Primer

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Primer on bond investing

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Bonds provide income and the potential for capital gains. Investors can build bond portfolios that provide income to complement their stock portfolios. Bonds can be used for a variety of purposes including saving for future expenses, saving for retirement and financing living expenses during retirement.

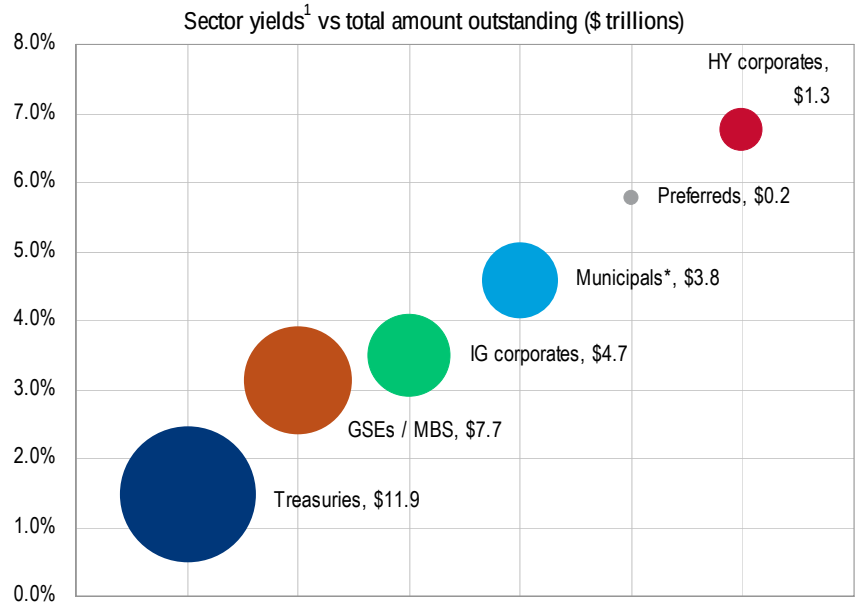
For most investors, the chief appeal of bonds is the income return, measured by the yield. The search for yield should be balanced against the risks involved with holding bonds. The primary risks are deteriorating credit (or ultimately default) and higher market yields. Total return is a more complete measure of the return from bonds, reflecting both the income return and price appreciation/depreciation over the holding period.

The performance among different sectors of the bond market can vary considerably. Treasury securities usually do best when investors are seeking safety. Lower-quality bonds generally outperform when investors expect the economy to improve. Returns on low-quality bonds usually correlate better with returns on stocks than with returns on Treasuries.

Historically, bonds that have the highest potential returns also have the most volatile returns. Bonds with lower credit quality and longer maturity tend to have the biggest price movements, both up and down.

Inside we discuss the basics of bond investing including measuring yield and total returns. We also describe the different choices available in the bond market.

Chart 1: US Bond market snapshot (March 31, 2013)



Source: BofA Merrill Lynch Global Research, Federal Reserve Flow of Funds. [1]Yields shown on y-axis. *Taxable equivalent at 28% rate.

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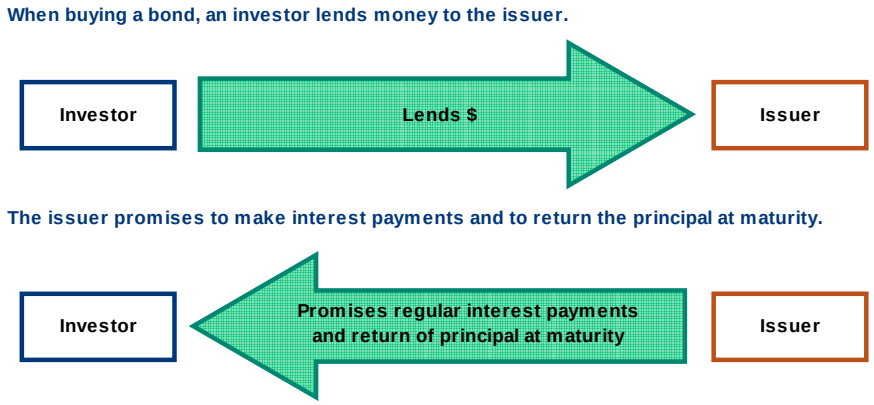
Refer to important disclosures on page 20 to 22. Link to Definitions on page 19.

Bond basics

When you buy a bond you are making a loan. In return, you receive the promise of periodic interest payments and the eventual return of your principal.

When you buy a bond, you are lending your money. The borrower could be a government, a corporation, or indirectly, an individual. In return for the use of your funds, the issuer of the bond promises to make periodic interest payments and to return the principal amount at maturity.

Exhibit 1: Basics of a bond transaction



Source: BofA Merrill Lynch Global Research

The bond market is often called the “debt market”, because the issuers are borrowing money, or the “fixed-income” market, because the interest payments on an individual bond usually do not vary.

Why buy bonds?

For most individual investors the appeal of a bond is usually the income and potential for price gains, although investors ought to be aware of the potential for losses as well.

- For a bond purchased directly, rather than through a fund, you can count on receiving the scheduled interest payments and the return of principal at maturity, provided the issuer does not default. That predictability, sometimes called “permanence and definition” can be particularly useful for people saving for long-term goals such as college tuition or retirement.
- For bond funds (mutual funds, closed-end funds, and exchange-traded funds), the stream of income payments is not as predictable—it will generally rise and fall with market rates. But funds can offer diversification, and the ability to re-invest principal payments and possibly interest payments at market rates. Actively managed funds, which aim to outperform the market, tend to have higher fees than passively-managed funds, such as exchange-traded funds (ETFs), which usually just aim to match a market index.

Bonds in your portfolio

For most investors the appeal of bonds is the income.

The income stream from bonds can complement the returns from stocks in a portfolio. The appeal of stocks is generally the potential for capital gains. But investors don’t realize capital gains until they sell their shares. Bonds can give you income to spend in the meantime.

Retirees can use their bond portfolios as a source of income to finance their living expenses. The size of the portfolio, the yield, and the safety of the principal are among the relevant considerations in using bonds for this purpose.

Some investors, particularly high net worth individuals, use bonds to preserve their wealth. If the portfolio is large enough, the investor could potentially live off the income and not have to tap into the principal.

Parents can use bonds to save for their children's education. Individuals can use bonds to save for their retirement. Zero-coupon bonds (see below) and inflation-adjusted bonds (page 13) can be used for these purposes.

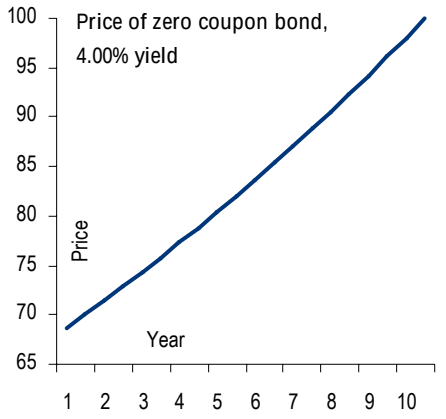
Bonds can pay a fixed coupon, a variable coupon, or no coupon at all.

The income

Most bonds pay a fixed rate of interest semi-annually. The payouts are called coupon payments, a throwback to the days when investors literally clipped coupons to receive their payments. A bond with a $1,000 par value with a 3% coupon would pay $15 every six months. Preferred securities generally pay their coupon every three months.

Other bonds pay "floating rate" coupons. Here the payout is tied to the movement in some other index, perhaps the three-month LIBOR rate or the consumer price index.

Chart 2: Price of zero coupon rises towards par



Source: BofA Merrill Lynch Global Research

Some bonds pay no coupon at all. *Zero coupon* bonds are sold at deep discounts to the par value and pay the par value at maturity. For example, a 10-year zero coupon bond might sell at $67 and mature at the par value of $100. That appreciation in the price over a 10-year period translates to an annual yield of about 4.0%. The Chart to the left shows how the price of a zero coupon bond rises towards par as maturity approaches.

Getting your money back

Most bonds have a fixed maturity. Provided the issuer does not default, you will receive the face value of the bond on the maturity date. For some bonds, the issuer has the option to call (redeem) the security before it matures, subject to pre-specified conditions.

High yield bonds, municipals, and preferreds can generally be called at the issuer's discretion after a specified date.

Traditional calls: A traditional call option enables the issuer to redeem the security, usually at par, after a specified date. This type of call option is found among preferred securities, most municipal bonds and corporate high-yield bonds.

For example, a bond issued with a 10-year maturity might become callable five years after issuance. In market parlance, the bond is said to be issued with five years of call protection. The short hand version is "10 non-call 5".

The issuer would typically call the security if it could re-finance at a lower rate. For example, if the bond were issued with a 5% coupon, and market rates have since declined to 3%, the issuer might call the security and issue a new bond at the lower market rate.

Such calls usually work to the disadvantage of the investor because the re-investment choices are likely to be less favorable in the lower rate environment. For that reason, investors usually demand a higher yield on callable bonds than bonds that are not callable.

Make-whole calls (MWCs): MWCs allow the issuer to redeem the security at its discretion. The redemption price is not fixed, as with a traditional call. The price is the greater of the par value of the bond (typically 100) or the price that corresponds to a particular yield spread over a specific Treasury security. When market yields decline, the MWC price usually winds up being above par, sometimes substantially so. MWCs are very common among investment-grade corporate bonds.

Make whole calls are rarely exercised.

The MWC structure is much more favorable for the investor than a traditional call because it allows the investor to benefit from declines in market yields. For that reason though, issuers rarely exercise MWCs. For the issuer, the advantage of the MWC is that it can typically pay a lower coupon rate on the bond than for one with a traditional call. The MWC also gives the issuer more flexibility in the event of a restructuring. For more information, see our Fixed Income Digest (Sept 25, 2012): Primer on make-whole calls.

All about yield

Yield is a measure of the annualized income return that you will receive from the bond. In this section we describe the relationship between yield and coupon, different ways to calculate yield, and how to assess the attractiveness of the yield on a bond. In the next section we tie in yield and total return.

Coupon rate and yield

The yield of a bond might differ from its coupon rate. The distinction arises because the purchase price could be above or below the par value of the bond.

The *coupon rate* is the annual payout as a percentage of the par value of the security. A $1,000 par security with a 5.00% coupon rate would pay $50 in interest per year.

The *yield* measure takes into account the price that the investor pays for the security. The price could be above par (a premium bond) or below par (a discount bond).

Table 1: Bond Yield to Maturity

Five-year maturity, 4% coupon

	Discount bond	Par-priced bond	Premium bond
Coupon rate	4.00%	4.00%	4.00%
Price	95.00	100.00	105.00
Yield	5.15%	4.00%	2.92%

Source: BofA Merrill Lynch Global Research

Table 1 shows examples of discount, par-priced bonds and premium bonds that have 4.00% coupons.

- A *discount bond* is priced below par. The yield exceeds the coupon rate because the price will rise towards par as the bond approaches maturity. Using the example in Table 1, the discount bond is priced at 95.00 and pays a 4.00% coupon. The investor will receive the par value of 100 when the bond matures in five years. That translates to a 5.15% yield.

- A *premium bond* is priced above par. Its price will compress towards par by maturity. For a premium bond, the yield is less than the coupon rate, reflecting the erosion of the premium as the bond approaches maturity. The example in Table 1 shows a bond priced at 105.00, again with a 4.00% coupon. At maturity, the investor receives par, making the yield 2.92%. See our Fixed Income Digest (May 8, 2013): Primer on premium bonds.

Timing of payouts and accrued interest

Most bonds pay interest on specified dates six months apart. The interest payment accrues over the course of the six-month period. For example, if the bond pays $50 semi-annually, the accrued interest three months after the last payment date is $25.

The accrued interest is added to the price of a bond purchased in the secondary market. For most preferreds, the accrued interest is imbedded in the price

For most bonds, the interest accrual is separate from the price of the bond. If you buy a bond in the secondary market (i.e., not a new issue) in between the interest payment dates, you will pay the seller the accrued interest. You will receive the full semi-annual coupon payment when the payment date arrives. Using the example above, the seller would receive the price of the bond plus $25 accrued interest. On the payment date three months later, the buyer will receive $50.

In contrast, for preferreds the accrued interest is imbedded in the price, much as it is with common stocks. If you buy a preferred while the dividend is accruing, you do not pay anything extra to the seller, because the price already reflects the accrued dividend. At the end of the dividend period, the price of a preferred security will decline by the amount of the dividend payment, other things equal.

Measuring yield changes: basis points

The bond market convention is to express yield changes in basis points. A basis point equals 0.01% or, one-hundredth of one percent. For example, the difference between a yield of 3.00% and 3.50% is 50 basis points. Alternatively, yield changes could be expressed in percentage points. A move from 3.00% to 3.50% is a 0.5 percentage point change.

Calculating yield

Current yield (CY) is the simplest yield measure. CY is the standard measure for perpetual preferred securities and common stock. It's also the yield metric used for most mutual funds and for some exchange traded funds. CY is generally not applied to bonds that have a fixed maturity.

Current yield = Coupon payment / Price

CY is the coupon payment on a security divided by its price. For example, if a $25 par preferred with a 7.00% coupon were selling at a discount, say, $23.00, its CY would be 7.61% (the 7.00% coupon payment times the $25.00 par price, divided by the $23.00 market price). If the same security were selling at a premium, say $27.00, its CY would be 6.48%.

Yield to maturity (YTM) and related metrics are the standard for bonds and preferreds that have a stated maturity. The key difference with CY is that the YTM takes into account the maturity date of the bond and the time value of money: a dollar in the future is worth less than a dollar today.

The calculation of the YTM is not straightforward, but can be done easily with many financial software applications.

We will use a simple example. We assume a bond that pays an annual coupon and returns full principal value at maturity. Suppose we know the price, the coupon rate, and the maturity of the bond, and want to calculate the yield.

Calculating YTM: find the discount rate that equates the present value of the cash flows of the bond to its price.

Mathematically, the YTM is the discount rate that equates the present value of the cash flows of the bond to the price of the bond. The cash flows are the coupon payments and the return of principal at maturity. The formula is:

$$Px = C_1/(1+YTM)^1 + C_2/(1+YTM)^2 + C_3/(1+YTM)^3 + \ldots..C_n/(1+YTM)^n + P/(1+YTM)^n$$

Where Px is the Price of the bond, C_t is the coupon payment in period t, P is the principal value, and n is the period when the bond matures. YTM is the only unknown in the equation, but it cannot be solved for directly. The solution requires a series of iterations—you keep plugging in values for YTM until the right hand side of the equation equals the bond's price. Fortunately, financial software packages do that calculation.

For the more conventional semi-annual paying bonds, you would make some slight modifications to the formula. Some other points from the equation above:

- Those with a background in finance may recognize the YTM as the internal rate of return on the bond.
- The equation shows the inverse relationship between the YTM and the bond's price— the lower (higher) the YTM, the higher (lower) the price. Intuitively, this means that the higher the rate at which future cash flows are discounted, the lower the present value of the security.

- The calculation assumes that coupon payments are re-invested at the yield to maturity. That is usually not a realistic assumption. Some bond holders spend their payments rather than re-invest them, and those who do re-invest the payments often do so at lower rates than the YTM. To the extent that the coupons are re-invested at rates below the YTM, the "realized" YTM would be lower than the YTM.

Table 2: Bond YTM (5-yr maturity, 4% coupon)

	Discount bond	Par-priced bond	Premium bond
Coupon rate	4.00%	4.00%	4.00%
Price	95.00	100.00	105.00
Yield	5.15%	4.00%	2.92%

Source: BofA Merrill Lynch Global Research

Table 2 to the left, which is the same as Table 1 on page 5, illustrates the how yields and prices move in opposite directions. As the price of the bond rises (95, 100, 105), the yield declines (5.15%, 4.00%, 2.92%). We discuss the inverse relationship between prices and yields in more detail on pages 8 and 11.

The top three rows of Table 3 below show how the price could vary for bonds with the same yield and different coupon rates. For a given yield, the discount bond has a lower coupon and a lower price: the lower price compensates investors for the lower coupon. The premium bond pays a higher coupon, but also costs more.

Yield to Call (YTC): Some bonds entitle the issuer to call, or redeem, the security, typically at par, prior to its stated maturity date. (See page 3). The YTC follows the same concept and calculation as YTM, except it uses the call date, rather than the maturity date for the maturity.

The usefulness of the different yield measures arises when evaluating bonds priced at discount to par versus bonds priced at par or a premium. Table 3 gives examples using bonds with different prices that all have a 5.00% YTM, a 10-year maturity, are callable at par five years after issuance, and pay a semi-annual coupon.

The yield to worst is the lower of the yield to call and the yield to maturity.

Yield to Worst (YTW): The YTW is the lower of the YTC and the YTM[1], and more realistic than either one alone. The last row of Table 3 shows the YTW of the three types of bonds.

For example, the YTW for a premium bond is the YTC. An issuer is more likely to call a security priced at a premium than one priced at a discount. The premium price means that the coupon rate on the security exceeds the market yield. That often means that the issuer would be able to reduce financing costs by calling the security and reissuing a new one at a lower coupon rate.

Table 3: Alternative yield measures, 10-year maturity, callable in 5 years

	Discount Bond	Par-priced Bond	Premium Bond
Yield to Maturity	5.00%	5.00%	5.00%
Coupon rate	4.00%	5.00%	6.00%
Price	92.21	100.00	107.79
Current yield	4.34%	5.00%	5.57%
Yield to Call	5.82%	5.00%	4.25%
Yield to Worst	5.00%	5.00%	4.25%

Source: BofA Merrill Lynch Global Research

For a discount bond the YTW is the YTM. The issuer is unlikely to call a bond priced at a discount because it would be paying par value for something priced below par.

[1] Some municipal bonds have more than one call date, with different call prices. In such cases, the YTW is the lowest of the various YTCs and the YTM.

Effective or option-adjusted yield: The YTC/YTW approach makes a very simple assumption about whether the bond will be called: if it is priced above par it will be called; if it is priced below par, it will not be called, regardless of how far away the call date might be. The reality is not so simple. Whether or not a bond will be called when the call date arrives depends upon how interest rates change over time. The option adjusted spread (OAS) methodology, which we outline on page 10, calculates different possible interest rate paths over time, hence allows for the different scenarios about whether the bond will be called.

The OAS approach calculates an effective or option-adjusted yield, which removes the effect of the call option. Other things equal, the lower the price of the bond, the closer the effective yield will be to the YTM, and the higher the price of the bond, the closer it will be to the YTC.

Evaluating yield

In most cases, the appeal of a bond depends upon the yield that you receive on your funds. Here are some basic considerations in assessing the yield on a particular bond:

Bond yields vary with the credit quality of the issuer, expected inflation, expected future yields, and overall business conditions.

What is the probability that the borrower will default? Bondholders will demand a higher yield from borrowers who appear to be less likely to be able to make timely interest payments or to return the principal at maturity. Top-quality borrowers, like the U.S. government can borrow at the lowest rates. Most other bonds must pay a higher yield than Treasuries to account for the higher default probability, and perhaps call features. The yield spread over Treasuries will vary over time and among issuers depending upon the market's perception of business conditions and as the fundamentals for a company improve or worsen. (See pages 10-11).

How much will inflation erode the value of the future payments? When you buy a bond you exchange your payment today in return for a series of payments in the future. Inflation erodes the purchasing power of those future payments. Higher expected inflation generally calls for higher yields.

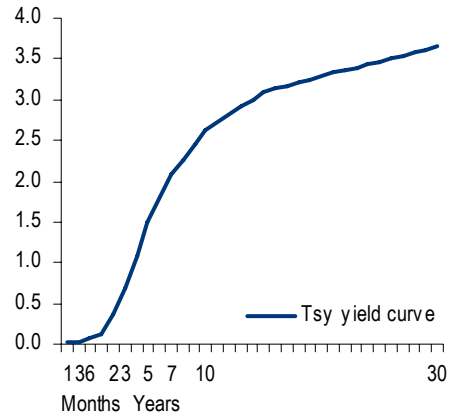
Yields will generally rise and fall with inflation expectations.

What impact will future changes in market yields have on the value of your bond? Suppose you buy a bond that pays a 3.00% coupon rate. If market yield a year from now is 4.00%, the price of your bond will decline: you will have to reduce the price in order to compensate investors for the below-market rate. Likewise, your bond would appreciate in value if market yields decline, because your bond now pays more than the market yield. See page 11.

Compensation for risk

The yield on a bond should compensate investors for the amount of time they are locking up their money, the interest rate risk they are taking, and the credit risk they are taking. The yield curve touches on the first and second elements. Yield spreads deal with the third. We discuss those next.

Chart 3: Treasury yield curve



Source: BofA Merrill Lynch Global Research, Bloomberg

Yield curve: a picture of yields and maturity

The yield curve depicts how yields change as maturity changes. Chart 3 to the left illustrates a yield curve for Treasury securities. In this example, the yield curve is positively sloped, meaning that yields rise as maturities extend. For example, the yield for a two-year maturity is about 0.4%, while the yield on a 10-year maturity is about 2.6%. On occasion, the yield curve is negatively sloped, meaning that longer maturities have lower yields than shorter maturities.

Short-term Treasury yields are influenced to a large degree by Federal Reserve policy. Long-term yields are influenced largely by expectations of future inflation.

Changes in the shape of the yield can often reflect changes in market perceptions about business and financial conditions.

- The yield curve flattens when short-term yields rise in relation to long term yields, or when short-term yields decline by less than long-term yields. One reason that the yield curve could flatten is that the market begins to expect the Federal Reserve to raise short-term interest rates soon. Another possible reason is that the market expects lower inflation.
- The yield curve steepens when long-term yields rise in relation to short-term yields, or long-term yields decline by less than short-term yields. One reason that the yield curve could steepen is that the market raises its expectation for inflation in coming years.

Federal Reserve policy influences short-term rates, inflation expectations affect primarily long-term rates.

Spread vs. Treasuries: a measure of relative yield

Treasury securities are generally used as the benchmark for the bond market, since they are considered to be largely free from credit risk. The attractiveness of other bonds is often measured by their yield in relation to the yield on a Treasury security of the same maturity.

Except in the municipal market, the convention is to look at the basis point difference or spread between the yields. For example, if the yield on a 10-year corporate bond were 4.00%, and the yield on a 10-year Treasury were 2.00%, the spread on the corporate bond would be 200 basis points.

In the municipal market, the convention is to look at the ratio between the two yields. For example, if the yield on a muni is 1.80% and the yield on a Treasury of the same maturity is 2.00%, the muni yield ratio is 90%.

Market conventions: spreads for taxables, ratios for munis.

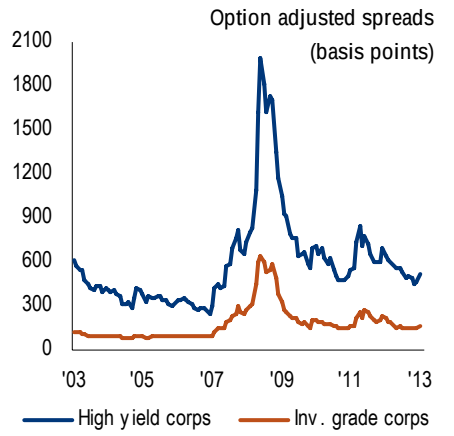
Spread to worst

How do you evaluate the spread for a bond that could be called prior to its maturity date? Suppose for example the bond has 10 years remaining to maturity and can be called in three years. Do you compare its yield to that of the 10-year Treasury or the 3-year Treasury?

The simplest way to address this problem is to use the “spread to worst”. That is, the spread that applies to the yield to worst, which is the lower of the yield to call and the yield to maturity. (See page 7).

If the security in our example were priced above its call price, the relevant comparison would be with the yield on 3-year Treasury. If the security were priced below its call price, the relevant comparison would be with the 10-year Treasury. The reasoning is that other things equal, a bond that is priced above its call price is likely to be called, while a bond priced below its call price is not likely to be called.

Chart 4: Spreads vary over time



Source: BofA Merrill Lynch Global Research

Option adjusted spread

The drawback of looking at the spread to worst is that it makes a simplistic assumption: if the bond is currently priced above par it will be called, if it's priced below par, it will not be called, regardless of how far away the call date is. In fact, the prospect for a call depends upon the course of interest rates over time. Also, as a practical matter, the spread to worst could change dramatically when the price of the security goes above or below its call price. When the price is above the call price, the relevant benchmark is a short-term Treasury. When the price falls below the call price, the relevant benchmark extends to a longer-term Treasury. The difference in those spread measures could be very large.

The option adjusted spread (OAS) approach takes into account various possible paths for interest rates, and the associated outcome with regard to a call. The OAS is the spread versus Treasuries that equates the present value of the bond's cash flows under different assumptions about interest rate movements. The approach estimates the value of the call option on the bond, and ultimately the yield spread excluding the amount needed to compensate for the call option.

The OAS methodology is most relevant for bonds with conventional calls such as high yield bonds, preferreds, and also mortgage backed securities. It is less relevant for investment grade corporate bonds and Treasuries, which generally do not have conventional calls.

Chart 4 to the left shows OAS for both investment grade and high yield bonds during the past ten years.

Credit ratings and default potential

The yield and eventual return that you receive will be influenced by the credit quality of the borrower. Safer credits, borrowers that are perceived to be better able to make good on their obligations, command lower yields, while riskier credits command higher yields. Those higher yields reflect the expectation of a higher probability of default.

In the event of a bankruptcy, the bondholders usually wind up receiving a portion of the original principal value.

Default and recovery value: For most bonds, the failure to make scheduled interest payments or return the principal at maturity constitutes a default. In the event that the issuer declares bankruptcy, a bankruptcy court would typically decide upon some recovery value on the bond—usually some portion of the initial principal value. The decision could take several years.

The credit rating on a bond represents the rating agency's assessment of the potential loss from default on a bond. The potential loss reflects the estimated probability of default and the likely recovery value in the event of default. Investment grade bonds carry ratings of at least Baa3 / BBB- / BBB- from Moody's, S&P, and Fitch respectively. High yield ratings are Ba1 / BB+ / BB+ and lower.

While by no means perfect, the credit ratings on corporate and municipal bonds have a reasonably good track record for assessing the risk of default. Based on historical experience, a low-rated bond is more likely to default than a bond with a better rating.

Total return: income + price change

The yield represents the annualized income return that you will receive if you hold the bond to maturity and receive the scheduled payments along the way and par value at maturity (that is, the bond does not default). But the price of the bond can fluctuate as the maturity date approaches. If you hold the bond to maturity, you will get the principal value back. But if you sell the bond prior to maturity, your total return will depend upon the market price when you sell.

Total return reflects both the income and the price change that occurs with changes in yield.

For a given period, the total return on the bond equals the sum of the coupon income, the interest earned from the re-invested coupons and the price change.

Total return = coupon income + income from re-invested coupons + price change

The coupon income is simply the interest received. The income from re-invested coupons is the "interest on the interest". That is, the return on the re-invested coupon payments.

Yields and prices move in opposite directions

As described on pages 6-7, the price of the bond will change with market yields and, for bonds priced at a discount or premium, as the bond approaches maturity. The price will rise when its yield declines, and decline when its yield rises.

Table 4 shows how the price of bonds with a 3.00% coupon / 3.00% initial yield would change as market yields change over a one year horizon. For example, for a 10 year maturity, a one-percentage point rise in yield would knock the price down by 7.5%. A one-percentage point decline would boost the price by 8.2%.

Table 4: Price return for a given change in yield, coupon = initial yield = 3.00%

	Change in yield (pct points), one year horizon				
	-2	-1	0	+1	+2
2-yr maturity	2.0%	1.0%	0.0%	-1.0%	-1.9%
5-yr maturity	4.0%	2.0%	0.0%	-1.9%	-3.8%
10-yr maturity	17.2%	8.2%	0.0%	-7.5%	-14.4%
30-yr maturity	50.2%	21.9%	0.0%	-17.1%	-30.4%

Does not include the effect of rolling down the yield curve. Source: BofA Merrill Lynch Global Research

Duration: a measure of the sensitivity of the price to changes in yield

Modified duration is a measure of how the price of the bond would change with changes in yields.

Modified duration is a bond statistic that measures the sensitivity of the price of a bond to changes in market yields. Specifically, modified duration measures the percentage change in price for a small instantaneous change in yields for all maturities. For example, if the modified duration were 6, then a one-percentage point rise in yield would reduce the price of the bond by roughly 6%. We show the average duration of different bond market sectors on page 18.

Other things equal, the duration is greater the longer the maturity of the bond and the lower the coupon and yield. In other words, the price of bonds with longer maturities and lower coupons and yields will fluctuate more with changes in yield. We can see the influence of the maturity in Table 4 on the previous page. For any given column in the Table, the price change for a given change in yields is greater for longer maturities.

For non-callable bonds, the price increase for a given decline in yields exceeds the price decrease for the same rise in yields. Returning to the example from Table 4, the one percentage point decline in yields generated an 8.2% price increase, while the same rise in yields generated a 7.5% loss. This relationship is a result of positive *convexity:* the duration of a bond rises as its yield declines.

Positive convexity: the price increase for a given decline in yields exceeds the price decrease for the same rise in yields.

Bonds with call options, especially mortgage backed securities, often have negative convexity, meaning that duration rises as yields rise. See our primer on duration and convexity.

Combining income and price

So far we've considered the effect that changes in yield have on the price return of a bond. The other main component of return is income.

Total return includes the price change and the yield.

Table 4 showed that the longer the maturity of a bond, the more sensitive its price is to changes in yield. Typically yields are higher for bonds with longer maturities, that is, the yield curve is positively sloped. That extra income helps compensate investors for the extra price risk for longer maturities.

Table 5 shows how total return (income + price change) varies for different maturities as yields change. The first data column shows the yields assumed for different maturities.

Longer maturities usually have higher yields, compensating investors for at least some of the extra price risk.

The total return for a given yield change is approximately equal to the price change shown in Table 4 plus the yield. For example, from Table 4, if yields rise by a percentage point, the price of a 10-year bond would decline by 7.5%. The total return would be that price decline plus the assumed 3.00% yield on the bond or -4.5%. The higher yield for longer maturities that comes with a positively sloped yield curve cushions some of the effect of the price loss when yields rise.

Table 5: Total return for a given initial yield and change in yield

		Change in yield (pct points), one year horizon				
	Initial yield	-2	-1	0	+1	+2
2-yr maturity	1.0%	NM	NM	1.0%	0.0%	-0.9%
5-yr maturity	2.0%	NM	4.0%	2.0%	0.1%	-1.8%
10-yr maturity	3.0%	20.2%	11.2%	3.0%	-4.5%	-11.4%
30-yr maturity	4.0%	54.2%	25.9%	4.0%	-13.1%	-26.4%

NM = Not meaningful, assumed yield decline exceeds the initial yield. Does not include effect of rolling down the yield curve or the reinvestment rate.
Source: BofA Merrill Lynch Global Research

The sensitivity of the price of an individual bond to changes in yield will decline over time as the maturity shortens.

Funds vs individual bonds

Investors can purchase bonds directly with individual securities, or indirectly through funds such as open ended mutual funds, exchange traded funds, and closed end funds. We discussed some basic considerations in this decision on page 2.

The nature of interest rate risk differs between individual securities and bond funds. For individual securities, the interest rate risk diminishes over time because the duration of a bond shortens with its maturity. For example if you buy a 10-year bond today, five years from now it will have five years remaining to maturity, and hence its price will be less sensitive to changes in yields. At maturity, barring default, you will get the principal value back.

The maturity of funds will not shorten over time as with individual bonds, but the ability to re-invest proceeds could mitigate the impact of changes in yield.

In contrast, the interest rate risk of a bond fund typically does not decline over time, particularly if the fund targets a particular market or maturity range. For such funds, maturity and interest rate exposure stays roughly constant over time. But, the payouts on bond funds that re-invested their maturing proceeds would rise and fall with market rates over time, offsetting some of the sensitivity of the price to changes in yields.

Sectors of the bond market

The bond market consists of many different types of borrowers. The performance of different sectors of the bond market can vary, sometimes sharply, depending upon economic and financial conditions. We divide the sectors into broad categories: government and corporate, domestic (U.S. issuers) and international.

Table 6: Size of U.S. bond market, $ trillions

U.S. Treasury		
Bills	$	1.8
Nominal, notes & bonds	$	8.7
TIPS	$	0.9
GSEs/MBS	$	7.7
Municipals	$	3.8
Investment grade corporates	$	4.7
High yield corporates	$	1.3
Total:	$	28.9

Source: BofA Merrill Lynch Global Bond Indexes, Federal Reserve Board Flow of Funds

U.S. federal / municipal government linked

This category consists of Treasuries, TIPS, debt from government sponsored enterprises (GSEs), mortgage backed securities (MBS) from the GSEs, and municipal debt. Table 6 estimates the amount of debt outstanding in each of these sectors.

Treasury securities are backed by the full faith and credit of the U.S. government. Treasuries are the benchmark instrument in the bond world, since they are considered to be largely free of credit risk. Yields on other bonds are evaluated in relation to the yields on Treasuries. Treasury securities are rated AAA by Moody's and Fitch, and AA+ by S&P.

Despite the large budget deficits in the U.S., the markets consider Treasury securities to be among the safest financial assets in the world. Investors who purchase Treasury securities generally accept lower yields than for other bonds in return for the high degree of safety. Treasury securities generally perform best among the bond market sectors when the market is concerned about the economic or financial conditions. A "flight to quality" generally benefits Treasuries most.

Treasury bills are issued with maturities of one year and less. They do not pay a coupon. They are issued at a discount to par and rise to par value at maturity.[2] That accretion from the discount price to the par value represents the yield. Treasury notes are issued with maturities of two through ten years, and bonds are issued with maturities of 30 years.

The principal value of TIPS rises with the consumer price index.

Treasury Inflation Protection Securities (TIPS) also have the full faith and credit backing of the U.S. The par value of TIPS moves proportionately to the consumer price index (CPI). The coupon payment moves proportionately with the CPI as well. Specifically, the coupon payment is the fixed coupon rate on the TIPS, multiplied by the CPI-adjusted par value. See our Fixed Income Digest (Jan 4, 2012): TIPS Primer.

For example, suppose a TIPS was issued five years ago at a price of 100 with a 2.00% coupon, and CPI has risen by 10% since then. The par value would now be 110, and the semi-annual payment would be $1.10. ($110 * 2.00% / 2).

The annualized return on a TIPS that is held to maturity will approximate the sum of the stated yield on the security (which could be negative) and the annual inflation rate over the remaining life of the bond.

[2] On rare occasions, one and three-month Treasury bills have been issued at premiums, giving them negative yields. The yield on Treasury bills is quoted on a discount basis.

Government Sponsored Enterprises (GSEs) issue debt to fund their purchases of mortgages, and for other purposes. Debt issued by the GSEs is sometimes called agency debt. Housing related GSEs that issue debt are Fannie Mae, Freddie Mac, and the Federal Home Loan Bank Board. Fannie and Freddie use the funds that they raise from debt issuance in order to buy mortgages that they bundle into new securities. The Financing Corporation (FICO) and the Federal Farm Credit Banks are also GSEs.

This debt is not guaranteed by the U.S. government, but the markets treat it as if it has a large degree of government protection. The major ratings agencies assign the same credit rating to the GSEs as they do to the federal government, reflecting the belief that the government would ultimately support the debt.

Mortgage-backed securities: A mortgage backed security (MBS) is form of ownership in mortgage loans that are made by banks and other financial institutions. The holder of a residential MBS is essentially on the other side of the mortgage payment made by a household: the MBS investor receives a monthly payment that consists of a combination of principal and interest on the outstanding mortgage loans.

With residential MBS passthroughs, the main question is the timing of the return of the principal payments.

The most common mortgage structure is the "passthrough". In this structure, the bank or loan-service provider sells the monthly principal and interest payments from a pool of mortgages to a government sponsored enterprise (GSE) such as Ginnie Mae, Fannie Mae and Freddie Mac. These entities then distribute (pass through) the payments to the holder of the MBS.

The question that investors face with MBS is less a matter of *whether* the principal will be returned than *when* it will be returned. When mortgage rates decline, homeowners are more inclined to re-finance their mortgages, and investors will receive their principal sooner. That would likely reduce the returns on MBS that were purchased above par, but raise the return on securities purchased at a discount.

MBS are typically not assigned credit ratings by the major agencies. Ginnie Mae securities have the full faith and credit backing of the U.S. government, but Fannie and Freddie securities do not. But, as with GSE debt, the market generally treats these securities as if they have a high degree of government protection.

Collateralized Mortgage Obligations (CMOs) are created from MBS. The main distinction is that a CMO, unlike a mortgage passthrough, does not distribute cash flows evenly. A typical CMO is divided into classes or tranches. The tranches differ in the mix of principal and interest payments each period, and hence the sensitivity of the price to changes in interest rates. CMO buyers ought to be aware of the sensitivity of the returns to changes in market yield.

Municipal bonds are debt issued by state and local governments to finance capital projects such as major highways, schools, and hospitals.

The interest income on public purpose municipals and some private-purpose munis is exempt from federal taxation. Interest on some muni bonds is subject to the Alternative Minimum Tax (AMT). The interest income on a small part of the municipal market, most notably, Build America Bonds is subject to federal taxation. Most states do not tax the interest income from their own bonds, but do tax the interest from bonds issued by other states.

Table 7: Profile of IG municipal bond market

Type of issue	
General Obligation	27%
Revenue	73%
	100%
Credit rating	
AAA	11%
AA	47%
A	34%
BBB	8%
	100%

Source: BofA Merrill Lynch Global Bond Indexes

Table 8: IG corporate market by credit rating

Credit rating	% of market
AAA	1%
AA	12%
A	43%
BBB	44%
	100.0%

Source: BofA Merrill Lynch Global Bond Indexes

Table 9: Corporate Capital Structure

Loans
Senior Secured Debt
Senior Unsecured Debt
Subordinated debt
Junior subordinated debt/hybrid and trust preferreds
Preferred shares
Common shares

Source: BofA Merrill Lynch Global Research

Table 10: Avg cumulative default rates, '70 - '12

	Years after issuance	
Municipal bonds	1 year	10 years
Investment grade	0.0%	0.1%
Below Investment grade	1.0%	5.7%
Corporate bonds		
Investment grade	0.1%	2.8%
Below Investment grade	4.6%	33.9%

Source: Moody's Investors Service

The two broad types of munis are general obligation (GO) bonds and revenue bonds. GOs are backed by the full resources of the issuer, including its taxing power. The payments from revenue bonds come from the earnings of an enterprise or a specific project. For example, toll roll bonds are backed by the revenues collected from the tolls. Table 7 outlines the composition of the investment-grade muni market.

In order to evaluate the yield on munis on an equal footing with the yield on taxable bonds, muni yields are often expressed on a taxable-equivalent (TE) basis. The TE yield is the yield that would be needed on a taxable bond in order for it to provide same yield as the muni. The TE yield for a muni bond equals the stated yield divided by one minus the investor's marginal tax rate. For example, the TE yield on a bond with a 3.00% tax-exempt yield for an investor in the 28% federal tax bracket is 4.17% (3.00% / (1-28%)).

The TE calculation enables you to make a more consistent comparison between yields on munis and yields on taxable securities. The stated yields on munis are usually lower than for corporate bonds and Treasury securities of similar credit quality and maturity. But for individuals in higher tax brackets, the TE yield is often higher.

Historically, default rate on investment grade rated municipal bonds has been extremely low. See Table 10 below.

Corporate bonds

Corporations issue bonds to finance a variety of programs including plant and equipment spending. The corporate market is divided into two broad categories: investment grade (also called high grade) and high yield.

Table 9 outlines the ranking of different types of securities in the capital structure. The ranking reflects the priority of payment in the event of default. Senior unsecured bonds, the typical corporate bonds, rank behind loans and secured debt in the capital structure, but ahead of preferreds and common shares.

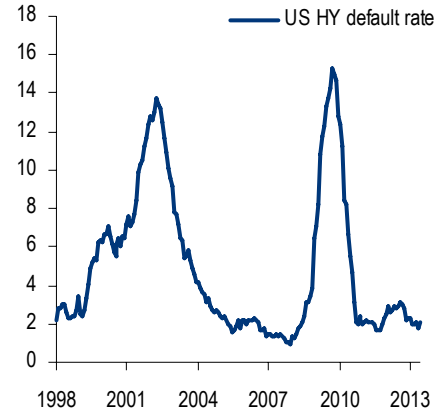
Investment grade corporate bonds: The bulk of the IG market is rated towards the bottom of the IG scale. Based on the BofA Merrill Lynch Global bond indexes, roughly 85% of IG corporate bonds are rated BBB or A.

Based on data from Moody's Investors Service, the annual default rate on investment grade corporate bonds has been less than 1%. Over 10-year periods, the cumulative default rate on investment grade corporate bonds has averaged about 2.8%. See Table 10 to the left.

Corporate bond issuers cover the gamut of industries. Banking, energy, and utilities are the largest sectors of the market, accounting for about 40% of the outstanding supply. Investors can gain some exposure to non-U.S. companies without taking currency risk via the "yankee" market. Yankee bonds are bonds that are issued by foreign companies but denominated in dollars.

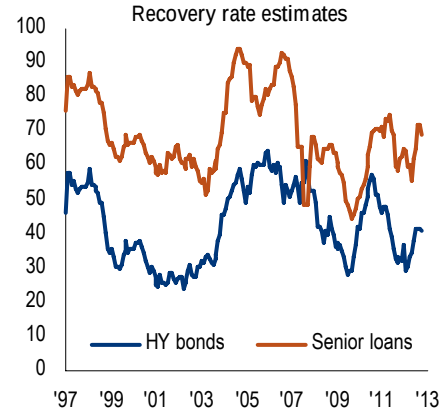
High yield bonds and senior loans: Below-investment grade bonds, also called high yield (HY), and less commonly, "junk", are issued by the lowest quality companies. The credit ratings are Ba1/BB+/BB+ and lower from Moody's, Standard & Poor's (S&P), and Fitch respectively. In return for the lower credit quality, HY bonds offer better yields than investment grade bonds.

Chart 5: High Yield default rate



Source: BofA Merrill Lynch Global Research

Chart 6: Better recovery rates on loans than bonds



Source: Moody's Investors Service, measured by bond prices taken one month after default.

When assessing the yield on a high yield bond or fund, investors need to consider the potential loss from default. The default rate on high yield bonds is considerably higher than for investment grade companies, and the recovery value in the event of default is lower. Chart 5 to the left shows that the annual default rate on high yield bonds has ranged from as low as near 2% to as high as 15%. Table 10 (previous page) shows that over rolling 10 year periods stretching from 1970-2012, the cumulative default rate has been about 34%.

Senior loans, sometimes called floating rate loans or leveraged loans, are another form of debt issued primarily by below investment grade companies. Loans rank higher in the capital structure than bonds and are often secured, or backed, by physical assets. The coupon rates on these securities are typically a markup over the three-month LIBOR rate. In some cases, the coupon rate is a spread over the higher of a "floor rate" or LIBOR.

Chart 6 compares estimates of the recovery value from defaulted HY bonds and loans going back to 1997. The recovery value is the percentage of the original principal that the security holders will receive in the event of default. The ultimate settlement is usually determined by a bankruptcy court. The recovery estimates shown in Chart 6 are based upon market pricing in the weeks following the default. The expected recovery rate has averaged 65% for loans vs 41% for HY bonds.

Preferred securities have elements of both bonds and equities. Like bonds, the coupon rate is fixed: the company cannot alter the coupon rate based upon changes in profitability, as it can with equities. But preferreds rank lower in the capital structure than bonds—that is, preferred holders rank behind bond holders in priority in the event of default. But like stocks, preferreds generally make payouts quarterly, rather than semi-annually as with bonds.

Financial firms account for the large majority of the preferred market. Most preferred securities that are geared towards individual investors have a $25 par value, although some individuals buy preferreds with a $1,000 par value.

Digging deeper, the securities that trade in the preferred market run the gamut from near-equities to bonds. See our Primer on preferred securities (May '13).

- Traditional preferreds are perpetual securities that pay dividends, not interest. The payments on most perpetual preferreds are non-cumulative, meaning that the issuer does not need to make up any missed payments.
- At the other extreme are "baby bonds" or senior notes. These are not actually preferreds--they are senior obligations of the company. Baby bonds trade in the preferred market because they have $25 par value.
- In between are hybrid securities, which pay interest and are cumulative, meaning that the issuer needs to make up any missed payments before it can resume dividends on lower-ranking securities. The issuer can deduct the interest payments from its taxable income, as it can with bond interest.

As we mentioned on page 5, most preferred prices include the accrued dividend, which builds over the payment period. The price will usually decline on the ex-dividend date, when the accrued dividend resets to zero. In order to remove the effect of the dividend accrual when comparing two preferreds, it's often better to look at the *"strip"* or "clean" price, which excludes the accrued dividend.

Table 11: Non U.S. sovereign debt*

	Developed Markets	Emerging Markets	
		$ Denominated	Local Currency
Size of market ($ billions)	$14,269	$421	$1,777
Average yield	1.59%	5.51%	6.15%
Average maturity (years)	9.1	12.0	7.4
Average credit quality	AA3	BB1	BBB1

Source: BofA Merrill Lynch Global Bond Indexes, tickers: N0G1, IGOV, LDMP. *These are the capital-constrained indexes. The full markets are larger than what these data show.

International bonds

U.S. investors could purchase bonds issued by entities in other countries. The two broad categories are bonds issued by other government (sovereign bonds) and bonds issued by corporations.

Sovereign bonds

Within the non-US sovereign market, the two broad categories are developed countries and emerging markets. We profile the characteristics of these markets in Table 11 above.

Developed country sovereign bonds: The largest bond issuers among developed countries are Japan, the euro zone, and the U.K. These bonds are denominated in the local currency. Dollar-based investors benefit when those currencies strengthen against the dollar and lose when they weaken.

Investors can use these bonds to gain exposure to foreign currencies while collecting some interest income. Table 12 shows that changes in the exchange rates have often accounted for a large share of the dollar-denominated returns on non-U.S. developed country sovereign bonds. Keep in mind that credit quality varies among nations, and as with all bonds, prices will vary with market yields.

Emerging market sovereign bonds have become more popular in recent years. Many countries that are categorized as emerging have been growing faster and have better financial metrics than many developed countries

Investors can choose between emerging market bonds denominated in dollars and those denominated in local currencies. As with developed country bonds, local market debt brings exposure to the movements in those currencies: dollar-based investors benefit when those currencies strengthen against the dollar, and lose when the currencies weaken.

Table 11 shows that the local currency debt market is far larger than the dollar-denominated market. The average yield is also higher, the credit rating is stronger, and the interest rate risk is lower than for dollar-denominated debt. For U.S. investors, these beneficial characteristics must be balanced against the currency risk

Non-U.S. corporate debt is probably less familiar to US residents than non-US sovereign debt. Table 13 to the left profiles the market. Europe accounts for the bulk of the developed country securities, and most of that market is investment grade, rather than high yield. Most emerging market corporate bonds are denominated in dollars or euros.

Table 12: Returns on developed country sovereign bonds (%)

	US $	Local currency	Contribution of Exchange rate
2008	10.0	7.4	2.6
2009	4.2	2.3	1.9
2010	5.8	2.8	3.0
2011	5.5	4.6	0.9
2012	1.5	5.4	-3.9

Source: BofA Merrill Lynch Global Bond Index, Ticker: N0G1

Table 13: Non-U.S. Corporate debt markets

	European Markets	Emerging Markets
Size of market ($ billions)	$1,776	$1,001
Average yield	2.12%	5.40%
Average maturity (years)	5.13	7.05
Average credit quality	A3	BBB2

Source: BofA Merrill Lynch Global Bond Indexes: tickers ER00, EMCB

Elements of building a bond portfolio: balancing returns and risk

Treasury securities perform best within the bond market when investors are concerned about safety.

In building bond portfolios, investors should consider their desire for yield and return while being mindful of the risks involved and the volatility in the market. Most investors should diversify their holdings and structure their portfolios according to their investment objectives and tolerance for risk. A full treatment of building a bond portfolio is beyond the scope of this Primer, but we will offer some brief guidelines.

As with most investments, the sectors of the bond market that offer the highest potential returns also present the greatest risk. As we have discussed, the two major forms of risk in the bond market are interest rate risk and credit risk. Interest rate risk refers the potential gain/loss from changes in market yields. Other things equal, longer maturities have greater interest rate risk.

Credit risk refers to the possible loss from a default. The price of a bond could change as market perceptions of default risk change. The credit rating provides one indication of the potential risk from default.

Table 14: Returns in bond market sectors June 2008 - June 2013

			Return	
	Avg credit rating	Duration	Annualized	Standard Deviation
Treasuries				
2 years	AAA	1.9	2.0%	1.2%
10 years	AAA	9.3	5.9%	8.9%
30 years	AAA	19.8	7.3%	18.8%
TIPS	AAA	8.1	4.4%	7.7%
GSEs	AAA	4.0	3.8%	3.1%
MBS	AAA	5.0	4.9%	2.9%
Corporates				
Investment Grade	A3	6.6	7.2%	7.6%
High yield	B1	4.5	10.6%	13.8%
Preferreds	BBB2	7.7	4.1%	21.8%
Non-US Sovereign				
Developed Markets	AA3	7.4	2.7%	9.1%
Emerging Markets				
$ denominated	BB1	6.9	8.8%	11.4%
Local currency	BBB1	5.1	5.1%	12.2%

Source: BofA Merrill Lynch Global Bond Indexes

Other things equal, bonds with greater interest rate risk and credit risk tend to have higher yields, and more volatile returns. Table 14 shows the return performance of different sectors of the bond market for the past five years. The first column shows average credit rating. The next column shows the average duration (a measure of interest rate risk, the higher the duration, the greater the potential change in price for a given change in yield. See page 11). The final two columns show the average annualized return for the past five years and the volatility of that return as measured by the standard deviation.

Returns on bonds with higher yields are generally more volatile.

Both absolute and relative returns will vary over different time periods. In particular, the large returns shown in some sectors of the market for the past five years, as shown in Table 14 might not be repeated in the future. But some historical relationships tend to hold up fairly well over time:

- The highest quality securities, such as Treasuries, MBS, and GSE debt do best within the market during recessions and other periods of financial turmoil when investors are seeking safety.
- Lower quality securities, such as high yield bonds, generally do best within the bond market when investors expect economic conditions to improve. They suffer most when the market expects recession. The return on high yield bonds actually correlates better with the return on stocks than the return on Treasury securities.

High yield bonds perform more like stocks than Treasury securities.

- Higher-quality securities and lower duration securities tend to have lower and less volatile returns. For example, two-year Treasuries are the highest rated and have the least interest rate risk of the different entries in Table 14. They had the lowest volatility in return. In contrast, high yield bonds, the lowest rated among the different sectors, had among the highest volatility in return.
- Within the Treasury market, 30-year bonds, which carry the greatest interest rate risk, usually have the most volatile return.
- The magnitude of the returns differed among the sectors. Broadly speaking the most volatile sectors generally had higher returns during the past five years, but that will vary over time.

Appendix

Table 15: BofA Merrill Lynch Global Bond Indexes used to measure performance[1]

Sector	Index name	Ticker
Treasuries		
2 year	U.S. Treasury, Current 2 yr	GA02
10 year	U.S. Treasury, Current 10 yr	GA10
TIPS	U.S. Treasuries, Inflation Linked	G0QI
Gov't Sponsored Enterprises	Unsubordinated U.S. Agency Master	G0P0
Mortgage Backed Securities	Mortgage Master Index	M0A0
Investment Grade Corporates	U.S. Corporate Master	C0A0
High Yield Corporates	US High Yield Master II	H0A0
Preferreds	US Preferred Stock, Fixed Rate	P0P1
Developed Sovereign	Global Gov't Bond Index II, Excl. US	N0G1
Emerging Market $	USD Emerging Market Sovereign Plus	IGOV
Emerging Market Local	Local Debt Markets Plus	LDMP
Munis	Municipal Master Index	U0A0

[1]Merrill Lynch index tickers apply only to the ML Global Index System, accessible through Bloomberg or ww.mlindex.ml.com.
Source: BofA Merrill Lynch Global Research

Link to Definitions

Macro

Click here for definitions of commonly used terms.

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