Fixed Income Securities

Business Club

Finance Team

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Content

Introduction

Fixed Income Market:
There are a variety of Debt Market/Fixed Income Instruments available, including Bonds, Treasury Bills, Money Market Instruments such as Commercial Paper and Asset Backed Securities. Bond markets in the United States alone are worth nearly $40 trillion, compared to less than $20 trillion in the domestic stock market. Bond trading volume also far outnumbers stock market volume, with nearly $700 billion in bonds traded every day. This makes it very important for us to be familiarised with the intricacies behind these instruments.

Owing to the size of the market, its accessibility and it's overall exposure to the markets, we shall cover the topic of bonds in considerable detail in the upcoming sections.

Bonds:
A debt security, often known as a bond, is a financial claim in which the issuer, or borrower, agrees to repay the bondholder, or lender, the cash amount borrowed, plus periodic interest calculated on that amount over a specified time period. It can be built in either a standard or nonstandard manner. A standard bond is a fixed-coupon bond delivering its coupons on periodic dates and principal on the maturity date.

The goal of a bond issuer (the Treasury Department, a government agency, or a business) is to fund its budget or investment projects (roads, schools, new product development, new factories) at a lower interest rate than the estimated return on investment.In contrast to equity holders, who are owners of the issuing firm, bondholders have the status of lenders. This is also why a bond is less hazardous than a stock in general.

Now let's cover some terminology that is essential to the structuring of both standardised and non-standardised debt contracts.

- **Maturity date**: Date on which the principal amount is due to the lender.
- **Coupon Type**: It might be fixed, floating, or a multi-coupon arrangement (a mix of fixed and floating or different fixed). A step-up coupon bond, for example, is a type of multi-coupon bond with a coupon rate that rises at regular intervals.
- **Accrued Interest**: It is the interest that the bond is earning but isn't collected yet.
- **Interest accrual Date**: This is the date when interest begins to accrue.
- **Coupon Rate:** It is expressed in percentage of the principal amount.

Here are some examples of bonds extracted from the NSE MarketWatch:

SYMBOL	SERIES	BOND TYPE	COUPON RATE	FACE VALUE	LTP	%CHNG	VOLUME (Shares)	VALUE	MATURITY DATE
HUDCO	N2	Regular	8.2	1000	1,248.50	0.04	8626	1,07,69,043.44	05-Mar-27
INDIGRID	NJ	Regular	8.2	1000	1,037.55	-0.05	3530	36,64,457.70	06-May-31
PFC	N5	Tax Free	8.3	1000	1,255.50	-0.2	2340	29,17,465.20	01-Feb-27

Bond Prices and Yields:

Every bond has a **face value**, which is also known as its **par value**. When a bond matures, the bond issuer pays the bond holder a certain amount of money. If you have a $1,000 bond from XYZ Corp. that matures in five years, you will get a $1,000 check from XYZ in that time. It makes no difference how much you paid for the bond; the par value is what you'll get.

The **market price** of a bond is the amount you'd have to pay to purchase it on the open market. A novice to the bond market may believe that a $1,000 bond will sell for $1,000, which is correct in some cases. Bonds, on the other hand, frequently sell for less than their face value. This is because the price of a bond grows and decreases in lockstep with interest rates.

Bondholders are usually compensated with interest payments. That is their compensation for lending money to the bond issuer. The **"coupon" interest rate**, often known as the **stated rate**, determines the amount of such payments.

The yearly interest on a $1,000 bond with a 5% coupon rate is equal to 5% of the par value, or $50. The coupon rate is fixed, so you'll collect $50 in interest every year as long as you own the bond. So, if you paid $1,000 for the bond (par value), you'd earn a 5% yearly return on your investment.

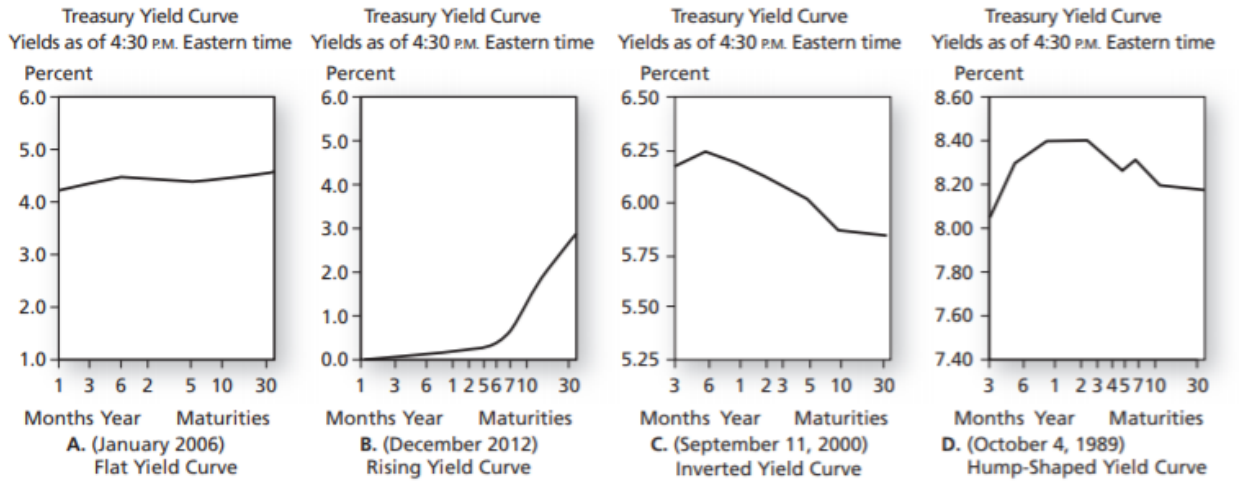
Consider, however, that you only paid $950 for the bond. The yearly payment of $50 would thus yield a 5.26 percent return. The $50 yearly payment would imply a 4.55 yearly return if you had spent $1,100 for the bond. The yield rate is your "actual" rate of return, and it's calculated using the price you paid for the bond rather than the par value.

Dirty Price vs Clean Price

The clean price is the current market price of the bond, excluding any accumulated interest. As previously stated, interest is paid on a bond every day and is referred to as accrued interest. A bond's clean price does not reflect the interest that has accrued since the last coupon is paid.

When we add the interest that has accumulated to date to the bond's clean price, however, we get the dirty price. If you buy a bond between the two coupon payment dates, the interest you've paid on it up to that point will be included in the dirty price, but not the clean price. Because there is no accumulated interest on a bond, both the clean and dirty prices will equalise on the interest payment date. The price that you pay for a bond is the dirty price which becomes equal to the clean price on the interest payout date.

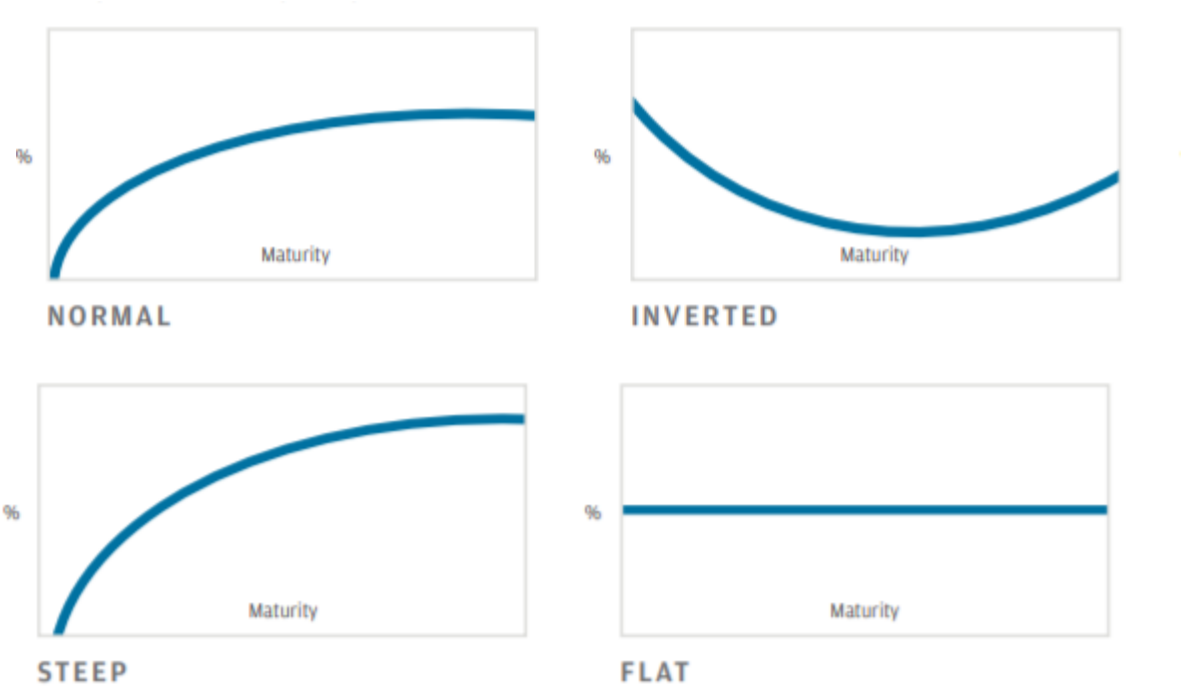
Yield Curves:
Bonds with various maturities have various yields to maturity. Long-term bonds traded at higher yields than short-term bonds when these bond prices and yields were gathered. A yield curve, which is a plot of yield to maturity as a function of time to maturity, is a typical way for practitioners to visualise the relationship between yield and maturity.



Some factors affecting Yield Curves are the Short Term and Long Term Interest Rates. The central banks of each country establish the short-term interest rate benchmarks. The Federal Reserve Board's Open Market Committee (FOMC) determines the federal funds rate, which serves as the benchmark for all other short-term interest rates in the United States. In India the rates are decided by the Reserve Bank of India(RBI)

If the central bank detects a slowdown in economic activity, it may cut the funds rate to boost borrowing and revive the economy. It is, nonetheless, concerned about inflation. It risks sparking inflation if it keeps short-term interest rates too low for too long.The slope of the yield curve indicates how bond traders expect short-term interest rates to change in the future, depending on economic activity and inflation predictions.

Market dynamics dictate long-term interest rates. If the bond market believes the federal funds rate is too low, future inflation forecasts will rise. To compensate for the detrimental impact of rising inflation, long-term interest rates will rise. The market, on the other hand, reacts negatively if it perceives the federal funds rate is too high. Long-term interest rates are falling because the market expects rates to fall in the future.



Normal Yield Curve: The market expects the economy to function at a normal rate of growth.There won't be significant changes in inflation, so investors who risk their money for longer periods of time can expect higher yields.

Inverted: The market expects the economy to slow down and interest rates to drop in the future. Long term investors want to take the opportunity to lock in interest rates before they fall even further

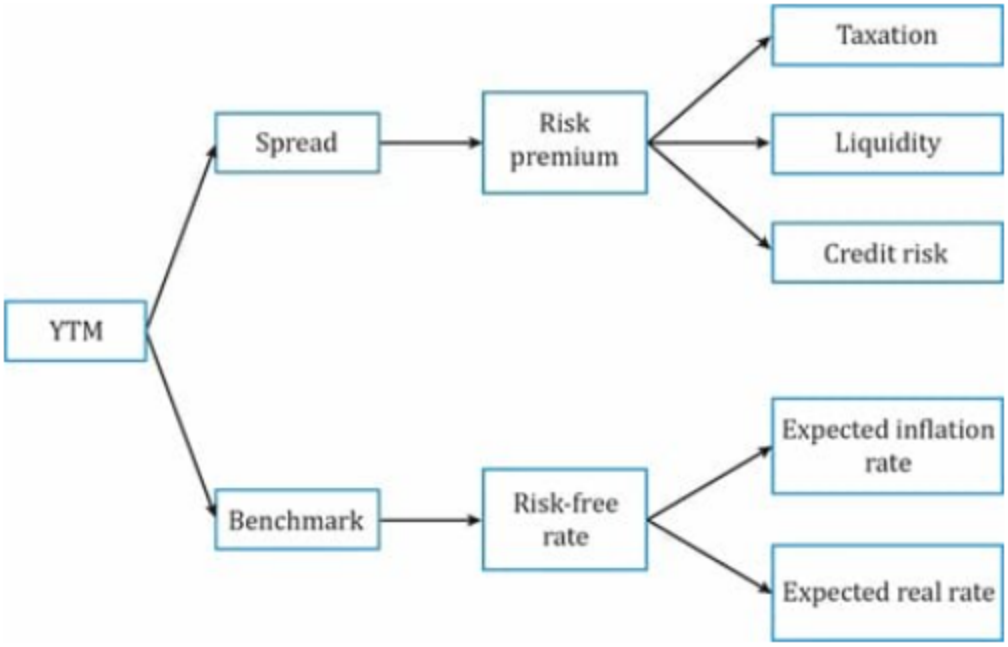
Steep: Long-term bond holders expect the economy to improve quickly in the future. Long-term investors fear being locked into low interest rates so therefore demand greater compensation more quickly than the more liquid short-term rate holders.

Flat: The market is at the point of inflection, preceding either a recession or an economic pick-up.

Yield Spreads:

The yield spread is the difference in yield between a fixed income security and a benchmark. SAy the YTM of a 3-year corporate bond is 7.00%. The benchmark rate is 3-year LIBOR, which is 5.00%. The yield spread of the corporate bond relative to the benchmark is 2.00%. Generally the benchmark reflects macroeconomic factors. A spread reflects microeconomic factors and aspects specific to the issuer such as credit quality of the issuer and bond, tax status etc.

The YTM spread can be explained using the following components:



Valuation and Pricing of Bonds

Bond pricing can be viewed as a three-step process:

- Step 1: obtain the cash flows the bondholder is entitled to.
- Step 2: obtain the discount rates for the maturities corresponding to the cash flow dates.
- Step 3: obtain the bond price as the discounted value of the cash flows.

First, one needs to obtain the cash flows on the bond to be priced. In particular, let us first assume that we are dealing with a straight default-free, fixed-coupon bond, so that the value of cash flows paid by the bond are known with certainty ex ante, that is, on the date when pricing is performed. In general, there are two parameters that are needed to fully describe the cash flows on a bond. The first is the maturity date of the bond, on which the principal or face amount of the bond is paid and the bond retired. The second parameter needed to describe a bond is the coupon rate.

To value a security, we discount its expected cash flows by the appropriate discount rate. The cash flows from a bond consist of coupon payments until the maturity date plus the final payment of par value. Therefore,

Valuation of a Coupon Bond

Bond value = Present value of coupons + Present value of par value
If we call the maturity date T and call the interest rate r, the bond value can be written as

$$\text{Bond value} = \sum_{t=1}^{T} \frac{\text{Coupon}}{(1+r)^t} + \frac{\text{Par value}}{(1+r)^T}$$

We call $\frac{1}{(1+r)^T}$

the PV factor, that is, the present value of a single payment of $1 to be received in T periods. Therefore, we can write the **price of the bond as**

$$\begin{aligned}\text{Price} &= \text{Coupon} \times \frac{1}{r}\left[1 - \frac{1}{(1+r)^T}\right] + \text{Par value} \times \frac{1}{(1+r)^T} \\ &= \text{Coupon} \times \text{Annuity factor}(r, T) + \text{Par value} \times \text{PV factor}(r, T)\end{aligned}$$

Valuation of a Zero-Coupon Bond

Because a zero-coupon bond has only a single payment at maturity, the value of a zero is simply the present value of the par or face value. Given the yield to maturity, the calculation on a semiannual basis is:

$$\text{bond value} = \frac{\text{maturity value}}{(1+i)^{\text{number of years} \times 2}}$$

Note that this valuation model requires just three pieces of information:
1. The bond's maturity value, assumed to be $1,000.
2. The semiannual discount rate, i.
3. The life of the bond, N years.

Taxonomy of Rates

There are a host of types of interest rates involved in the fixed-income jargon. These include:

Coupon Rate and Current Yield

The coupon rate is the stated interest rate on a security, referred to as an annual percentage of face value. It is commonly paid twice a year (in the United States, for example) or once a year (in France and Germany, for example). Each coupon entitles the bearer to a payment when a set date has been reached. Today, most bonds are registered in holders' names, and interest payments are sent to the registered holder, but the term coupon rate is still widely used.
It is essentially used to obtain the cash flows and shall not be confused with the actual current yield. The current yield yc is obtained using the following formula
yc = cN/P
where c is the coupon rate, N is the nominal value and P is the current price.

Yield to Maturity

The yield to maturity (YTM) is the single rate that sets the present value of the cash flows equal to the bond price. More precisely, the bond price P is found by discounting future cash flows back to their present value as indicated in the two following formulas depending on the coupon frequency:

When we assume that coupons are paid semiannually

$$P = \sum_{t=1}^{2T} \frac{CF_t}{\left(1 + \frac{y_2}{2}\right)^t}$$

the yield denoted by y_2 is expressed on a yearly basis with semiannual compounding where $2T$ is the number of semiannual periods.

When we assume that coupons are paid annually

$$P = \sum_{t=1}^{T} \frac{CF_t}{(1+y)^t}$$

the yield denoted by y is expressed on a yearly basis with annual compounding where T is the number of annual periods.

The yield to maturity (YTM) is the internal rate of return on the cash flows – the uniform interest rate that will make the sum of the present values of future cash flows equal to the price of the bond. It is the implied market discount rate. In simpler terms, it is a bond's internal rate of return – the rate of return on a bond including interest payments and capital gain if the bond is held until maturity. Yield to maturity is based on three important assumptions:

- The investor holds the bond to maturity.
- The issuer does not default on payments and pays coupon and principal as they come due
- The investor is able to reinvest all proceeds (coupons) at the YTM

Risk Associated with Investing in Bonds

Credit Risk

Bond default risk, usually called credit risk, is measured by Moody's Investor Services, Standard & Poor's Corporation, and Fitch Investors Service, all of which provide financial information on firms as well as quality ratings of large corporate and municipal bond issues. International sovereign bonds, which also entail default risk, especially in emerging markets, also are commonly rated for default risk. Each rating firm assigns letter grades to the bonds of corporations and municipalities to reflect their assessment of the safety of the bond issue. The top rating is AAA or Aaa, a designation awarded to only about a dozen firms. Moody's modifies each rating class with a 1, 2, or 3 suffix (e.g., Aaa1, Aaa2, Aaa3) to provide a finer gradation of ratings. The other agencies use a + or − modification. Those rated BBB or above (S&P, Fitch) or Baa and above (Moody's) are considered investment-grade bonds, whereas lower-rated bonds are classified as speculative-grade or junk bonds. Defaults on low-grade issues are not uncommon. For example, almost half of the bonds rated CCC by Standard & Poor's at issue have defaulted within 10 years. Highly rated bonds rarely default, but even these bonds are not free of credit risk. For example, in 2001 WorldCom sold $11.8 billion of bonds with an investment-grade rating. Only a year later, the firm filed for bankruptcy and its bondholders lost more than 80% of their investment. Certain regulated institutional investors such as insurance companies have not always been allowed to invest in speculative-grade bonds.

Determinants of Bond Safety Bond rating agencies base their quality ratings largely on an analysis of the level and trend of some of the issuer's financial ratios. The key ratios used to evaluate safety are:

1. **Coverage ratios**—Ratios of company earnings to fixed costs. For example, the times-interest-earned ratio is the ratio of earnings before interest payments and taxes to interest obligations. The fixed-charge coverage ratio includes lease payments and sinking fund payments with interest obligations to arrive at the ratio of earnings to all fixed cash obligations (sinking funds are described below). Low or falling coverage ratios signal possible cash flow difficulties.

2. **Leverage (e.g., debt-to-equity) ratios** —A too-high leverage ratio indicates excessive indebtedness, signaling the possibility the firm will be unable to earn enough to satisfy the obligations on its bonds.

3. **Liquidity ratios**—The two most common liquidity ratios are the current ratio (current assets/current liabilities) and the quick ratio (current assets excluding inventories/current liabilities). These ratios measure the firm's ability to pay bills coming due with its most liquid assets.

4. **Profitability ratios**—Measures of rates of return on assets or equity. Profitability ratios are indicators of a firm's overall financial health. The return on assets (earnings before interest and taxes divided by total assets) or return on equity (net income/ equity) are the most popular of these measures. Firms with higher returns on assets or equity should be better able to raise money in security markets because they offer prospects for better returns on the firm's investments.

5. **Cash flow-to-debt ratio**—This is the ratio of total cash flow to outstanding debt.

Moody's periodically computes median values of selected ratios for firms in several rating classes, which is presented below. Of course, ratios must be evaluated in the context of industry standards, and analysts differ in the weights they place on particular ratios. Nevertheless, this table demonstrates the tendency of ratios to improve along with the firm's rating class.

	Aaa	Aa	A	Baa	Ba	B	C
EBITA/Assets (%)	20.9%	15.6%	13.8%	10.9%	9.1%	7.1%	4.0%
Operating profit margin (%)	22.0%	17.1%	17.6%	14.1%	11.2%	8.9%	4.1%
EBITA to interest coverage (multiple)	28.9	15.1	9.7	5.9	3.5	1.7	0.6
Debt/EBITDA (multiple)	0.58	2.03	1.83	2.58	3.41	5.26	8.35
Debt/(Debt + Equity)	19.3%	50.2%	38.6%	46.2%	51.7%	72.0%	98.0%
Funds from operations/Total debt (multiple)	1.335	0.385	0.425	0.296	0.206	0.120	0.031
Retained cash flow/Net debt (multiple)	1.3	0.3	0.4	0.3	0.2	0.1	0.0

Suppose a firm issued a 9% coupon bond 20 years ago. The bond now has 10 years left until its maturity date, but the firm is having financial difficulties. Investors believe that the firm will be able to make good on the remaining interest payments, but at the maturity date, the firm will be forced into bankruptcy, and bondholders will receive only 70% of par value. The bond is selling at $750. Yield to maturity (YTM) would then be calculated using the following inputs:

	Expected YTM	Stated YTM
Coupon payment	$45	$45
Number of semiannual periods	20 periods	20 periods
Final payment	$700	$1,000
Price	$750	$750

The stated yield to maturity, which is based on promised payments, is 13.7%. Based on the expected payment of $700 at maturity, however, the yield to maturity is only 11.6%. The stated yield to maturity is greater than the yield investors actually expect to earn. This example suggests that when a bond becomes more subject to default risk, its price will fall, and therefore its promised yield to maturity will rise. Similarly, the default premium, the spread between the stated yield to maturity and that on otherwise comparable Treasury bonds, will rise. However, its expected yield to maturity, which ultimately is tied to the systematic risk of the bond, will be far less affected.Suppose that the condition of the firm in the example deteriorates further, and investors now believe that the bond will pay off only 55% of face value at maturity. Because of the higher risk, investors now demand an expected yield to maturity of 12% (i.e., 6% semiannually), which is .4% higher than in the last example. But the price of the bond will fall from $750 to $688 [n = 20; i = 6; FV = 550; PMT = $45]. At this price, the stated yield to maturity based on promised cash flows is 15.2%. While the expected yield to maturity has increased by .4%, the drop in price has caused the promised yield to maturity to rise by 1.5%.

To compensate for the possibility of default, corporate bonds must offer a default premium. The default premium is the difference between the promised yield on a corporate bond and the yield of an otherwise-identical government bond that is riskless in terms of default. If the firm remains solvent and actually pays the investor all of the promised cash flows, the investor will realize a higher yield to maturity than would be realized from the government bond. If, however, the firm goes bankrupt, the corporate bond is likely to provide a lower return than the government bond. The corporate bond has the potential for both better and worse performance than the default-free Treasury bond. In other words, it is riskier.

Credit Default Swap:

A credit default swap (CDS) is, in effect, an insurance policy on the default risk of a bond or loan. The CDS seller collects annual payments for the term of the contract but must compensate the buyer for loss of bond value in the event of a default.14 To illustrate, as the Greek government struggled to deal with its debt burden, the annual premium on a 5-year Greek government CDS in 2010 was about 3%, meaning that the CDS buyer would pay the seller an annual “insurance premium” of $3.00 for each $100 of bond principal. In contrast, CDS prices on 5-year bonds of the financially strong German government were less than .5%.

As originally envisioned, credit default swaps were designed to allow lenders to buy protection against default risk. The natural buyers of CDSs would then be large bondholders or banks that wished to enhance the creditworthiness of their outstanding loans. Even if the borrower had a shaky credit standing, the “insured” debt would be as safe as the issuer of the CDS. An investor holding a bond with a BB rating could, in principle, raise the effective quality of the debt to AAA by buying a CDS on the issuer.This insight suggests how CDS contracts should be priced. If a BB-rated corporate bond bundled with insurance via a CDS is effectively equivalent to an AAA-rated bond, then the premium on the swap ought to approximate the yield spread between

AAA-rated and BB-rated bonds. The risk structure of interest rates and CDS prices ought to be tightly aligned.

CDS contracts trade on corporate as well as sovereign debt. While CDSs were conceived as a form of bond insurance, it wasn't long before investors realized that they could be used to speculate on the financial health of particular issuers. For example, an investor in early 2008 who predicted the imminent financial crisis might have purchased CDS contracts on mortgage bonds as well as the debt of financial firms and would have profited as their CDS prices spiked in September. In fact, hedge fund manager John Paulson famously did just this. His bearish bets in 2007–2008 on commercial banks and Wall Street firms as well as on some riskier mortgage-backed securities made his funds more than $15 billion, bringing him a personal payoff of more than $3.7 billion.

Market Risk

Perceptions of increasing risk within and outside the banking sector have contributed to the credit crisis, and these perceptions are reflected in the wide fluctuations and volatility seen in bank funding markets. One key measure of perceived risk and volatility in markets is the TED spread. The TED spread is the difference between the London Interbank Offered Rate (LIBOR) (the benchmark for the interest rate banks charge one another for loans) and the rate on comparable-term Treasury bills, usually 3 or 6 months. Because a Treasury bill is considered a risk-free security, the difference between it and LIBOR, which is a gauge of banks' confidence in each other, is a good measure of concern in lending markets.

Inflation Risk

Inflation, though a measure of economic growth, has a significant decay effect on the value of bonds as it eats away at the purchasing power of the future value of payout. Bond Holders benefit from increasing inflation as the purchasing value of their payout/debt gets eroded. Bond Investors similarly suffer from reduced FV when the market expects inflation to be high in the future and hence they demand higher yield on the same bond. Inflation is measured using CPI(Consumer Price Index) which monitors and indexes a basket of consumer goods and as inflation increases, the value of the CPI index increases proportionally. However in order to find the market's expectation of possible inflationary risk, we can use something called the TIPS Spread.

TIPS

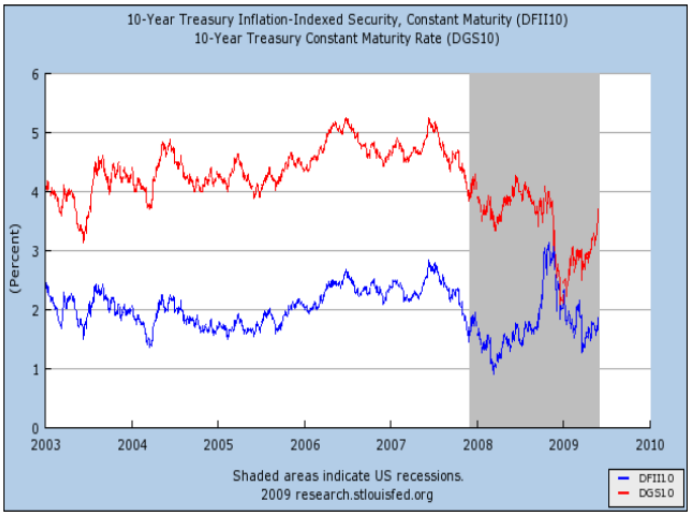
Treasury Inflation-Protected Securities, or TIPS, are inflation-protected bonds (IPBs) that are issued by the U.S. Treasury. Their face value is pegged to the CPI and adjusted in step with changes in the rate of inflation. The Treasury then pays interest on the adjusted face value of the bond, creating a gradually rising stream of interest payments as long as inflation continues to rise. At maturity, a TIPS investor will receive the original face value plus the sum of all the inflation adjustments since the bond was issued.

TIPS Spread

The TIPS Spread is a simple comparison between the yield of Treasury Inflation Protection Securities (TIPS) and the yield of conventional U.S. Treasuries with the same maturity date.Even though these securities have the same maturity date, they have different yields because the payments for TIPS adjust for inflation while the payments for conventional Treasuries do not.In principle, comparing the yields between conventional Treasury securities and TIPS can provide a useful measure of the market's expectation of future CPI inflation.

At a basic level, the yield-to-maturity on a conventional Treasury bond that pays its holder a fixed nominal coupon and principal must compensate the investor for future inflation. Thus, this nominal yield includes two components: the real rate of interest and the inflation compensation over the maturity horizon of the bond. For TIPS, the coupons and principal rise and fall with the CPI, so the yield includes only the real rate of interest.

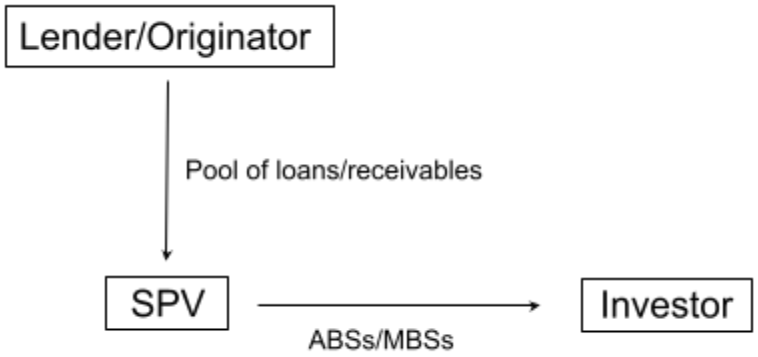
Therefore, the difference, roughly speaking, between the two yields reflects the inflation compensation over that maturity horizon.The wider the spread between the two yields, the higher investors' expectations are.The narrower the spread between the two yields, the lower investors' expectations are.



Securitization

Introduction to Securitization:
Mortgage-backed securities (MBSs) and asset-backed securities (ABSs) make up what is called the securitized debt market. The MBS and ABS creation process which involves combining many similar debt obligations as the collateral for issuing securities is called *securitization*. It consists of transforming the illiquid assets of a lending entity (financial institution or corporation) into tradable securities, backed by these assets. Precisely said, MBSs and ABSs are collateralized by a pool of loans, whose cash flow payments are used to pay the cash flows on the securities. Mortgage securitization is primarily done to increase the debt's attractiveness to investors and to decrease their(investor) required rates of return, increasing the availability of funds for home mortgages for the lending agency.

There are three participants involved in the securitization process:



• The originator, i.e, the original lender.
• The issuer, i.e, the investor who buys loans from the originator. He gathers them into a pool and issues securities guaranteed by the pool. Typically, the issuer creates a Special Purpose Vehicle (SPV), (which is also an off-balance sheet entity) designed for holding the pool of loans separately from the other assets of the originator, and so ensuring that the cash flows from the pool are entirely dedicated to servicing the securities backed by this pool. In case the originator goes bankrupt, the SPV continues to pay the proceeds from the loans to security holders.
• The trustee, that is, the entity that protects the rights of the security holders

The Government Sponsored Enterprises (GSEs), notably Fannie Mae (FNMA, or Federal National Mortgage Association) and Freddie Mac (FHLMC, or Federal Home Loan Mortgage Corporation), were created by the federal government of USA in 1938 and 1970, respectively, to perform securitization: the GSE's bought mortgage loans that met certain conditions from banks in order to facilitate mortgage lending and (theoretically) lower mortgage interest rates. These ABSs and MBSs then became a precursor to CDOs(Collateral Debt Obligation) and CMOs(Collateral Mortgage Obligations) - created two decades later, which were at the core of the Subprime Mortgage Crisis in 2008 that led up to the Global Financial crisis.

Advantages of Securitization:

For an issuer:

- Reduction in the size of its balance sheet by transferring a part of its assets, which in turn releases funds and helps in its reallocation. For example, they can acquire new loans or receivables from the sale of MBSs or ABSs, that is, they will replace their securitized assets with new loans or receivables.
- Refinance at an attractive cost, since the interest payable on ABSs and MBSs is lower than the interest payable on the underlying loans

For an investor:

- They generally have a high credit quality (AA–AAA) i.e, almost zero risk of default
- They are more liquid than corporate securities
- Often used to capture spread over Treasury bonds and enhance the yield on their portfolios without giving up credit quality and liquidity

Mortgage-Backed Securities (MBS)

What is a mortgage?

A mortgage is a loan secured by the collateral of some specified real estate property, either residential or commercial. In case the borrower, also called the mortgagor, fails to make the contracted payments, the lender, also called the mortgagee, has the right to seize the property so as to be paid back.

However, the cash flows from a mortgage are slightly different from the cash flows of a coupon bond.

Mortgage loans involve a series of equal payments consisting of the periodic interest on the outstanding principal and a partial repayment of the principal amount. Hence they come under fixed income securities.

In the USA, residential real estate mortgages are typically for 30 years and consist of 360 equal monthly payments. In the early years, the greater portion of the payment is interest, and the final payment, after 30 years, is almost all principal.

What is a MBS?

Mortgage-backed securities (MBSs) are securities that are backed by the cash flows of a mortgage or a pool of mortgages. Simple stated, a mortgage backed security is any security where the collateral for the issued security is a pool of mortgages.

They can be divided into three types, which will be examined later on:

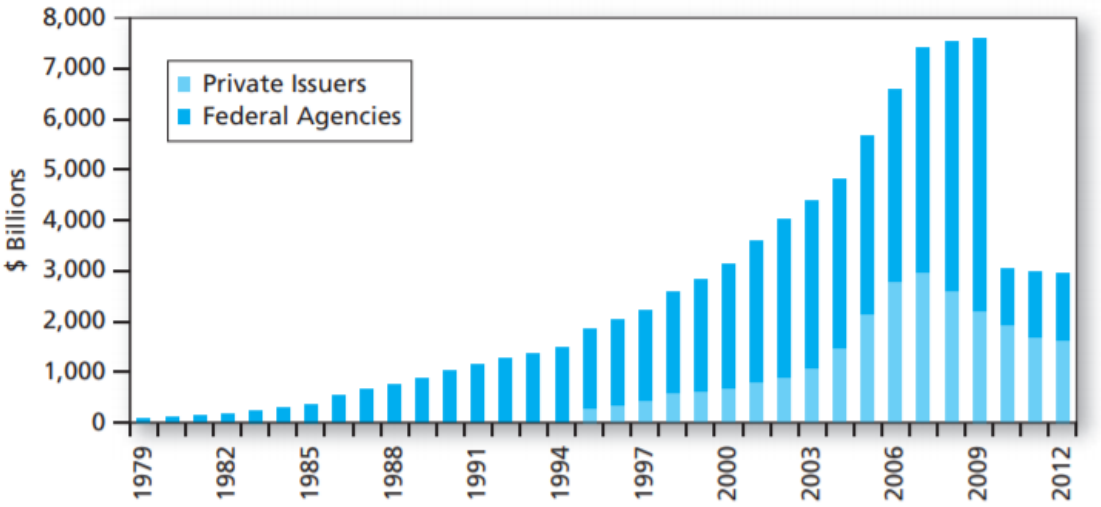
- Mortgage pass-through securities
- Collateralized mortgage obligations (CMOs)
- Stripped mortgage-backed securities

1. **Mortgage pass-through security:**

Mortgage pass-throughs are the simplest form of MBSs. A pass-through unit represents a share of the underlying mortgage pool. The cash flows generated by the pool are passed on proportionally to each security holder. A holder of a mortgage passthrough security that owns say, a 10% portion of the issue will receive a 10% share of all the monthly cash flows from all the mortgages, after a small percentage fee for administration is deducted.

- Each monthly payment consists of three components: ***interest, scheduled principal payments, and prepayments (of principal in excess of the scheduled amount).***
- Since each holder receives a percentage of all cash flows, a mortgage passthrough security has prepayment risk as a single mortgage would, but there is some diversification benefit from the pooling of hundreds of thousands of mortgages.

Once the securitization concept gained traction, it paved the path for a new product: the securitization of nonconforming “subprime” loans with higher default risk by private firms/banks. The investor in the private-label pool would face the risk of homeowners defaulting on their loans, which was a significant difference between government agency pass-throughs and these so-called private-label pass-throughs. As a result, as long as the loans could be sold to an investor, originating mortgage brokers had little motivation to undertake due diligence on them.
When housing prices began to fall, these loans quickly became "underwater," meaning that the house was worth less than the loan sum, MBS losses grew, and many homeowners chose to default on their loans.
The figure below demonstrates the explosive growth of both the Federal and Private-label issued MBSs in the USA, at least until the crisis.

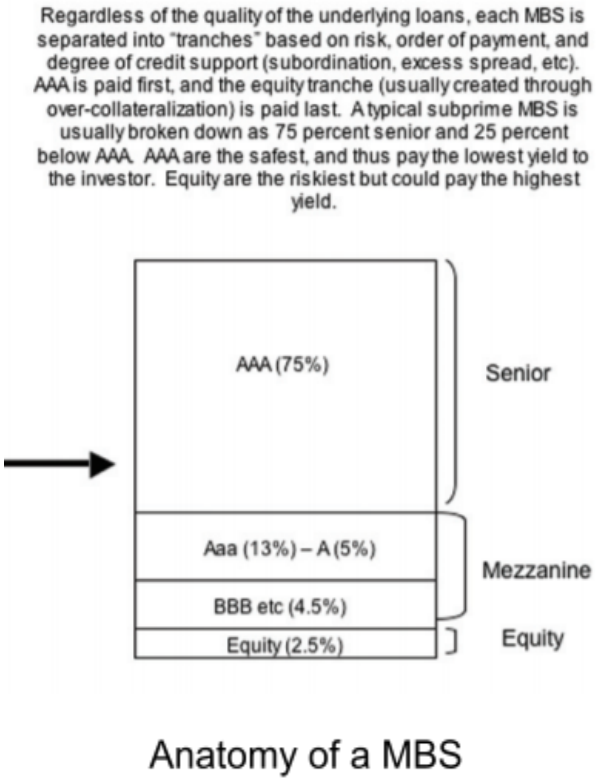


Mortgage-Backed Securities Outstanding
Source : Flow of Funds Accounts of the United States, Board of Governors of the Federal Reserve System, June 2012

2. **Collateralized Mortgage Obligation (CMOs):**

CMOs differ from mortgage pass-throughs in that they distribute cash flows to security holders on a priority basis. Also referred to as derivative mortgage-backed securities, since they are derived from a simpler MBS structure. CMOs have a more complex structure than mortgage pass throughs. They are structured in maturity classes, called tranches. All principal payments (regular principal payments as well as prepayments) are allocated to the first or senior tranche until it is fully paid off; then, the second tranche or mezzanine holders are paid next, and the junior-most or equity tranche receives whatever is left. In this way, prepayment risk is redistributed among the different tranches. As a result, the first tranche has the shortest maturity, while the last tranche has the longest maturity.

A senior tranche has a preferred claim on the stream of returns generated by the mortgages; Over-collateralization is when the face value of the mortgage assets in the pool is higher than the face value of the repackaged securities. The over-collateralized part of the MBS is also called the “equity” tranche, as its holders are the first to lose money in case of default and receive whatever money is “left over” if there are below-than-expected defaults.



Anatomy of a MBS

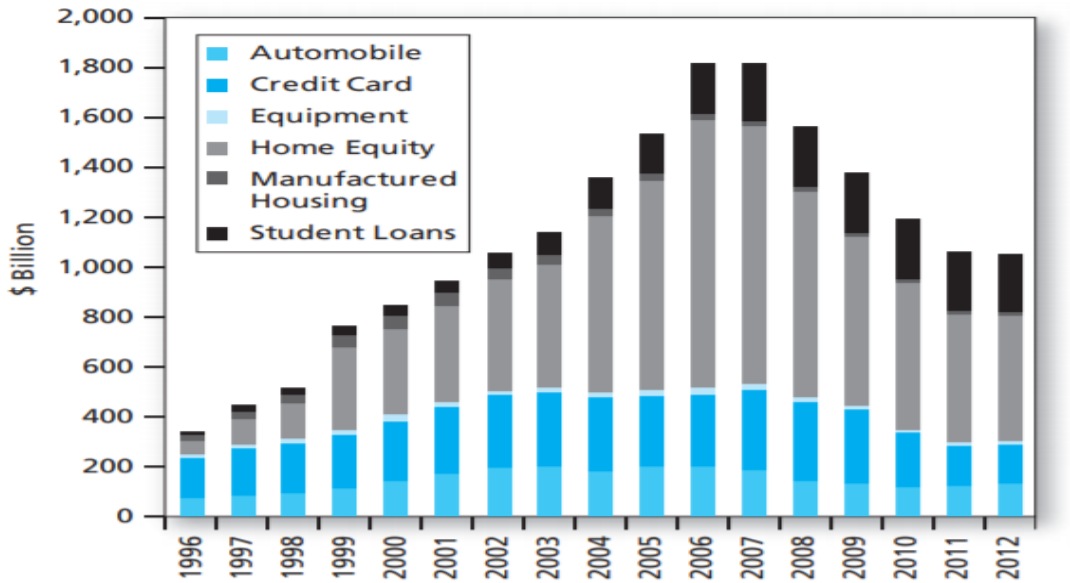
An important point to be noted here is that the repackaging of MBS into tranches does nothing to reduce the overall risk of the mortgage pool, rather it rearranges it. The senior tranches are less risky and eligible for high investment grade credit ratings, as they are (theoretically) well insulated from the default risk. On the other hand, the lower tranches are much more risky and can face losses very quickly; the equity tranche has the potential for huge returns when defaults are low but are also the first to be wiped out when the default rate hits even a small amount above what is expected. Tranching only redistributes the risk according to risk appetite of investors: senior tranches pay a lower yield but are safer bets, and the junior tranches pay a higher yield and are riskier.

3. **Stripped mortgage-backed securities:**

Stripped MBSs are either the principal or interest portions of a mortgage passthrough security. They are structured in two classes: an Interest Only class (IO) and a Principal Only class (PO). The IO class receives all interest payments, while the PO class receives all principal payments. Stripped MBSs are highly sensitive to prepayment rates, and hence riskier than mortgage pass-throughs. The holder of a principal-only strip will gain from prepayments because the face value of the security is received sooner rather than later. When prepayment rates are greater, the holder of an interest-only strip will receive fewer total coupon payments because interest is only paid on the outstanding principal amount, which is decreased by prepayments.

Despite the troubles caused by MBSs during the financial crisis, few believe that securitization itself will cease. However, practices in this market are highly likely to become more conservative particularly concerning the credit standards that the ultimate borrower must meet. Securitization is, in fact, becoming a more widespread feature of many credit markets.

Car loans, student loans, home equity loans, credit card loans, and even private company debt are increasingly frequently packaged into pass-through securities that may be traded on the stock exchange. The figure below illustrates the rapid growth of non-mortgage asset-backed deposits.The market expanded more than five-fold in the decade ending 2007. It contracted considerably after the financial crisis as the perceived risks of credit card and home equity loans skyrocketed, but the asset-backed market is still substantial.



Asset-Backed Securities outstanding
Source: The Securities & Industry and Financial Markets Association, www.sifma.org

Asset-Backed Securities

ABSs, like MBSs, are securities that are solely backed by the cash flows of a package of financial assets. Collaterals are divided into two categories: consumer financial assets and commercial financial assets. Automobile loans, boat loans, home equity loans, student loans, and credit cards are examples of the former.
The latter category contains among others computer leases, manufactured housing loans, small business administration loans, agricultural machinery loans and trade receivables. The three major collateral types are automobile loans, home equity loans and credit card receivables.

Compared to typical corporate bonds, which hold a general claim on a corporation's business assets, ABSs have the highest priority claim on a pool of specific assets, isolated by the issuer from the company's total assets. This gives ABSs their secured status. Typically, trust issues ABSs with different credit ratings. These credit ratings correspond to priority ranks in receiving cash flow payments from the trust in case of default. This is very similar to how MBS were divided into tranches. The ranks are referred to as seniority classes. For instance, it may be structured in three categories: a senior level, rated AAA, a middle or "mezzanine" class, rated A, and a subordinated class rated BBB or BB.

Motivation for a Firm to Issue an Asset-Backed Security
To reduce borrowing costs and by transferring the assets into a separate entity, the entity can issue the bonds and receive a higher rating than the unsecured debt of the corporation. The higher rating reduces the required yield on the (ABS) debt.

Credit Enhancement Mechanism
To provide bondholders with protection against adverse credit events like defaults, the credit quality of ABSs is improved compared to that of the underlying loans or receivables through what is known as the credit enhancement mechanism. Because asset-backed securities, on their own, may not receive the highest possible credit rating, the issuer may choose to enhance the credit rating by providing additional guarantees or security.
Credit quality can be enhanced either externally or internally. External credit enhancement commonly takes the following forms:

- *Excess spread protection*: The interest rate on the underlying assets is generally much higher than that of the ABSs. The difference between the two, adjusted for servicing fees, trust costs and default provisions, equals the excess spread. It is usually payable to the issuer. However, it can be distributed to bondholders in case losses are more significant than provisioned.
- *Subordination*: The ABS is structured in two portions: a senior tranche and a junior tranche subordinated to the senior tranche. The senior tranche holds priority in receiving cash flow payments from the trust. In other words, in case of a cash flow shortfall from the collateral, the obligations of the senior tranche are the first ones to be honoured. The junior tranche serves as a buffer that absorbs losses wholly or partly until it is entirely exhausted. This form of credit enhancement is widely used in the ABS market.

Bond Portfolio Management

Various strategies bond portfolio managers can pursue are mainly of two kinds: passive and active strategies. A passive investment strategy assumes that market prices of securities are set relatively. Instead of attempting to beat the market by exploiting superior information, passive managers try to maintain an appropriate risk-return balance given market opportunities compared to an active investment strategy that attempts to achieve returns more significant than those comparable with the risk borne.

Passive Bond Management
In the fixed income market, there are two types of passive management. The first is an indexing technique that tries to match the performance of a specific bond index. The second large category of passive methods is immunisation procedures, which are commonly utilised by financial organisations such as insurance companies and pension funds to protect the overall financial position of the institution from exposure to interest rate fluctuations.

1. **Bond-Index Funds**: Many investors manage portfolios (or parts of portfolios) to match index returns. This is known as bond indexing. Bond index funds occupy a relatively small niche in the world of mutual funds; only approximately 3% of all bond fund assets are invested in bond index funds—the Barclays Aggregate U.S. Bond Index is most commonly used, as it covers most U.S.-traded bonds and some foreign bonds. The simplest way to replicate an index is to buy most of the securities in the index in the proper proportions. While this approach is preferred for equities, it is not practical with bonds because of difficulties specific to the bond market and its indexes. There are some advanced techniques used for constructing a bond-index fund that is not in the module's scope.

2. **Immunisation**: In contrast to indexing strategies, many institutions try to insulate their portfolios from interest rate risk altogether. Such methods are referred to as Immunisation techniques.

Many banks have a natural mismatch between asset and liability maturity structures. Bank liabilities are primarily the deposits owed to customers, most of which are very short-term in nature and, consequently, of low duration. Bank assets, by contrast, are mainly composed of outstanding commercial and consumer loans or mortgages. These assets are of longer duration, and their values are correspondingly more sensitive to interest rate fluctuations. When interest rates increase unexpectedly, banks can suffer severe decreases in net worth—their assets fall in value by more than their liabilities.
So immunisation minimises the interest rate risk by adjusting the portfolio duration to match the investor's investment time horizon. It does so by locking in a fixed rate of return during the amount of time an investor plans to keep the investment without cashing it in.

Typically, interest rates affect bond prices inversely. When interest rates rise, bond prices decrease. But when a bond portfolio is immunised, the investor receives a specific rate of return over a given time regardless of what happens to interest rates during that time. In other words, the bond is "immune" to fluctuating interest rates.

Active Bond Management

Active fixed-income portfolio managers assume that investment and arbitrage opportunities exist, which yield a higher return on average than the cost incurred to implement these strategies. Their objective is to have their portfolios outperform the benchmark index. Typically, there are two kinds of active strategies:

1. Trading on interest-rate predictions, which is called **Market Timing** :

Active portfolio managers make some bets on changes in the yield curve or one particular segment of the yield curve. There are mainly three kinds of bets:

• Timing bets based on no changes in the yield curve.
• Timing bets based on interest-rate level.
• Timing bets based on both slope and curvature movements of the yield curve.

For a given strategy, a set of scenarios allows for the following two analyses: first, evaluating the break-even point from which the strategy will start making or losing money; second, estimating the risk that the expectations are not realized. In short, portfolio managers can calculate the return and risk of the strategy implied by their expectations and act coherently.

2. Trading on market inefficiencies, which is called **Bond Picking** :

Another approach to active bond portfolio management consists of trying to detect mispriced securities. There are mainly two kinds of trading:

• The first one which takes place within a given market is called the bond relative value analysis.
• The second one is across markets. It concerns both spread and convergence trades.

Bond relative value is a technique that consists of detecting bonds that are underpriced by the market to buy them and bonds that are overpriced by the need to sell them. Two methods exist that are very different. The first method consists of comparing the price of two equivalent instruments in terms of future cash flows. These two instruments are a bond. The sum of the strips (same as bonds except that the bond's principal has been stripped from its interest (coupons)) reconstitutes exactly the bond. Suppose the prices of these two instruments are not equal. In that case, there is a risk-free arbitrage opportunity because they provide the same cash flows in the future. The goal of the second method is to detect overpriced and underpriced securities that historically present abnormal yield to maturity, taking as reference a theoretical zero-coupon yield curve fitted with bond prices.