



BONDS BASICS AND DEFINITIONS

FIN 360: PRINCIPLES OF FINANCIAL MANAGEMENT
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BONDS

Recall that firms can raise money for capital budgeting projects (preferably with positive NPVs) in one of two ways: issuing debt or equity. **Bonds** are debt instruments issued by corporations or governments to borrow money for investments. It is a contractual relationship between the borrower (the **debtor** or the firm) and the lender (the **bondholder** or **bond investor** or **creditor**).

Figure 1: Bond Example



In 2017, Microsoft sold \$17 billion worth of bonds, including a 10-year bond with a 3.3% **coupon** (or $3.3\% \div 2 = 1.65\%$ every 6 months) for “general corporate purposes” including the repayment of short-term debt and paying for the acquisition of LinkedIn. Assuming 1 bond of the \$17 billion had a **face value** of \$1,000:

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**. Bonds originally had physical coupons you would cut from the paper bonds to turn in and receive payments every 6 months.
- **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. For example, if the 10-year \$1,000 bond pays you a 3.3% annual coupon, but you only paid \$900 for this 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 you earn an *additional* \$100 (or \$1,000 par minus the \$900 you paid). Your yield to maturity, or your rate of return, would actually be 4.556%. We'll learn how to calculate this later.

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.

In this way, the yield to maturity can be thought of as an EAR.



A bond you pay more than face value for is a **premium bond**. A bond you pay less than than face value for is a **discount bond**. Why would a bond's price deviate from the face value?

Registered bonds have an ownership record, whereby coupon and principal payments are made only to the owner of record while **bearer** bonds are issued with no ownership record, and anyone possessing the bond is entitled to the payment. These are less common due to the difficulties of being replaced if lost or stolen).

THE INDENTURE

The bond's **indenture** is the written agreement between the borrower and the lender. These documents are often several hundred pages and include:

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

Figure 2: Components of Bond Indentures

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.

Callable bonds aren't desirable: the borrower will "call" bonds when interest rates are falling so they can reissue at a lower rate. This is at a disadvantage to the lender.

Some bonds are **privately placed** or sold directly to large financial institutions, while others are **publicly offered** and may be purchased by the general public.



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

BOND RATINGS

Moody's, Standard & Poor's, and Fitch are **credit rating agencies** that assign ratings to borrowers (the issuing firm) 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.

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 coupon rate it will be expected to pay? What else might determine the coupon rate a company pays (senior vs. subordinate, callable vs. non-callable, debenture, etc.)?

Figure 3: Bond Ratings

<i>Investment grade</i>	Moody's	Standard & Poor's	Fitch
	Aaa	AAA	AAA
	Aa1	AA+	AA+
	Aa2	AA	AA
	Aa3	AA-	AA-
	A1	A+	A+
	A2	A	A
	A3	A-	A-
	Baa1	BBB+	BBB+
	Baa2	BBB	BBB
	Baa3	BBB-	BBB-
<i>Non-investment-grade (speculative grade or "junk")</i>			
	Ba1	BB+	BB+
	Ba2	BB	BB
	Ba3	BB-	BB-
	B1	B+	B+
	B2	B	B
	B3	B-	B-
	Caa1	CCC+	CCC+
	Caa2	CCC	CCC
	Caa3	CCC-	CCC-
	Ca	CC	CC
<i>At or near default</i>			
	C	C	C
		D	D

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.

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 navigation bar at the top displaying market indices: DJIA ▲ 32507.14 0.84%, S&P 500 ▲ 3989.24 0.46%, U.S. 10 Yr ▼ -123/32 Yield 3.518%, and Euro ▲ 1.0796 0.33%. Below the navigation bar is the 'U.S. Treasury Quotes' section, which includes a sub-header 'Treasury Notes & Bonds | Treasury Bills' and a disclaimer: 'Treasury note and bond data are representative over-the-counter quotations as of 3pm Eastern time. For notes and bonds callable prior to maturity, yields are computed to the earliest call date for issues quoted above par and to the maturity date for issues below par.'

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 $3\% \div 2 = 1.5\%$ 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.

YIELD CURVE

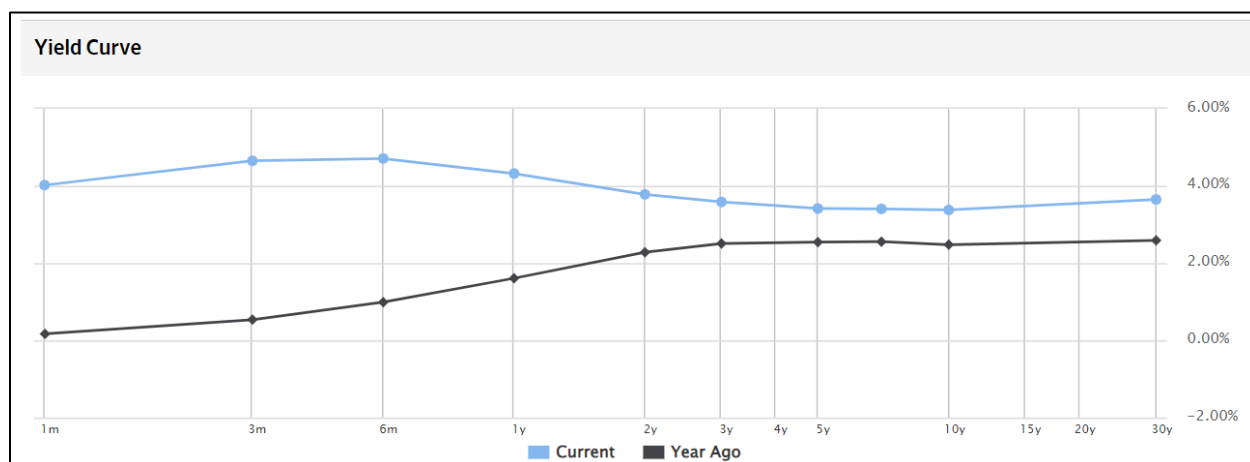
The **yield curve** shows the relationship between interest rates and time to maturity on government bonds. A **normal** yield curve slopes upwards, implying that investors demand a higher rate of return on longer securities, while an **inverted** yield curve slopes downward, implying that investors demand higher rates on short-term securities than long term securities.

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



The yield curve has inverted before *every recession since the 1950s*, though some of these “inversions” may have been coincidental.

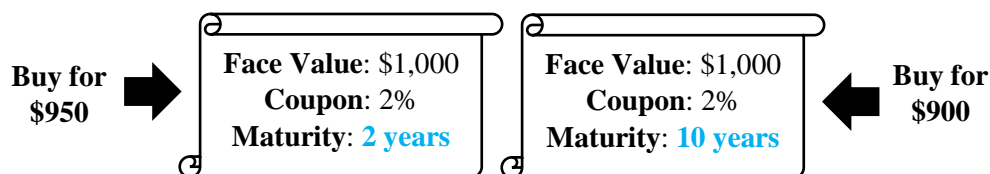
Figure 5: Treasury Yield Curve



INVERTING YIELD CURVE

Consider this (simplified) example regarding the yield curve.

IN “NORMAL” TIMES:



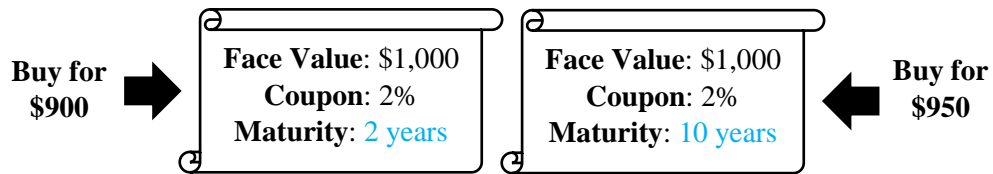
Investors think that the economy will steadily grow and inflation will be normal. As such, interest rates will steadily rise with the growing economy.

Investors are willing to pay \$950 for the 2-year bond but only \$900 for the 10-year bond, since it “locks up” their money for longer. In 2 years, when the shorter-term bond matures, they want to be able to reinvest their money into *new* bonds they expect will be paying 3%, 4%, or 5% coupons instead of riding out a longer-term bond that is stuck receiving 2% coupons.

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

The shorter-term bond has a lower yield. The yield curve is normal.

PRIOR TO A RECESSION:



Investors now think that the economy will contract. As such, interest rates may be slashed to spur the economy.

They are willing to pay only \$900 for the 2-year bond but \$950 for the 10-year bond, since they *want* to lock up their money for longer. 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. The yield curve is inverted.



Keep in mind a bond's coupon remains fixed. The *yield* or *return* is a function of how much you as an investor pay for the bond and what you receive in coupons and principal at maturity. *Bonds of similar risk and structure will trade at the same YTM regardless of the coupon rate!* Investors trade such that the price of bonds will “adjust” and equate to that of similar bonds.