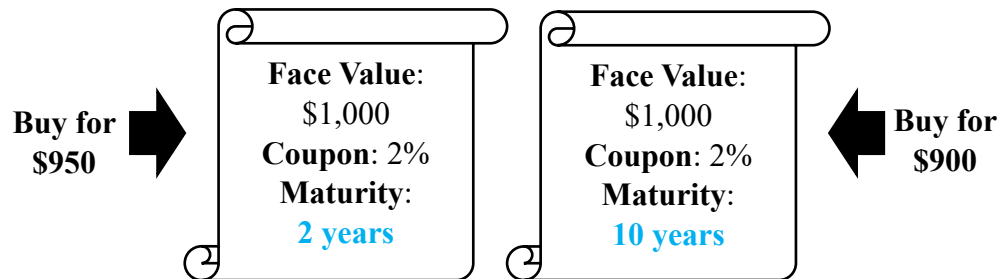
THE SHAPE OF THE YIELD CURVE



EXAMPLE: We'll consider two cases to better understand what causes yield curves to have either **normal** or **inverted** shapes. For these examples, we assume both bonds have the same coupon rate of 2%:

In “normal” times:

Investors think that the economy will steadily grow, and inflation will be stable and predictable. As such, *interest rates are expected to steadily rise with the growing economy.*



Bond investors are willing to pay:

- \$950 for the 2-year, 2% bond
- \$900 for the 10-year, 2% bond (this bond “locks up” their money for longer)



Which of the above bonds offers a higher rate of return (yield to maturity)?

Investors demand more of the shorter-term bonds, bidding up their prices and reducing their yields.

In 2 years, when the shorter-term bond matures, investors expect to reinvest their money into *new* bonds paying higher coupons (3%, 4%, or 5%, etc.) instead of riding out a longer-term 10-year bond that is stuck receiving 2% coupons.

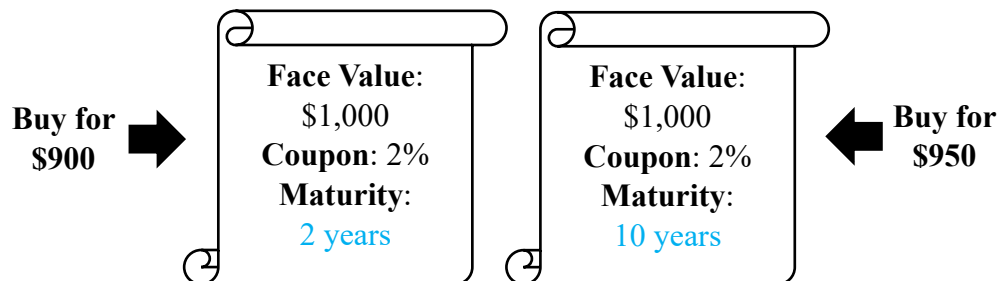
*The shorter-term bond has a lower yield because investors have greater demand for the shorter-term bonds. The yield curve is **normal**.*



Price and yield (return) are inversely related: you pay more, your yield (return) is less.

Prior to a Recession:

Investors now fear that the economy will contract. As such, *interest rates are expected to be slashed in the future to spur the economy.*



Bond investors are willing to pay:

- \$900 for the 2-year, 2% bond
- \$950 for the 10-year, 2% bond (this bond “locks up” their money for longer)



Which of the above bonds offers a higher rate of return (yield to maturity)?

Investors demand more of the longer-term bonds, bidding up their prices and reducing their yields.

In 2 years, when the shorter-term bond matures, they might be stuck investing in *new* bonds they expect will be paying only 0.75%, 1%, or 1.5% coupons instead of enjoying their longer-term bond that is still receiving 2% coupons.

The longer-term bond has a lower yield because investors have greater demand for the longer-term bonds. The yield curve is **inverted**.

THE IMPORTANCE OF AN INVERTING YIELD CURVE



The yield curve has inverted before *every recession since the 1950s*, though some of these “inversions” may have been coincidental – such as the inversion before COVID. However, not all inversions precede a recession.

Figure 6: Yield Curve Inversions and Recessions⁷



The above figure shows the difference between the yield on 10-year Treasuries and 2-year Treasuries. When the “10-2” is positive, the yield curve is normal. When the “10-2” is negative, the yield curve is inverted. The faint vertical bars represent recessions.

CRITICAL THINKING & CONCEPTUAL QUESTIONS

1. Why is a bond's rate of return not always the coupon rate the bond pays you?
2. What might cause a bond's price to deviate from its face value?
3. For each of the options below, which bond would generally have to pay investors a greater yield, assuming all else equal? Explain why for each.
 - a. Secured vs. unsecured
 - b. Callable vs. non-callable
 - c. Senior vs. subordinate
 - d. *With* protective covenants vs. *without* protective covenants
 - e. Investment grade vs. speculative grade
 - f. A highly levered firm vs. a firm with low leverage
 - g. Corporate bonds vs. treasury bonds
 - h. Illiquid bonds vs. liquid bonds
 - i. Municipal bonds vs. treasury bonds
4. What are the similarities and differences between a sinking fund and bond callability?
5. Why is callability not desirable for a bond investor?
6. Explain when a bond is more likely to be called.
7. Describe a typical corporate bond (that we see in the real world): how frequent are the payments? Are payments at the beginning or end of the period? Are the payments fixed? Are the bonds callable? Are they debentures?
8. What is the difference between T-bills, Treasury Notes, and Treasury Bonds?
9. What's the difference between acquiring bonds on the primary market vs. the secondary market?
10. What's the difference between a bid and ask price?
11. Describe the concept of the "asked yield" in U.S. Treasury quotes. What does this number tell us?
12. What is an attractive feature of municipal bonds? What is an unfavorable feature?
13. Explain the significance of a yield curve inversion. Explain what causes a yield curve inversion in the first place. Is the yield curve inverted now?
14. Bond prices and yields are inversely related. Explain what this means. In particular, discuss why fixed coupon payments matter, and what the statement "bonds of similar risk and structure will trade at (about) the same YTM regardless of the coupon rate" means.

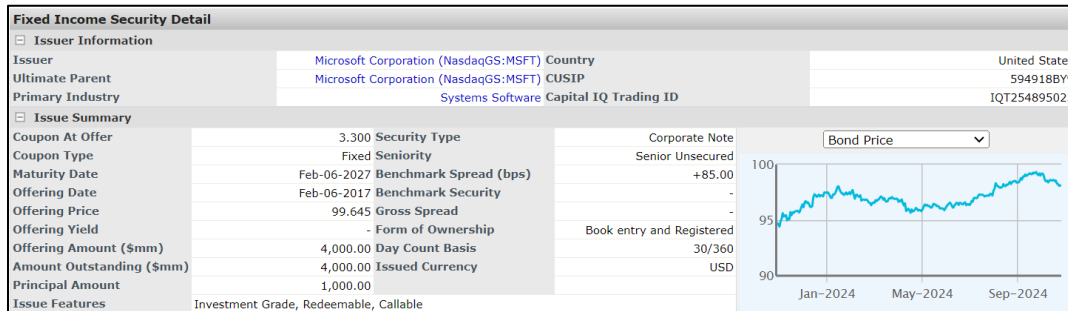
ANALYTICAL QUESTIONS

1. Revisit the distribution of Corporate Issuer Ratings in Figure 3. Why do you believe the amount of AAA and AA rated debt is so low relative to other ratings? If you were a bond investor, how confident would you be that a firm with a AAA rating is “safe”? If a firm that once had a rating of BBB was “upgraded” to a rating of AA, what do you think would happen to the yields they offer on their new debt (that is, what would be the rates of return their bonds would need to offer in the future?)
2. Revisit the Treasury Bond Quotes in Figure 4. Answer the following questions, assuming the Bonds have a face value or par of \$1,000:
 - a. What is the dollar value of the coupon you receive every 6 months for the bond maturing on 11/15/2051?
 - b. How much would you as an investor need to pay for the bond maturing on 2/15/2052?
 - c. How much could you sell a bond with a 4.0% coupon that matures on 11/15/2052?
 - d. Explain why the values in the ASKED YIELD column are so similar even though the coupons and prices for these bonds vary.
3. Revisit the Yield Curve Inversion diagram in Figure 6. What warnings would you offer for the coming year, and why? How certain can you be about your prediction?

NOTES & REFERENCES

¹ See https://microsoft.gcs-web.com/node/25811/html#ITEM_8_FINANCIAL_STATEMENTS_AND_SUPPLEM.

² From S&P Net Advantage:



³ See <https://www.schwab.com/learn/story/callable-bonds-understanding-how-they-work>.

⁴ For example, in 2024 Six Flags Entertainment Corporation (NYSE: FUN) had an S&P rating of BBB- on its senior secured debt and a BB- on its senior unsecured debt.

⁵ Available at <https://www.pimco.com/us/en/resources/education/understanding-corporate-bonds>.

⁶ Available at <https://www.spglobal.com/ratings/en/research/articles/240528-default-transition-and-recovery-2023-annual-u-s-corporate-default-and-rating-transition-study-13114000>.

⁷ See <https://fred.stlouisfed.org/series/T10Y2Y>.

