

# Investing in Bonds

---

Joaquim Montezuma de Carvalho

# Valuation of Bonds and Their Yield Rates

---

□ **Bond (definition)** → Debt instrument that pays interest at regular intervals and that matures at some specific date in the future.



The lender buys the bond from the corporation, for maybe € 1.000, and every six months he receives a **guaranteed interest payment** → called the **Coupon**.

➤ **Term of the Bond:** can be as short as several months or more than thirty years

➤ **Maturity Value or Redemption Value:** value of the bond at the end of its term.

➤ **Redeeming the Bond:** process called when the bond holder receives his principal back at the maturity date.



The redemption value at the maturity date is typically the face value of the bond.

The amount the holder originally paid for it could be less than face value if it was purchased at auction.

□ **How the Corporation or Government will redeem the Bonds at the maturity date?**

- Using regular earnings or revenue fees to pay the coupon.
  - Establishing a sinking fund to plan for the redemption of the bond issue at the maturity date.
-

# Sinking Fund

---

- ❑ **A sinking Fund : Na Ordinary annuity with a known future value that represents some debt or obligation that is coming due.**

## **Example:**

**A corporation issues \$2.000.000 pieces of commercial paper that comes due in 2 years. If it sets up a sinking fund with an institution that pays 7,0% (annual capitalized quarterly), what will its quarterly payment be? Set up a schedule showing the accumulation of the assets in this sinking fund.**

---

# Valuation of Bonds and Their Yield Rates

---

## ❑ Bonds → Ways of Classification:

→ **Coupon Bonds:** unregistered bonds that have coupons attached that are presented to the trustee (usually a commercial bank) for payment of interest.

→ **Mortgage Bonds:** pledge certain fixed assets as security or collateral for the debt.

→ **Convertible Bonds:** provide all of the regular features of a bond, like interest coupons and a maturity date.

↓  
*2 embedded options:*

1. Giving the investor the option to convert the bond into a specific number of shares of common stock → the investor could realize significant capital gain if the price of the stock were to increase.
  2. Call Provision → allows the issuer of the bonds to redeem them at a specified price before maturity → Bonds with a call provision must pay higher rates to be competitive.
-

# Valuation of Bonds and Their Yield Rates

---

## ❑ Bonds → Ways of Classification:

→ **Zero Coupon or Discount Bonds:** pays no interest but are sold like treasury bills.

↓  
The investor buys them at a discount and receives the face value at maturity.

→ **Indexed Bond:** has an interest payment structure tied to inflation so that the returns are increased as the Consumer Price Index increases.

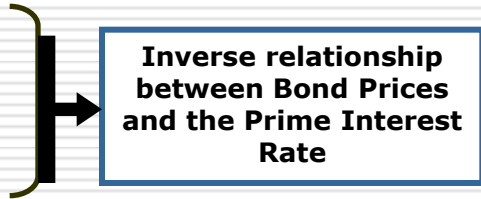
❑ Bonds have a significant place in the day-to-day trading of the securities secondary market.

### Bond Prices:

- Fluctuate less because their value is related to the rise and fall of prime interest rates.
- Rise and fall with interest rates because bonds are paying interest to their owners.

If other securities are paying a higher rate → bonds will have to sell at a lower price in order for an investor to make the same return.

In times of low prime rates → bonds that are paying interest at a higher rate will be a more attractive investment and can sell for a higher price.



**Inverse relationship  
between Bond Prices  
and the Prime Interest  
Rate**

# Bonds (example)

---

## **Obrigações do Tesouro**

### **Fixed Rate Bonds (OT)**

The Obrigações do Tesouro (OT) are the main instrument used by the Republic of Portugal to satisfy its borrowing requirements. OT are medium- and long-term book-entry securities issued with maturities of between 1 and 50 years;

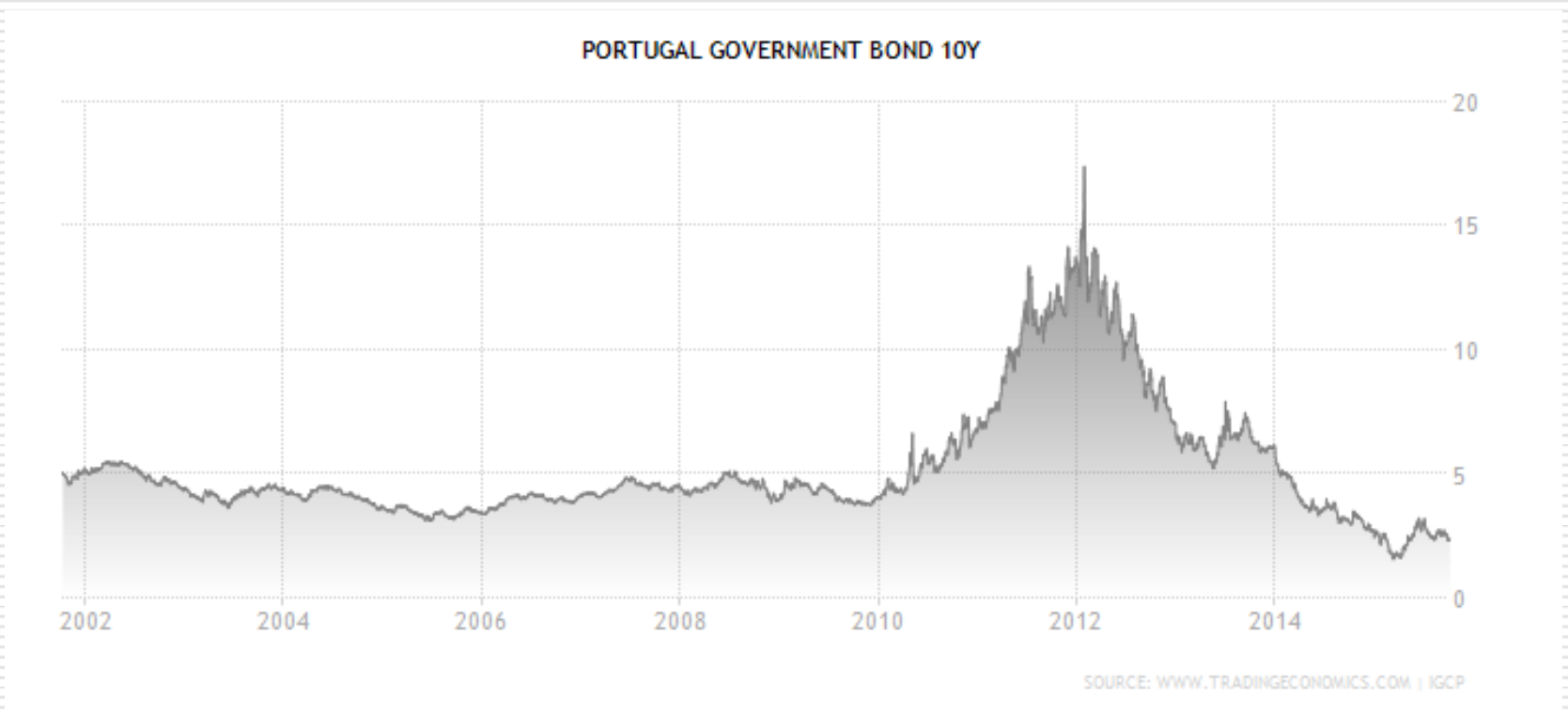
bearing a fixed interest rate coupon or not (zero coupon);

redeemable on maturity at nominal value and

Two methods have been adopted, by IGCP, (Agencia de Gestão de Tesouraria e Divida Publica), for the issue of OT in the primary market: through banking syndicate and via auction.

---

# PORTUGUESE GOVERNMENT BONDS 10 Year (2002-2015)



Source: Trading Economics, October 2015

# Valuation of Bonds and Their Yield Rates

---

→ **Yield** is calculated by dividing the annual interest payment by the bond value

→ **Yield to Maturity:** unless a bond is called early, the yield to maturity is the rate of return the buyer gets if he buys and holds the bond until its maturity date when it is redeemed at par. Otherwise is the interest rate that would equate interest and principal payments to be received in the future relative to the present cost. YTM also called the effective rate of return.

→ **Current Yield:** is the rate of return for a given year; it is simply the annual interest earned divided by the bond current market value.

*(e.g. A €1.000 bond paying 8% and purchased for €950 would have a current yield of 8,4%)*

Using the equation, we can calculate the value of "YTM".

$$P = C/(1+YTM)^1 + C/(1+YTM)^2 + C/(1+YTM)^3 + \dots + (C+S)/(1+YTM)^n$$

Where

V = purchase price (market value)

S = redemption value

C = annual coupon payment

YTM = yield to maturity

n = number of years to maturity

---



# Valuation of Bonds and Their Yield Rates

---

## □ Rates involved in a bond price calculation :

**1. Bond Rate:** determines the coupon or amount of interest the bond pays.

*The coupon typically pays semiannually over the life of a bond*

This sequence of payments is called → **Coupon Annuity**

**2. Yield Rate:** is used to find the present value of the coupon annuity and the present value of the redemption value.

*These two present values are added to give the current price of the bond that will return the desired yield to the buyer.*

### **Formula for the Value of a Bond**

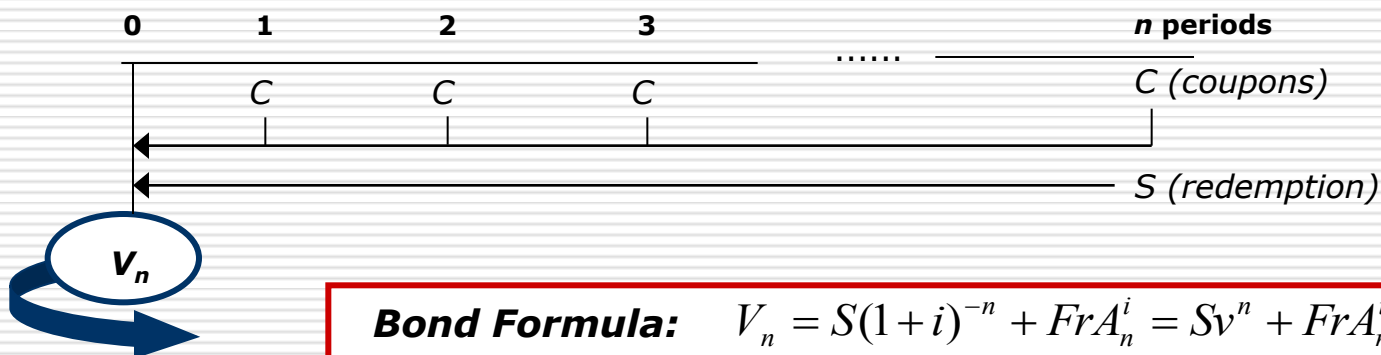
<b>F</b>	Face value or par value of a bond,
<b>S</b>	The redemption value of a bond (future value),
<b>r</b>	Interest rate paid by the bond each period,
<b>C=Fr</b>	Interest paid by the bond (the face value times the bond rate),
<b>n</b>	Number of interest periods to the maturity date,
<b>i</b>	Current yield (or investor's desired rate of return per period),
<b>V<sub>n</sub></b>	Value (or price which will give the desired yield).

---

# Valuation of Bonds and Their Yield Rates

**Value of a Bond = PV of the redemption price + PV of the coupon annuity**

## Method of Discounted Cash Flows : Time line Diagram



The cash flows in the present are equal except the redemption value  $S$ .

### **Relationship between the time to maturity and the interest rate:**

➤ For a given bond the time to maturity  $n$  and the yield rate  $i$  will both significantly effect the value of the bond.

**Term  
Structure  
of  
Interest Rates**