

## Bonds

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In the past decade, the size of global bond markets expanded dramatically as companies borrowed more and countries ran large budget deficits. As of 2006, the size of global bond markets was estimated at \$44.9 trillion, of which the U.S. bond market accounted for \$25.2 trillion.<sup>1</sup> In this report, we will look at key characteristics of bond markets.<sup>2</sup> What types of bonds are available? How are they priced? How does one interpret different yield curves? How does one account for interest rate risk? Against the backdrop of a global credit crisis, an understanding of bond markets is critical to appreciate today's financial turmoil.

A bond is similar to an I.O.U. In return for a loan, the issuer promises to pay a specified rate of interest during the life of the bond and to repay the face value of the bond (the principal) when it "matures" or comes due. The maturity of a bond is the date when the principle amount of the security is payable.

Bonds are not to be confused with common stock.<sup>3</sup> Stock holders own a part of the issuing company (have an equity stake) whereas bond holders in essence are lenders to the issuer (issuer owes a debt). For stocks, a portion of corporate profits are paid out to stockholders, known as the dividends, while with a bond the issuer typically is obliged to pay interest, known as the coupon. Bonds are usually defined in terms of when they are redeemed, whereas stocks may be outstanding indefinitely.

Consider the different types of bonds. Coupon Bonds pay regular interest until the bond reaches maturity. The amount of interest can either be fixed (fixed coupon bond) or change throughout the bond's lifetime (floating-rate coupon bond).<sup>4</sup> In the case of the later, Treasury bill and LIBOR (London Interbank Offered Rate) rates may be

reviewed regularly to determine the amount of interest owed. As example, the issue of “Liberty Bonds” in September 1918 raised \$6 billion dollars at a fixed interest rate of 4.25 percent to help finance WWI.<sup>5</sup>

Unlike coupon bonds that pay regular interest, zero-coupon bonds pay the accumulated value of interest at maturity. A familiar zero-coupon bond is a series E U.S. savings bond that people often give as gifts to newborns.<sup>6</sup> Today, a \$50 Series E Savings Bond costs \$25 and pays the \$50 face value in 30 years. They offer a continuous compounded yield given by  $50 = 100 \cdot \exp(-30r)$  or  $r = -(\ln(50/100))/30 = 2.3\%$ .

Another type of bond is a callable bond, which can be viewed as a plain vanilla bond combined with a call option.<sup>7</sup> A callable bond allows the issuer to redeem bonds before their maturity date. The value of a callable bond equals the price of a straight bond minus the price of a call option. One subtracts the price of the call option because the issuer gains the option from the investor to call the bonds and refinance the debt at a cheaper level.

A bond may also be puttable.<sup>8</sup> A puttable bond gives the investor the option to force the issuer to repurchase the bond before maturity. The price of a puttable bond equals the price of a straight bond plus the price of the put option. The investor buys both the bond and option from the issuer in order to protect themselves. With the put option, the investor may sell the bonds back and lend the proceeds elsewhere at a higher rate if interest rates rise.

A subordinated bond has a lower priority than other bonds of the issuer in the event of liquidation.<sup>9</sup> Liquidation is defined as the termination of the firm and involves selling off the firm’s assets. In such a case there exists a hierarchy of creditors. If a firm declares bankruptcy, the liquidator must be paid first, then government taxes, then

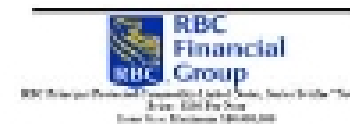
“senior bond” holders, then “subordinated bond” holders. As a result, subordinated bonds have a lower credit rating than senior bonds.

A bond without a maturity date is called a perpetual bond.<sup>10</sup> The cash flows continue forever, in perpetuity. One can price a fixed rate perpetual bond using formulas for a geometric series. One of the most famous perpetuities known is the UK Consols (Treasury Annuities or Undated Treasuries); some were issued back in 1888 and still trade today.

A convertible bond can be exchanged into a predetermined amount of the company’s equity at certain times during its life, usually at the discretion of the bondholder.<sup>11</sup> Issuers sell convertible bonds to enjoy a reduced cash interest payment at the expense of stock dilution when bonds convert into new shares.

Asset Backed Securities (ABS) pass-through payments derived from a specified pool of underlying assets.<sup>12</sup> The asset pool is typically small, illiquid assets that are unable to be sold individually like payments from credit cards, auto loans, and mortgage loans to aircraft leases, royalty payments and movie revenues. Back on March 19, 2009, Citigroup Inc. planned to sell \$3 billion in bonds backed by credit card payments eligible for the Fed’s Term Asset-Backed Securities Loan Facility, or TALF, to jumpstart consumer lending.<sup>13</sup>

Structured Notes are debt obligations that contain embedded derivatives which adjust the security’s risk/return profile.<sup>14</sup> A structured note can be made up of many different building blocks, such as bonds, call options and put options. An example of a structured note is a commodity-linked bond issued by RBC. The structure is offered at par and made up of a zero coupon bond plus a call option (as opposed promised



The interest payable on this bond is "floating" and will vary with the "floating" interest rate. The interest rate will be based on the 3-month LIBOR rate plus a spread of 1.00% (one percent) per annum. The interest rate will be reset on the 15th day of each month. The interest rate will be based on the 3-month LIBOR rate plus a spread of 1.00% (one percent) per annum. The interest rate will be reset on the 15th day of each month.

Collecting Commodity	Component Weight
WTI Crude	30.0%
WTI Crude Oil	30.0%
Crude Oil	30.0%
Crude	30.0%