

FIN 2704/2704X

Week 6 Slides

Introduction to Bond

Learning objectives

- Understand what a bond is
- Recognize the important bond features



What is a Bond?

- A bond is the **long-term debt instrument** sold to raise money
- Government, municipalities and companies can turn to the public to borrow money by issuing bonds
- One who buys a corporate bond is a **creditor** of the company; **NOT an owner** (unlike stockholders who are owners)



LTA Sells S\$1.4b Bond, Its Second Mega Deal in 2019



THE Land Transport Authority of Singapore has sold a S\$1.4 billion 35-year bond, its second massive deal this year. The latest issue carries a **3.30 per cent coupon**, said DBS Bank, one of the joint bookrunners for the deal on Wednesday. The other bookrunners were HSBC, OCBC Bank and United Overseas Bank....The latest LTA issue was well received, with broad based participation and a growing number of investors, said Clifford Lee, DBS Bank head of fixed income.

"It has been exciting for us because the LTA is very progressive in approaching both book building and distribution," said Mr Lee. It is critical to have broad based participation as this will ensure secondary trading, which is important for creating a benchmark for subsequent issuances, he said. ...LTA ...are a highly sought after issuer and much is bought by long term hold investors."

Typical investors of long-term bonds include insurers and various types of asset or fund managers. Geographically, Singapore-based investors have dominated the deal, he said.

In the past, government-linked entities focused on the price so the deals would be done on a bidding basis with the bonds ending up in the hands of just a handful of banks.

"But LTA is more progressive, it wants to broaden the investor base, attract new investors and deepen the Singapore dollar market further so that it can accommodate longer term financing for infrastructure investments," said Mr Lee. "This bodes well for Singapore's ambition to become an infrastructure financing hub," he said.

...Market volatility has meant that investors are turning back to bonds as a defensive strategy, said Mr Lee.



Bond Terminologies

- **Par Value:** The face value of a bond (i.e., its principal amount) assigned by the issuer; this amount will be repaid at the end of the term. It is generally \$1,000, unless otherwise stated (e.g. par value could also be \$100).
- **Coupon:** A bond's periodic interest payment (the actual period payment made to the holder of the bond)
- **Coupon rate:** The stated annual coupon interest rate of the bond. It is equal to the annual coupon payment divided by the par value of the bond.

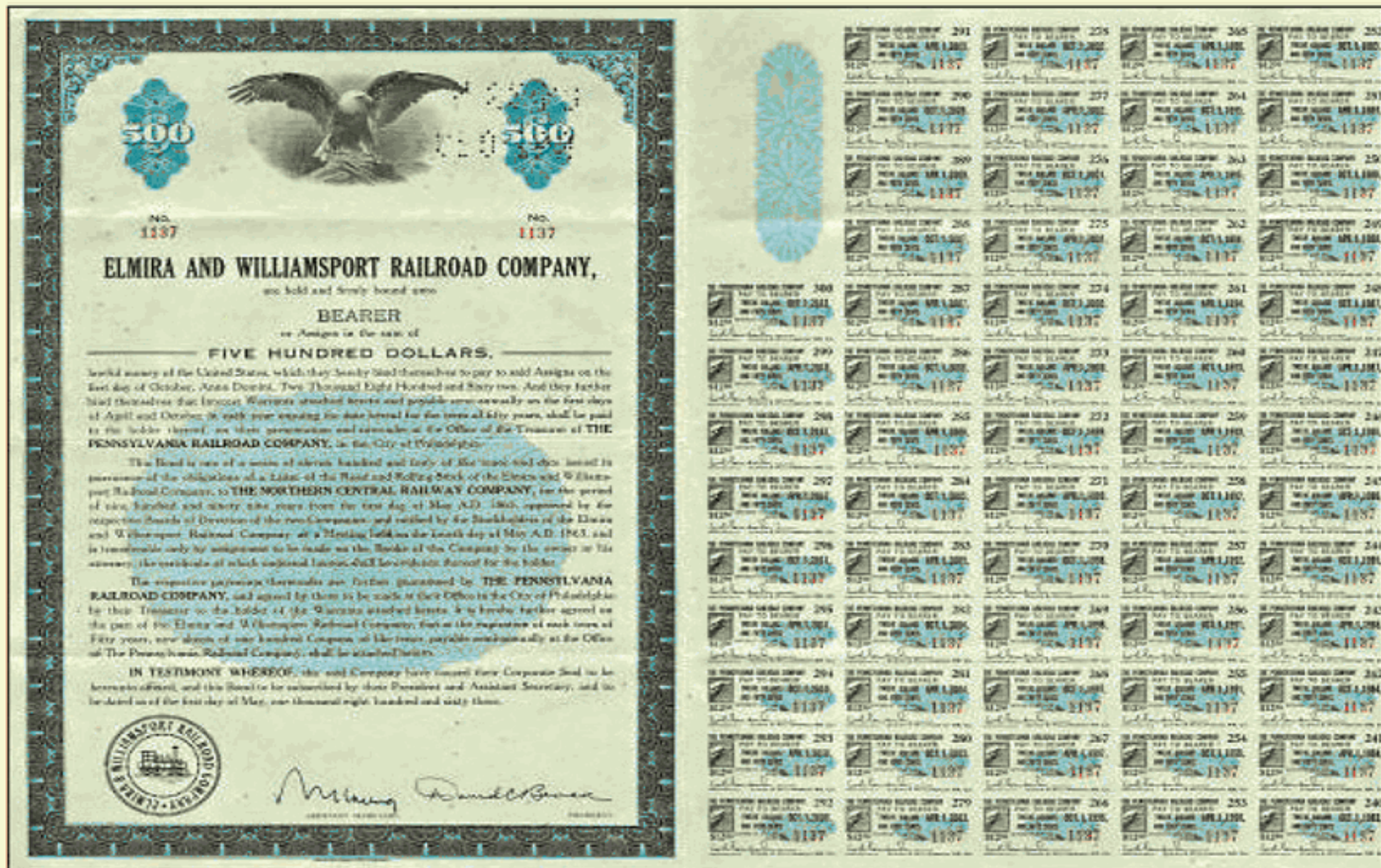
$$\text{Coupon Payment} = \frac{\text{Stated Annual Coupon rate} * \text{Par Value}}{\text{Number of Coupon Payments per year}}$$
- **Maturity (or Maturity Date):** Specified date on which the bond's principal (par) amount is paid.
- **Term:** The time remaining until the principal repayment date.



A Bearer Bond and Its Uncut Coupons Issued by the Elmira and Williamsport Railroad Company for \$500

Origin of Coupon Terminology

Source: Courtesy Heritage Auctions, Inc. © 1999–2006.



Bond Maturity

Unlike stocks, bonds have **finite** lifetimes. The issuers of bonds determine the bonds' lifetime before they sell the bonds to investors. The date on which a bond comes due is called the **maturity date**.

- Some people use the word “**maturity**” to refer to the **lifetime** itself. For example, they may say that a particular bond has a ten-year maturity
- The **time remaining** until the repayment date is known as the **term of the bond**



Putting the Main Bond Characteristics Together

If you buy a bond, the issuer (i.e., the borrower) promises to pay you back

1. The “**par value**” (assume \$1000) on a particular day – the “**maturity date**” – and
2. The periodic “**coupons**” at a predetermined rate of interest based on the stated “**coupon rate**” and the number of coupon payments per year.

As a creditor/lender, your cash flows to be received will be the par value and the periodic coupon payments.



Example 1

You Buy a GE Bond With a \$1,000 Face Value, a 5% Coupon Paid Annually and a 10-year Maturity

- GE guarantees to pay back your principal (\$1000 value) plus periodic annual interest of \$50. If you hold it to maturity, unless GE goes bankrupt you know exactly how much cash inflow you will receive and when you will receive it.

“fixed-income” investments – i.e., you are assured a steady payout or yearly income.

- This regular income is what makes bond returns inherently less volatile than stock returns



Example 2:

A Bond with a \$1,000 Face Value, a 5% Coupon Paid *Semi-Annually*

- Jim buys a **\$1,000** bond with semiannual coupon payments. The bond has an annual stated coupon rate of **5%**. What will the coupon payments be on Jim's bond?

$$\text{Coupon Payment} = \frac{\text{Stated Annual Coupon rate} * \text{Par Value}}{\text{Number of Coupon Payments per year}}$$

Coupon Payment = \$25 every 6 months



More Bond Terminologies

- **Callability:** A feature whereby the issuer can redeem the bond before it matures. A bond with this feature is a **callable bond**.
- **Putability:** A feature whereby the buyer can redeem the bond before it matures. A bond with this feature is a **putable bond**.
- **Seniority:** Preference in lender position over other lenders and debts are sometimes labelled as **senior** or **junior** to indicate seniority, e.g., some debts are **subordinated**.



More Bond Terminologies (cont.)

- **Debenture:** A bond backed by the issuer's general credit and ability to repay and not by an asset or collateral (unlike a secured bond).
- **Basis points:** A unit of measure, used to express yields or interest rates. Most often used to express differences between yields.
 - The basis point unit is one one-hundredth of one percent ($0.01\% = 0.0001$)
 - For example, if a bond begins with a yield of 5.50% and the yield increases over time to 5.62%, the increase is 12 basis points



More Bond Terminologies (cont.)

- **Convertibility:** The option to exchange a bond for a specified amount of stock in the same issuing company. Bonds with this feature are called **convertible bonds**.
 - Conversion must occur at specified times, specified prices and under specified conditions, all of which are indicated in writing at the time of bond issue.
- **Protective Covenants:** That part of the indenture or loan agreement that limits certain actions a company might otherwise wish to take during the term of the loan.
 - E.g., limiting the amount of additional debt the company can take on, requiring a minimum working capital ratio, etc.



Sinking Fund

- A pool of money set aside by a corporation to help repay a bond issue. To lessen its risk of being short on cash at the time of bond maturity, the company agrees to create a sinking fund. Sinking fund provisions usually allow the company to repurchase its bonds periodically and at a specified sinking fund price (usually the bonds' par value) or the prevailing current market price.
- Thus a sinking fund is essentially a provision to pay off a loan over its life rather than all at maturity. Similar to amortization on a term loan.
- Reduces credit risk to creditor. Shortens average maturity.
- The account is managed by the bond trustee for the purpose of repaying the bonds.



The Bond Indenture

It is the contract between the company and the bondholders and includes:

- The basic terms of the bonds: the principal, coupon rate, maturity date, and the rights and duties of the buyers
- The total amount of bonds issued
- A description of property used as security (i.e., collateral), if applicable
- Sinking fund provisions
- Call provisions
- Details of protective covenants



Summary

- Bond:
 - Long-term debt instrument
 - Fixed-income instrument
- Bond buyers are lenders. The bond issuers (i.e., borrowers) promise their bond holders:
 - Payment of the par value at the specified maturity date
 - Periodic coupon payments at the stated coupon rate



Bond Valuation

Learning objectives

Understand bond values and why they fluctuate



Valuation Generally

Recall in our first lecture, finance was described as a discipline concerned with determining values and making optimal decisions based on those values.

- In finance, optimal investment decisions are those which maximize the owner's wealth

In finance, valuation involves comparing the **benefits** (the PV of cash inflows) and **costs** (the PV of cash outflows) associated with a proposed asset or project decision

- Assessing an asset's value today requires **discounting its expected future cash flows to the present**



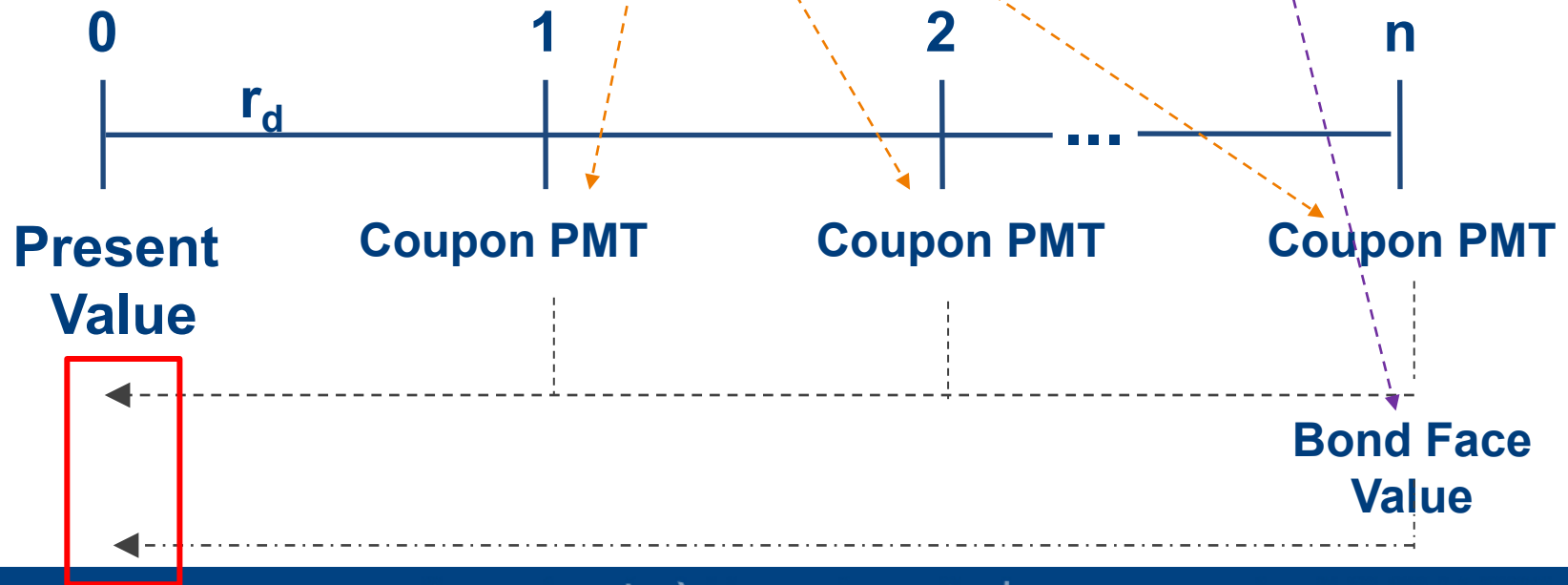
Bond Characteristics and Required Returns

- The coupon rate generally depends on the risk characteristics of the bond when issued
- Which bonds will have the higher coupon, all else equal?
 - Secured debt versus a debenture?
 - Subordinated debenture versus senior debt?
 - A bond with a sinking fund versus one without?
 - A callable bond versus a non-callable bond?



Bond Valuation

Bond Value = PV of coupons + PV of par
 \Rightarrow Bond Value = PV annuity + PV of lump sum



The Bond-Pricing Equation

For Coupons Paid Annually

$$\text{Bond Value} = \text{Coupon} \left[\frac{1 - \frac{1}{(1 + r_d)^N}}{r_d} \right] + \frac{\text{Face Value}}{(1 + r_d)^N}$$

PV Annuity Factor
(From Lecture 3)

PV of the Coupons

PV of Par Value

Note that r_d may not equal the annual coupon rate on the bond, in which case the bond value will not equal the face value of the bond



Returns on Bond

- If you hold a bond to maturity, you won't lose your principal as long as the borrower doesn't default.
- If you buy and sell bonds before they mature, you can make or lose money on the bonds themselves. How much more or less you are going to get depends on the **exact maturity date of the bond, where interest rates have moved, and the transaction costs involved.**

$$\begin{aligned} & \text{1-Yr Holding Period Return} \quad \text{Bond Price Change} \\ &= \frac{(\text{Annual Coupon} + (\text{Current Price of Bond} - \text{Beginning Bond Price}))}{\text{Beginning Bond Price}} \end{aligned}$$

Example:

- Annual Coupon = \$80
 - Beg. Price = \$863.73, End Price = \$870.10
 - Price Change = \$870.10 – \$863.73 = \$6.37
- $\Rightarrow \text{Rate of Return} = (\$80 + \$6.37) / \$863.73 = 10\%$



Yield to Maturity (YTM)

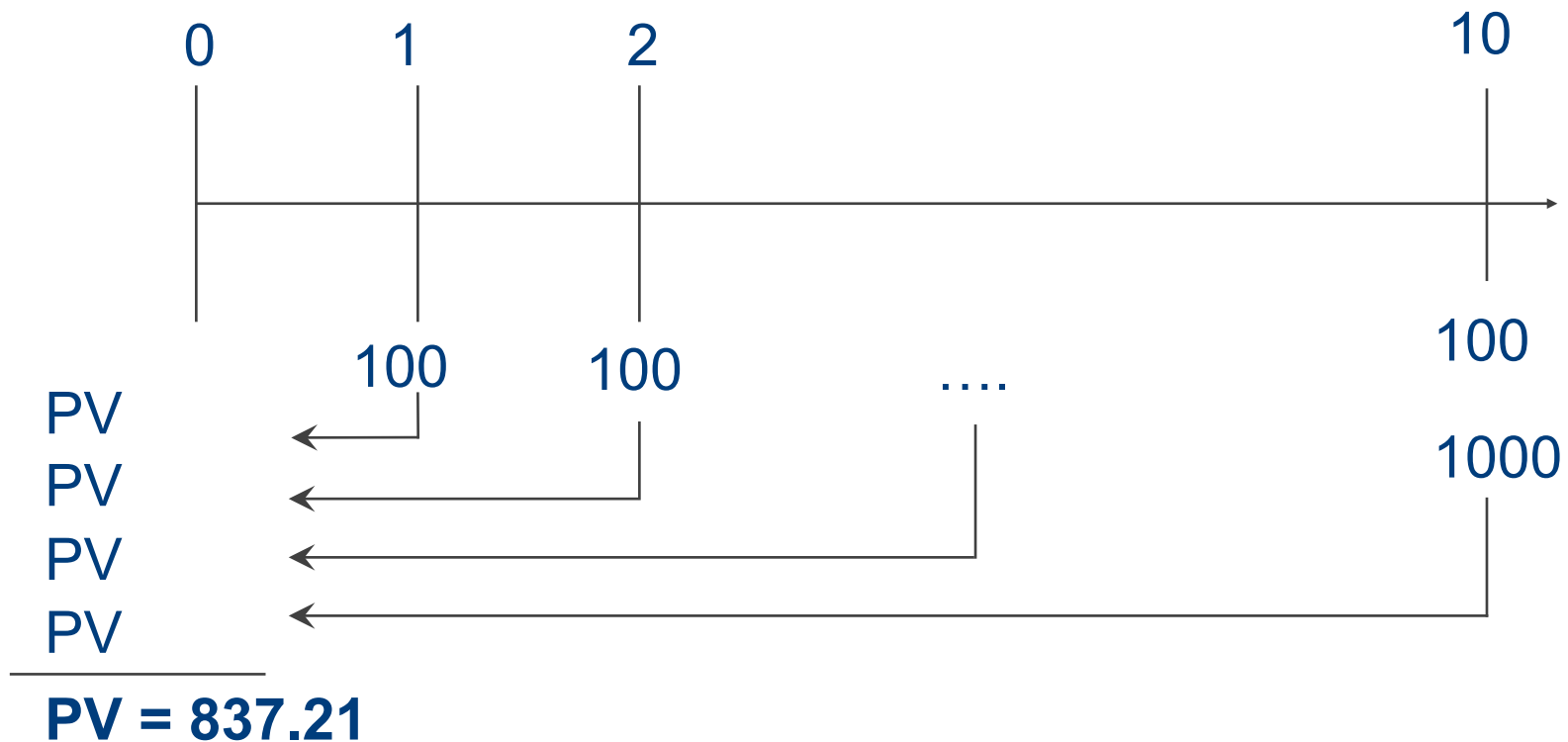
1. The rate earned if a bond is held to maturity.
2. The rate which discounts all future bond cash flows to their current value (price).
3. The 'market' rate for the bond in question, r_d is the interest rate required in the market on the bond.
4. YTM is sometimes called the bond's **yield** for short.



Valuation of a bond example

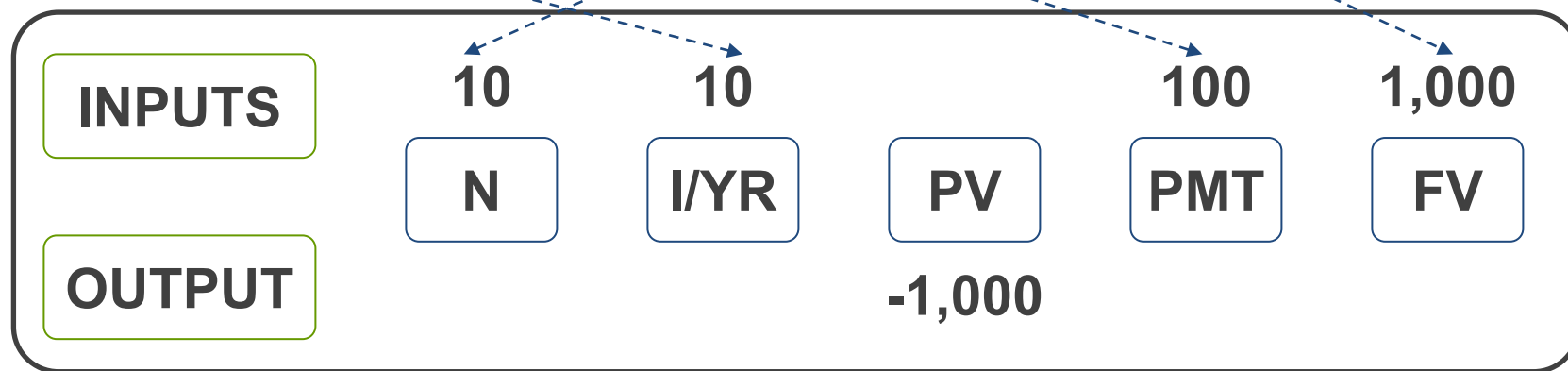
A bond has a \$1,000 par value due at $t = 10$, annual \$100 coupon payments, and a discount rate of 13%,

Solution with timeline:



Using A Financial Calculator To Value A Bond

This bond has a \$1,000 par value due at $t = 10$, and annual \$100 coupon payments beginning at $t = 1$ and continuing through $t = 10$. Assuming the discount rate is 10%, The price (or PV) of the bond can be found as follows:



If the coupon rate equals to discount rate (rate of return on the bond), the price of bond equals its face value.



Example: Increasing Inflation, $\uparrow r_d$

Suppose inflation rises by 3%, causing r_d to approximately equal **13%**. When r_d rises above the *coupon rate*, the bond's value falls below par, and sells at a *discount*.

Recall the **coupon rate** determines the **PMT**

INPUTS	10	13		100	1,000
	N	I/YR	PV	PMT	FV
OUTPUT			-837.21		

If the coupon rate is smaller than the discount rate (rate of return on the bond), the price of bond is smaller than its face value → discount bond



Example: Decreasing Inflation, $\downarrow r_d$

Suppose inflation falls by 3%, causing r_d to approximately equal **7%**. When r_d falls below the coupon rate, the bond's value rises above par, and sells at a *premium*.

INPUTS	10	7		100	1,000
	N	I/YR	PV	PMT	FV
OUTPUT			-1,210.71		

If the coupon rate is larger than the discount rate (rate of return on the bond), the price of bond is higher than its face value → premium bond.



Semi-Annual Coupons

Suppose you are looking at a bond that has an APR or stated coupon rate of 16%, paid semi-annually, and a face value of \$1000. There are 20 years to maturity and the semi-annual yield to maturity* is 10%.

➤ How many coupon payments are there?

❖ Number of years = 20 years, so $20 * 2 = 40$

➤ What is the semiannual coupon payment?

❖ APR = 16% \Rightarrow semi-annual coupon rate = $16\%/2 = 8\%$

❖ Semi-annual coupon = $16\% / 2 * \$1000 = 8\% * \$1000 = \$80$

INPUTS	40	10		80	1,000
	N	I/YR	PV	PMT	FV
OUTPUT			-804.42		

* Note: Most bonds make semi-annual coupon payments and the “semi-annual yield to maturity” is generally referred to as just “yield”



Quick Review Question

On July 1, 2015, Ford Motor Company issues a ten-year \$1000 bond. The coupon rate is 8% paid semi-annually. You buy the bond at par.

- a. What occurred on July 1, 2015?
- b. On what dates will the interest be paid?
- c. What is the amount of each interest payment?
- d. How many interest payments will be made?
- e. How much total interest will be paid over the life of the bond?
- f. What is the face value of the bond?
- g. What is the maturity date of the bond?



Solution

- a. On July 1, 2015, you buy the bond from Ford Motor Company for \$1000.
- b. Interest is paid semi-annually, or every 6 months. Six months from the issue date of July 1 is December 31. Six months from December 31 is June 30. So interest is paid on December 31, 2015 and June 30, 2016. Interest is paid on those dates every year until the final payment is made on June 30, 2025.
- c. The amount of each interest payment is $(1/2) \times \$80 = \40 .
- d. There will be $10 \times 2 = 20$ interest payments.
- e. The total interest paid over the life of the bond is $\$40 \times 20 = \800 .
- f. The face value of the bond is \$1000.
- g. The maturity date of the bond is June 30, 2025.



Summary

Bond valuation:

- Present value of future cash flows: periodic coupon payments & par value
- The coupon rate generally depends on the risk characteristics of the bond when issued

What happens to the price of the bond when:

- $r_d =$ coupon rate
- $r_d >$ coupon rate
- $r_d <$ coupon rate



Yield to Maturity of a Bond

Learning objectives

- Understand what a Yield to Maturity (YTM) of a bond is and how to compute it
- Understand the relationship between YTM, coupon rate, current yield, and bond prices



Current Yield

(Not as relevant as YTM)

- **Current Yield** is the annual interest paid by a bond, expressed as a percentage of its current market price.
 - Note that it's actual use is limited
 - For example, a \$1,000 bond selling for \$850 and paying an 8% coupon rate (or \$80 per year) has a current yield of 9.41% (the quotient of \$80 divided by \$850).
- The weakness of current yield as a bond description is that it does not take into account any capital gain or loss associated with the principal to be paid at maturity.
- Because you can buy a bond above or below par value, YTM includes not only the interest payments you will receive all the way to maturity, but it also takes into account any difference between the par value of the bond and the actual trading price of the bond at that time.



Finding Bond Yields

- The **yield-to-maturity (YTM)** is that yield which equates the present value of all the cash flows from a bond to the price of a bond.
- This key piece of information is used for comparisons with other potential investments of the same risk level.
- Why not just look at the coupon rate to determine the bond's yield?



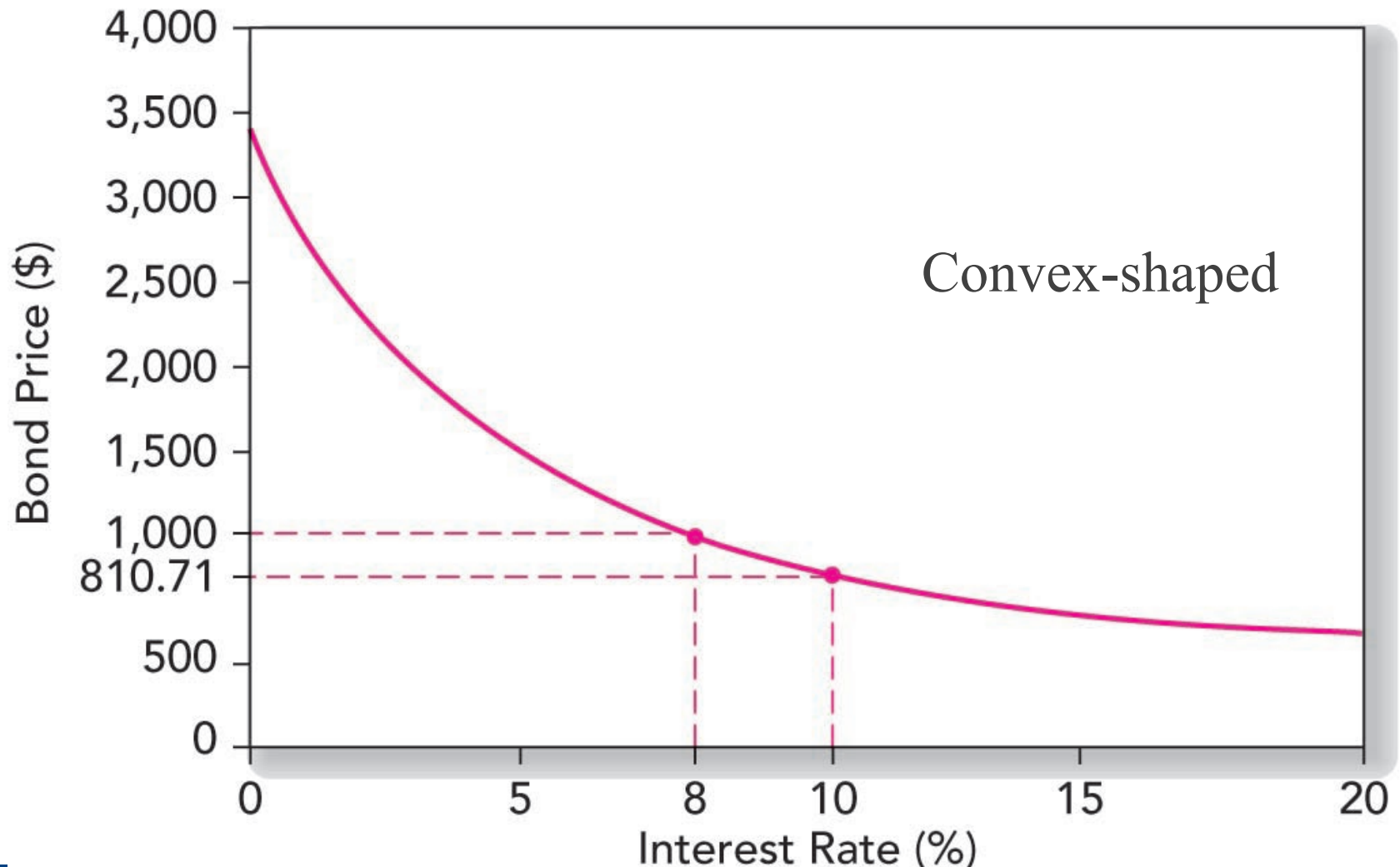
Relationship of YTM & Bond Prices

- As interest rates increase the bonds' PVs decrease, and vice versa
 - As YTM increases, bond prices decrease and vice versa
- The actual future change in bond prices could involve both discounts and premiums depending on future movements in market interest rates.
- Bond prices fluctuate as interest rates change, so a bond can trade above or below the par value based on what interest rates are.
- **If you hold the bond to maturity and the firm remains solvent, you are guaranteed to get your principal back**
 - However, if you sell the bond before it matures, you will have to sell it at the going rate, which may be above or below par value.

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Graphical Relationship: YTM and Bond Prices



Example: Yield vs. Coupon Rate (Time = 0)

- Say you bought a \$1,000 bond maturing in 10 years, with a 10% coupon rate paid annually.
- Thus, you will receive \$100 per year for a decade, at which time you will get back the \$1,000 in principal.
- In this case,

$$\text{YTM} = \text{Current Yield} = \text{Coupon Rate}$$



Example: Yield vs. Coupon Rate (7 years later)

- Newly issued bonds of the same risk as our bond issued 7 years later have a 5% YTM at issuance and thus would promise only a \$50 annual coupon payment, not \$100 as our bond.
- Thus you *would actually be able to sell your bond at a premium* (i.e., more than the \$1,000 par value)
 - Because an investor would be willing to pay more for a bond of the same risk that paid 10%, rather than the market required yield of 5%



Example: Yield vs. Coupon Rate (7 years later)

So how much can I sell the bond for?

Based on 5% = YTM in an efficient market:

- Current Bond Price = \$1136.16
 - How did we get this?
- Current Yield = $100/1136.16 = 8.8\%$
- Note:

$$5\% < 8.8\% < 10\%$$

$$\text{YTM} < \text{Current Yield} < \text{Coupon Rate}$$

► The above condition holds for all bonds selling at a ***premium.***



An Extreme Example: Zero-coupon Bonds

- Yield to maturity is especially important when looking at zero-coupon bonds (also called deep or pure discount bonds), a special type of bond that pays no interest until the maturity date.
 - At maturity, the zero-coupon bond holder will receive the principal plus interest for the entire period the money was borrowed
 - Make no periodic interest payments (coupon rate = 0%)
- Because “zeros” have no coupon payment and thus no current yield, any yield expressed for zero coupon bonds is always a **yield to maturity (YTM)**.
 - The entire yield-to-maturity comes from the difference between the purchase price and the par value
- Cannot sell for more than par value
 - Hint: if $r = 0\%$, what is the price?



Computing Yield-to-Maturity

- **Yield-to-maturity** is the rate implied by the current bond price
- Finding the YTM usually requires mathematical trial and error if you do not have a financial calculator.
- If you have a financial calculator, enter N, PV, PMT and FV, remembering the signs convention (PMT and FV need to have the same sign, while PV the opposite sign)



YTM with Annual Coupons

Consider a bond with a **10% coupon** rate paid **annually**, **15 years** to maturity and a par value of **\$1,000**. The **current price is \$928.09**.

- Will the yield be more or less than 10%?
 - $N = 15$; $PV = -928.09$; $PMT = 100$; $FV = 1,000$
- $\Rightarrow <CPT> <I/Y> = 11\%$

INPUTS	15		-928.09	100	1,000
	N	I/YR	PV	PMT	FV
OUTPUT		11			



YTM with Semiannual Coupons

Suppose a bond with a **10% coupon** rate paid ***semiannually***, has a face value of **\$1,000**, **20 years** to maturity and is **selling for \$1,197.93**.

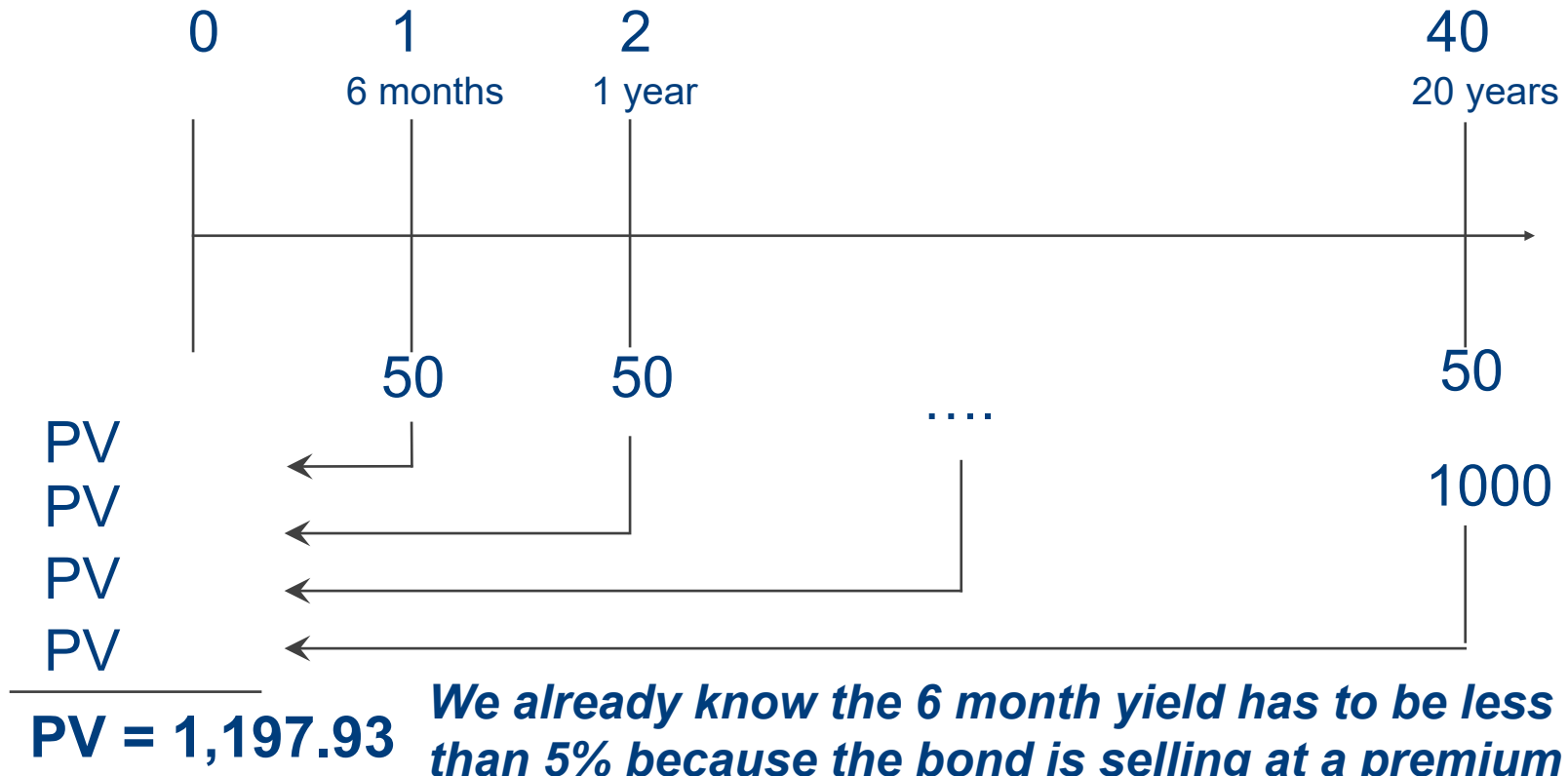
- Is the YTM more or less than 10%?
- What is the semiannual coupon payment?
- How many periods are there?
- $N = 40$; $PV = -1,197.93$; $PMT = 50$; $FV = 1,000$
 $\Rightarrow I/Y = 4\%$ (yield per 6 months)
- Reported $YTM = 4\% * 2 = 8\%$



YTM with Semiannual Coupons

Suppose a bond with a 10% coupon rate paid semiannually, has a face value of \$1,000, 20 years to maturity and is selling for \$1,197.93

Solution with Timeline:



Summary

- Current Yield is the annual interest paid by a bond, expressed as a percentage of its current market price.
- The yield-to-maturity (YTM) is that yield which equates the present value of all the cash flows from a bond to the price of a bond.

Bond Selling at . . . Satisfies this condition

Discount	$\text{Coupon Rate} < \text{Current Yield} < \text{YTM}$
Premium	$\text{Coupon Rate} > \text{Current Yield} > \text{YTM}$
Par Value	$\text{Coupon Rate} = \text{Current Yield} = \text{YTM}$



More on Bonds

Learning objectives

- Understand the bond pricing theorems
- Understand the effect of time on bond prices
- Understand bond ratings and what they mean
- Understand the different types of bond
- Understand the term structure of interest rates and the determinants of bond yields



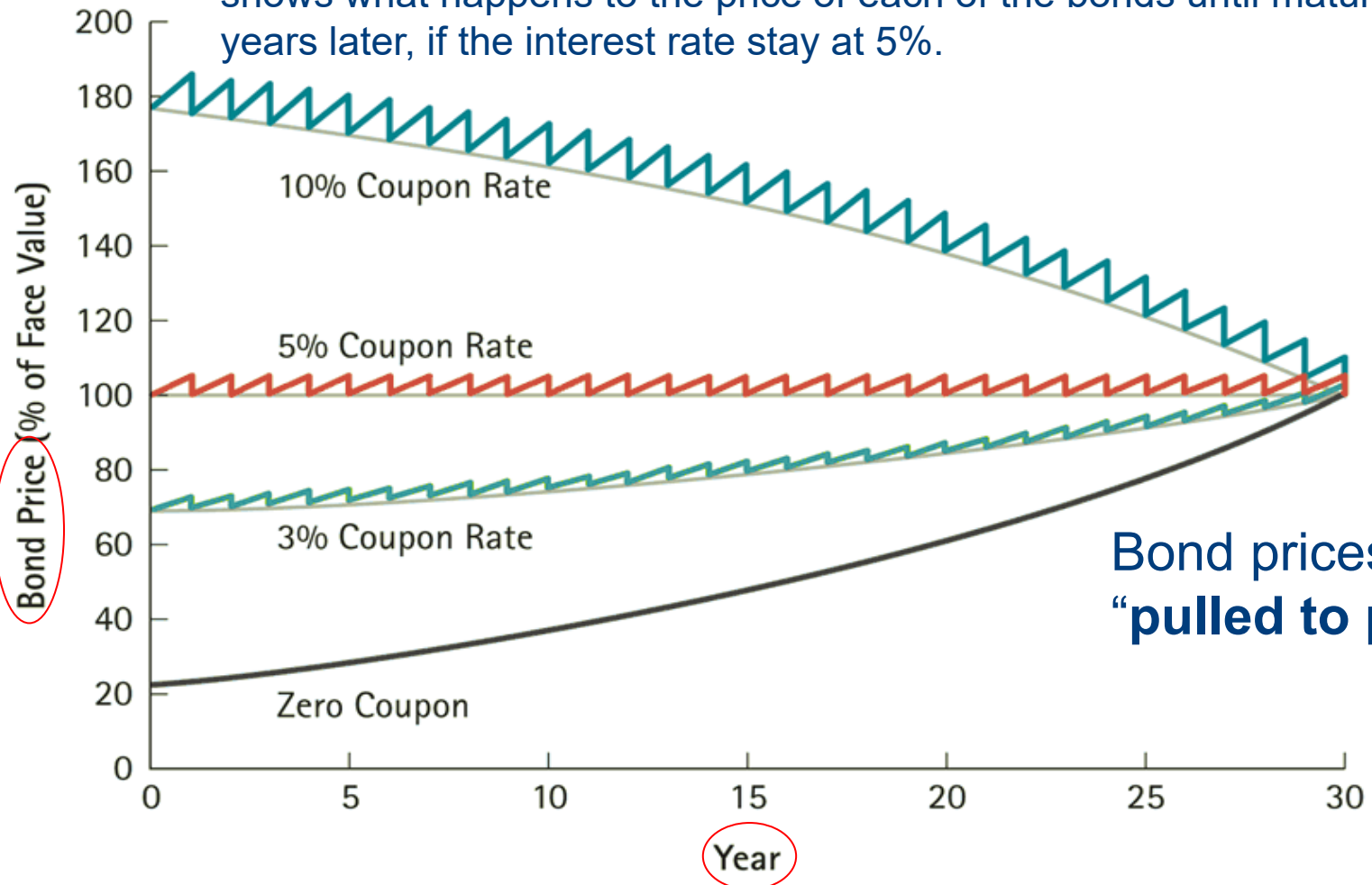
Bond Pricing Theorems

- Bonds of similar risk (and maturity) will be priced to yield about the same return (the same YTM), regardless of the coupon rate.
- If you know the price of one bond, you can estimate its YTM and use that to find the price of the second bond.
- This is a useful concept that can be transferred to valuing assets other than bonds.



The Effect of Time on Bond Prices

Four 30-year maturity bonds are issued by the same issuer at different coupon rates at time 0. The interest rate at issuance is 5%. The graph shows what happens to the price of each of the bonds until maturity 30 years later, if the interest rate stay at 5%.



Bond Ratings

	<u>Moody's</u>	<u>Standard & Poor's</u>	<u>Safety</u>
Investment Grade	Aaa	AAA	The strongest rating; ability to repay interest and principal is very strong.
	Aa	AA	Very strong likelihood that interest and principal will be repaid
	A	A	Strong ability to repay, but some vulnerability to changes in circumstances
	Baa	BBB	Adequate capacity to repay; more vulnerability to changes in economic circumstances
Speculative	Ba	BB	Considerable uncertainty about ability to repay.
	B	B	Likelihood of interest and principal payments over sustained periods is questionable.
	Caa	CCC	Bonds in the Caa/CCC and Ca/CC classes may already be in default or in danger of imminent default
	Ca	CC	
	C	C	C-rated bonds offer little prospect for interest or principal on the debt ever to be repaid.



Factors Affecting Default Risk & Bond Ratings

- Financial performance (for example):
 - Debt ratio
 - TIE ratio
 - Current ratio
- Bond contract provisions (for example):
 - Secured vs. Unsecured debt
 - Senior vs. Subordinated debt
 - Guarantee and sinking fund provisions
 - Debt maturity



Government Bonds

Treasury Securities

1. **T-bills** – pure discount bonds (zero coupon bonds) with original maturity of one year or less
2. **T-notes** – coupon debt with original maturity between one and ten years
3. **T-bonds** - coupon debt with original maturity greater than ten years

For info about Singapore government securities, please visit:
<https://www.mas.gov.sg/bonds-and-bills>



Government Bond vs. Taxable Bond

A taxable bond has a yield of 8% and a non-taxable municipal government bond has a yield of 6%

- If you are in a 20% tax bracket, which bond do you prefer?
 - $8\% (1 - 0.2) = 6.4\%$
 - The after-tax return on the corporate bond is 6.4%, compared to a 6% return on the municipal
- At what tax rate would you be indifferent between the two bonds?
 - $8\% (1 - T) = 6\%$
 - $T = 25\%$



Floating Rate Bonds (Floaters)

- Here the coupon rate floats depending on some index value
 - Examples: *adjustable rate mortgages* and *inflation-linked Treasuries*
- There is less price risk with floating rate bonds
 - The coupon floats, so it is less likely to differ substantially from the yield-to-maturity
- Floating coupon rates may have a “collar” – the rate cannot go above a specified “ceiling” or below a specified “floor”



Other Bond Types

- Disaster bonds
- Income bonds
- Convertible bonds
- Put bond
- There are many other additional provisions that can be added to a bond and many bonds have several provisions – it is important to recognize how these provisions affect required returns



Example: 'Pandemic bonds' are latest idea to beat disease

World Bank raises debt whose payments can be diverted from investors in emergency

The World Bank launched the first-ever pandemic bond on Wednesday, raising \$322m in two separate three-year issues. It is the first instance of the World Bank using its financial capacity to combat infectious diseases.



The bonds will pay investors a regular coupon, in exchange for which they lose some income or capital if a catastrophic infectious disease takes hold. The funds will be channelled to developing countries facing a pandemic, and to charities and rescue organisations working in those countries, in a bid to tackle what the Bank regards as one of the greatest systemic risks facing the world.

One of the new bonds, priced at 6.5 percent over six-month US Libor, will cover pandemic influenza and coronaviruses such as SARS, while the other, priced at 11.1 per cent over US Libor, will cover filoviruses such as Ebola, and several types of fever. Insurance triggers will include the size of the outbreak, measured using World Health Organization statistics on the number of cases and deaths, and whether the disease is growing at an exponential rate, as well as its geographical spread, with the payout value depending on the number of countries impacted.

The launch of the bonds is the latest innovation from the Bank which has also issued \$1.6bn-worth of catastrophe bonds to raise finance to tackle natural disasters, as well as sustainable development bonds to promote ethical investing and green bonds to pay for environmentally friendly projects.

- Financial Times, Jun 2017

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Example: Pandemic bonds (cont.)

Poorest countries finally set to get World Bank pandemic bond funds

Mark Baker | Tuesday, April 28, 2020

Source: <https://www.euromoney.com/article/b1ld7jd2y7w2rd/poorest-countries-finally-set-to-get-world-bank-pandemic-bond-funds>

Four months after the start of the coronavirus outbreak, financial assistance from the World Bank's pandemic bonds is about to find its way to poor countries to help them fight Covid-19.

Announcing the allocation on Monday afternoon, the World Bank commented that the PEF funds would "provide a boost of financing to support the immediate health response early in the outbreak in IDA countries".

According to World Health Organization (WHO) data as of Friday, IDA countries accounted for 33,195 cases since the start of the outbreak, or just 1.34% of cases.

It is on this basis that the World Bank argues the funds are being allocated at an early stage in IDA countries.

However, if the outbreak had started in one or more IDA countries, the same 12-week period would have been in place before any assessment could be made of whether the bond triggers had been met, meaning that an outbreak could have been already catastrophic in the region that the bonds are intended to help.



Example: “Women’s livelihood bond” to list on SGX



A new bond of its kind, designed to foster social sustainability, called the "women's livelihood bond", will soon debut on the Singapore Exchange (SGX).

The four-year bond offers a coupon rate of 5.65 per cent a year.

The US\$8 million (S\$11 million) bond offers loans to social enterprises and microfinance institutions which, in turn, aim to help more than 385,000 women in Cambodia, the Philippines and Vietnam, said DBS Bank yesterday.

- Straits Times, 7 Jul 2017

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Example: “CDL markets Singapore's first Green bond”

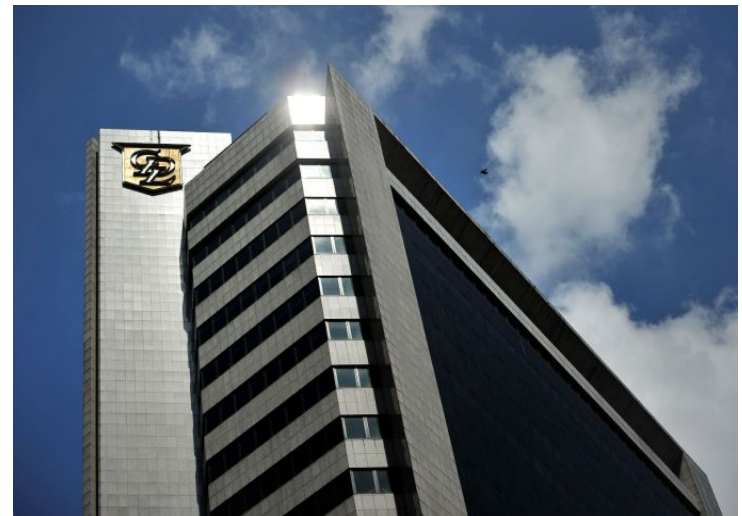
City Developments is today marketing the first Green bond offering in Singapore.

The property company is offering a Singapore dollar two-year Green bond indicated at a 1.98 per cent coupon, with pricing expected later today.

The unrated bond is secured against Republic Plaza, which has scored a green mark platinum from Singapore's state agency Building and Construction Authority. The office complex is located in the heart of financial and commercial district Raffles Place.

This is the first time that a Green bond is being offered in the Singapore dollar bond market, offering a test of local investor appetite for this type of asset.

Proceeds are for the repayment of a loan extended by City Developments to issuer CDL Properties. The loan was used to retrofit and upgrade the office building to maintain the green mark platinum level.



- Business Times, 7 Apr 2017

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Bond Markets

- Generally assets will trade in a market such that the price of the asset reflects the valuation of the marginal investor.
 - Market equilibrium is the point at which the buying and selling of assets in a market are in balance.
- Some bonds are 'listed' and traded on public market exchanges. Primarily traded in the over-the-counter (OTC) market.
- Dealers connected electronically
- Most bonds are owned by and traded among large financial institutions.
- Full information on bond trades in the OTC market is not published, but a representative group of bonds is listed and traded on the bond division of the NYSE.



Bond Market Information

- Extremely large number of bond issues, but generally low daily volume in single issues
- Makes getting up-to-date prices difficult, particularly on small company or municipal issues
- Treasury securities are the exception
- Bond quotes are available online
 - One good site is www.bondsonline.com
- See also www.fundsupermart.com & <http://asianbondsonline.adb.org>
 - Information on the ASEAN(+3) government bond market



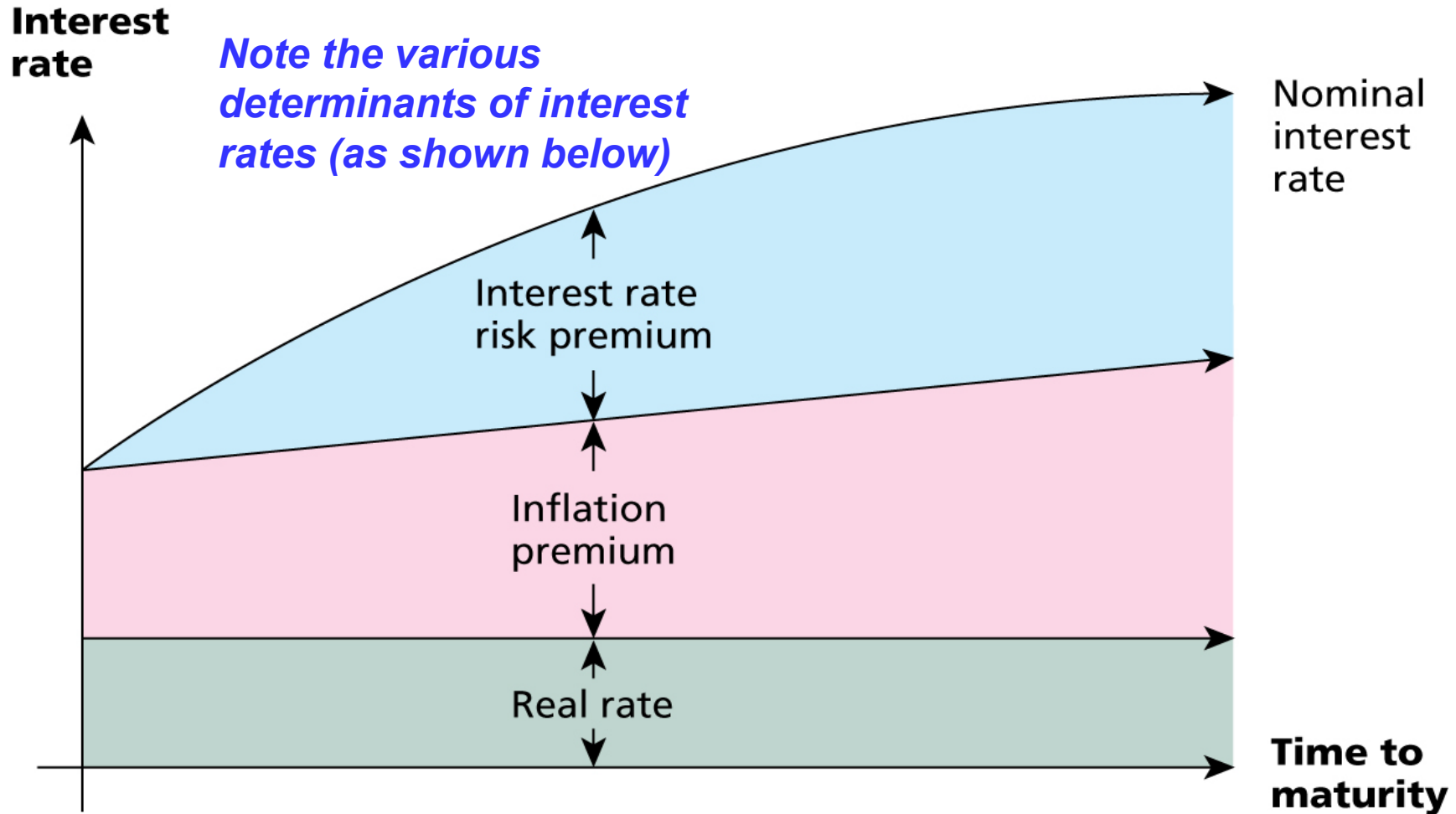
Term Structure of Interest Rates

- **Term structure of interest rates** (also called the **yield curve**) is the relationship between time to maturity and yields, for bonds of the same risk and holding all else equal. In order to consider bonds of the same issuer risk over time, we focus on government-issued bills, notes, bonds of all different maturities.
- “All else equal” means we remove the effect of default risk, different coupons, etc. So, we are able to focus on the relationship between maturity and yields.
- Yield curve – graphical representation of the term structure
 - Normal – upward-sloping, long-term yields are higher than short-term yields
 - Inverted – downward-sloping, long-term yields are lower than short-term yields



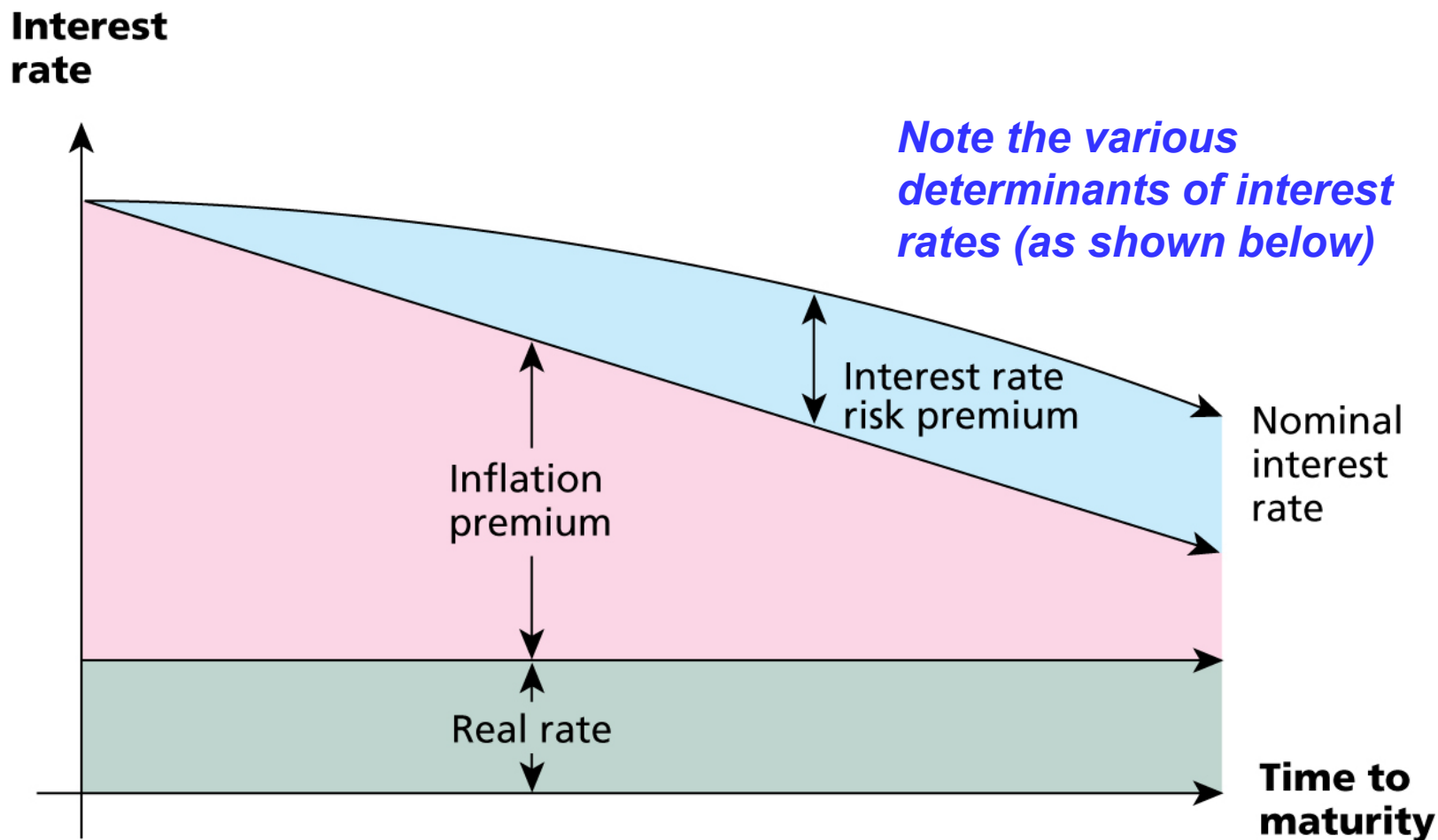
The Term Structure of Interest Rates

A. Upward-sloping term structure



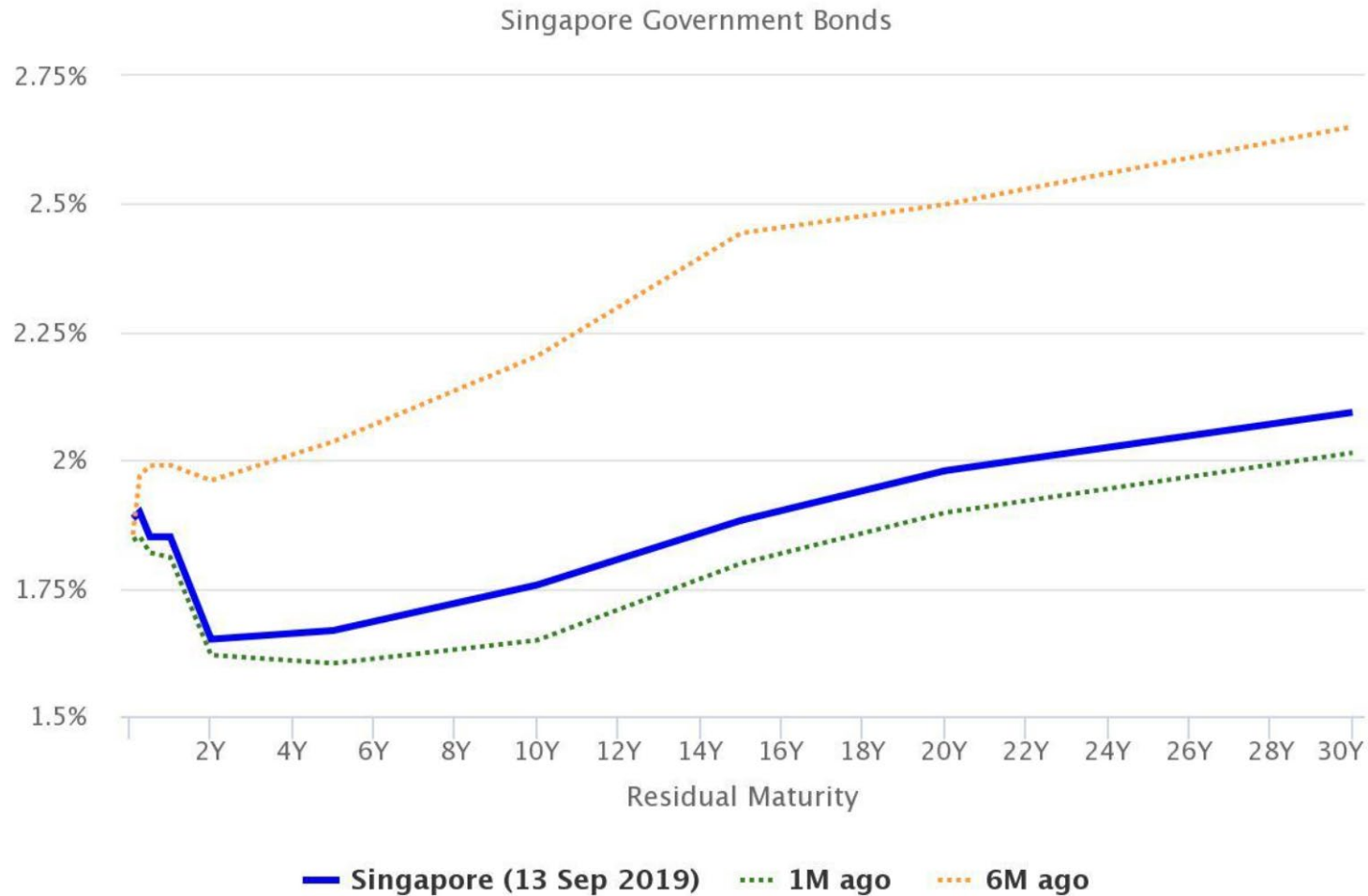
The Term Structure of Interest Rates

B. Downward-sloping term structure



Example: Singapore Government Yield Curve

Singapore Yield Curve – 13 Sep 2019



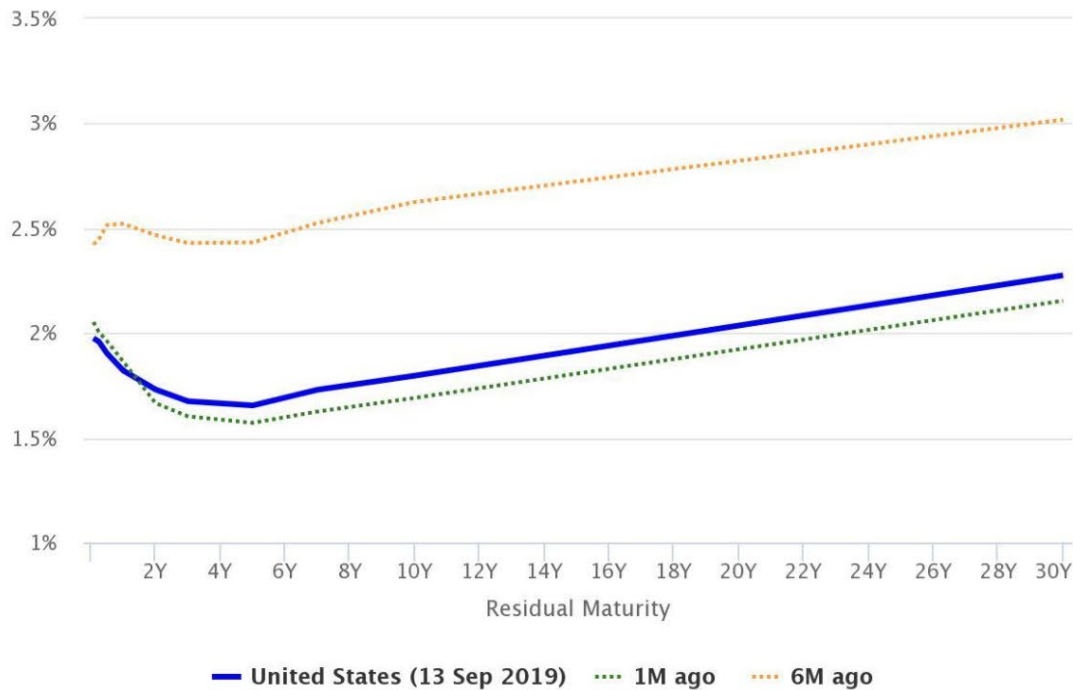
Highcharts.com



Example: US Government Bond Yield Curve

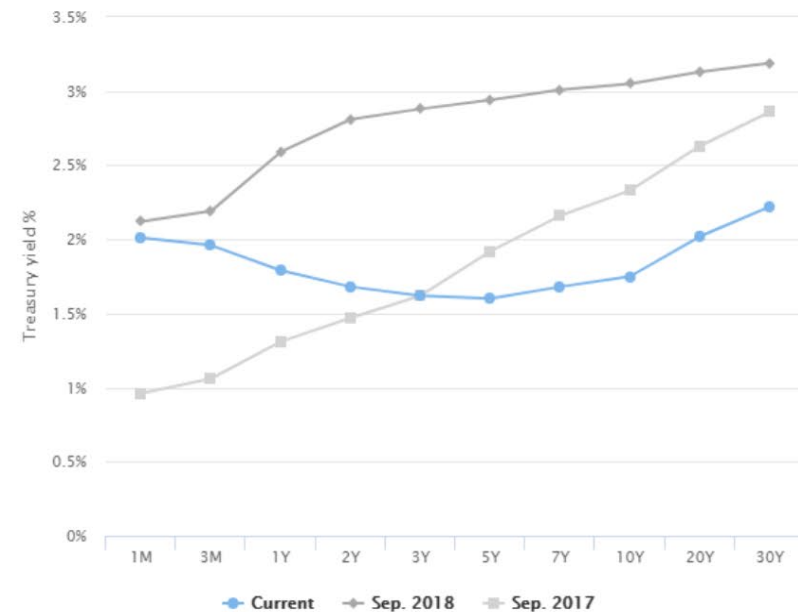
United States Yield Curve – 13 Sep 2019

United States Government Bonds



Highcharts.com

Treasury Yield Curve



GuruFocus.com



Factors That Affect Bond Yields

1. Real rate of interest
2. Expected future inflation
3. Interest rate risk
4. Default risk
5. Taxability
6. Lack of liquidity



Summary

- Bonds of similar risk and maturity will be priced to yield about the same return, regardless of the coupon rate
 - Bond prices are pulled to par
- Bond ratings: what they mean and the factors that influence them
- Government bonds vs. taxable bonds
- Other types of bond
- Bond market
- Term structure of interest rate

