



BUSINESS

Finance For Non-Finance

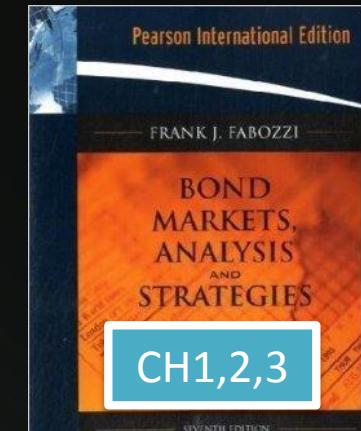
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Module 3

Introduction to Fixed-Income Markets

- Characteristics of debt instrument and debt markets
- Time Value of Money
- Basic concept of bond pricing
- Related **bond derivatives**



CH1,2,3

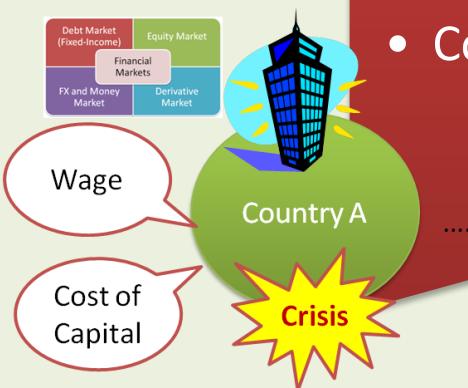


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..The Road So Far..

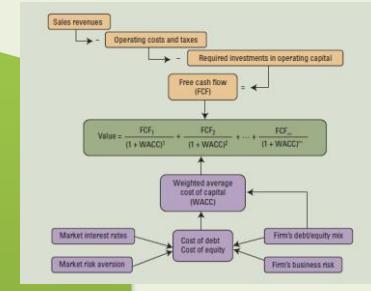
Module 1: Introduction to financial markets

- Money market vs. Capital market
- Cost of capital



Module 2: Introduction to equity market

- Asset = Debt + Equity
- Dividend, Dividend yld
- Risk and Return



Derivatives





...On Today's Menu...

Module 3: Introduction to Fixed-Income Markets

- What is the characteristic of Bill/Bond?
Government/Corporate?
- **Time value of Money**
- Bond Pricing
- Related **bond derivatives**



In Sum: This module will explain the concept of bond pricing and the importance factor of its calculation



Debt Instrument

- A **security** that promises to pay a periodically income (**annuity or coupon**) over a specific time
- The annuity/coupon is usually **fixed**
- Often refers to **Debt Market, Bond Market, Fixed-Income Market**



Importance of Debt Market



- Debt market enables corporations/government to fund its financial needs
- It is also where **interest rates** get determined.
- Interest rate usually states in per annual rate(**pa**)
- Debt Market accounts for the **largest** capital market



6 Sector of Debt Markets

Sector	Definition
Treasury	<ul style="list-style-type: none">•Issued by the government.•Treasury bills, notes, and bonds
Agency	<ul style="list-style-type: none">•Issued by federally related institution and government sponsored enterprises•Not backed by any collateral and are referred To as <i>agency debenture securities</i>
Municipal	<ul style="list-style-type: none">•Issued by state and local governments•Typically are exempt income taxes:- <i>tax-exempt sector</i>
Corporate	<ul style="list-style-type: none">•Issued by corporations
Asset-backed	<ul style="list-style-type: none">•Issued by corporations•Uses the pool of assets as collateral
Mortgage	<ul style="list-style-type: none">•Securities are backed by mortgage loans



Characteristic of a Debt Instrument

Issuer Name

Face Value (Par Value, Principal Value)

Coupon Rate

Coupon Structure

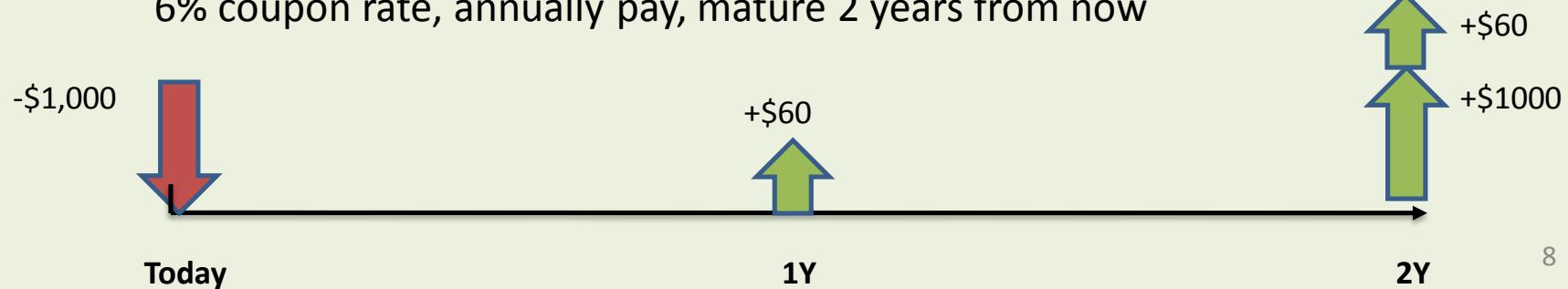
Maturity Date

Dominant Currency

Negative/Affirmative Covenants



- The State of South Carolina offers a Note /w \$1,000 Par Value, 6% coupon rate, annually pay, mature 2 years from now





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Features of Debt Securities

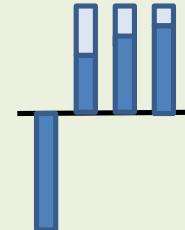
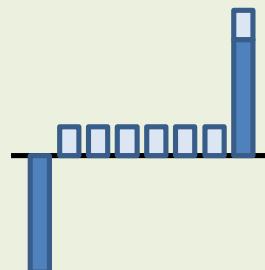
Negative Covenant – Prohibit borrower

- Restrict on asset selling
- Negative pledge of collateral
- Restriction on additional borrowing

Affirmative Covenant – Promises by borrower

- Maintain financial ratio
- Timely payment on **coupon** and **principal**

Redemption: At maturity or Amortization





Coupon Structures

Zero Coupon Bond

- Pure discounted bond with no coupon payment

Step up notes

- Coupon increases/decrease over time
- Usually with **Cap** and **Floor**

Deferred Coupon

- First few coupons are deferred



Categorization of Debt Instruments

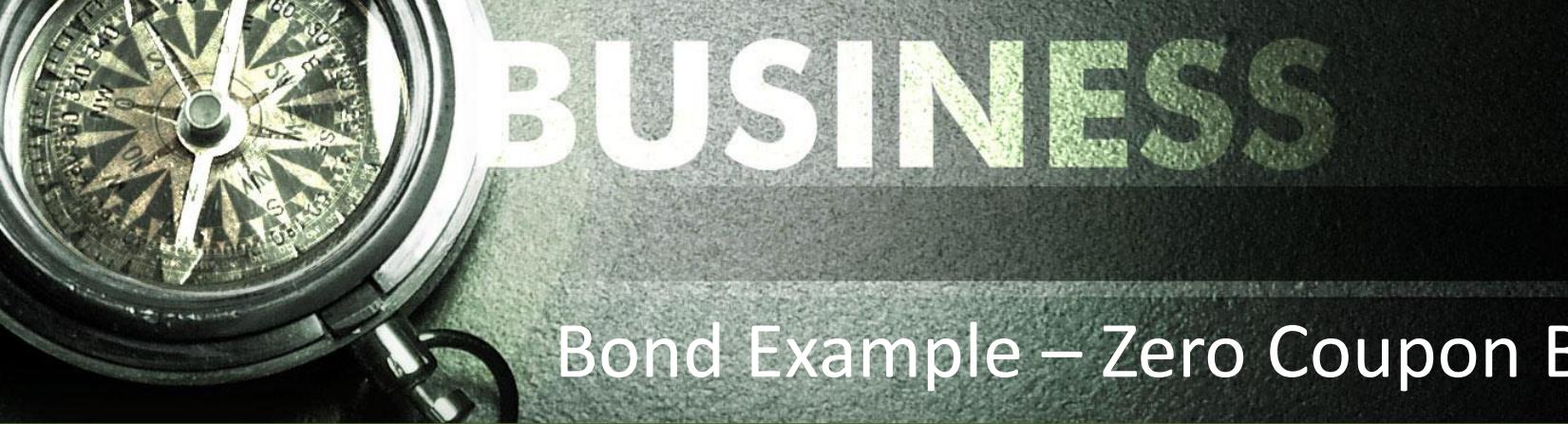
Instrument	Maturity	Coupon
Bill	1 year or Less	No coupon
Note	Between 2 and 10 year	Annual, semi-annual
Bond	More than 10 year	Annual, semi-annual

Issued by Government

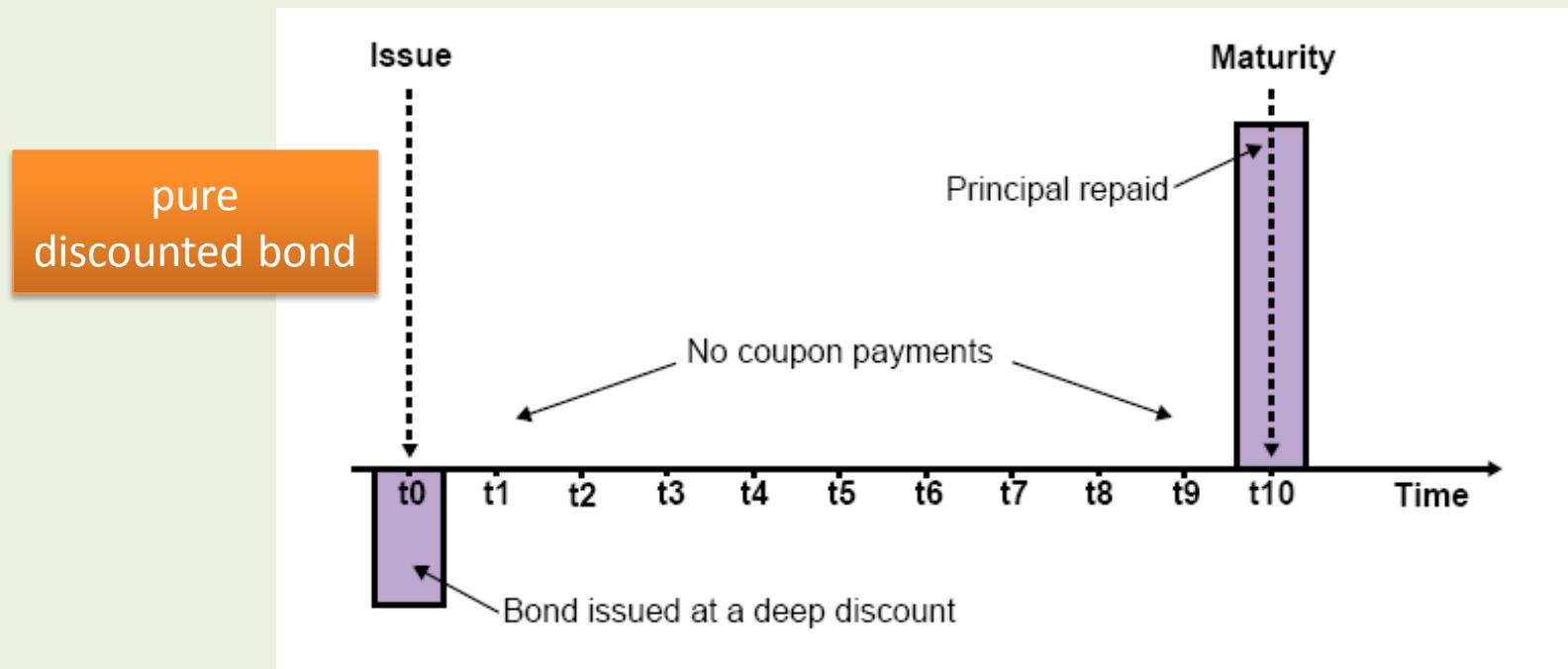
- T-Bills, T-Notes and T-Bonds

Issued by Corporations

- Commercial Papers, Medium-Term Notes, Corporate Bonds



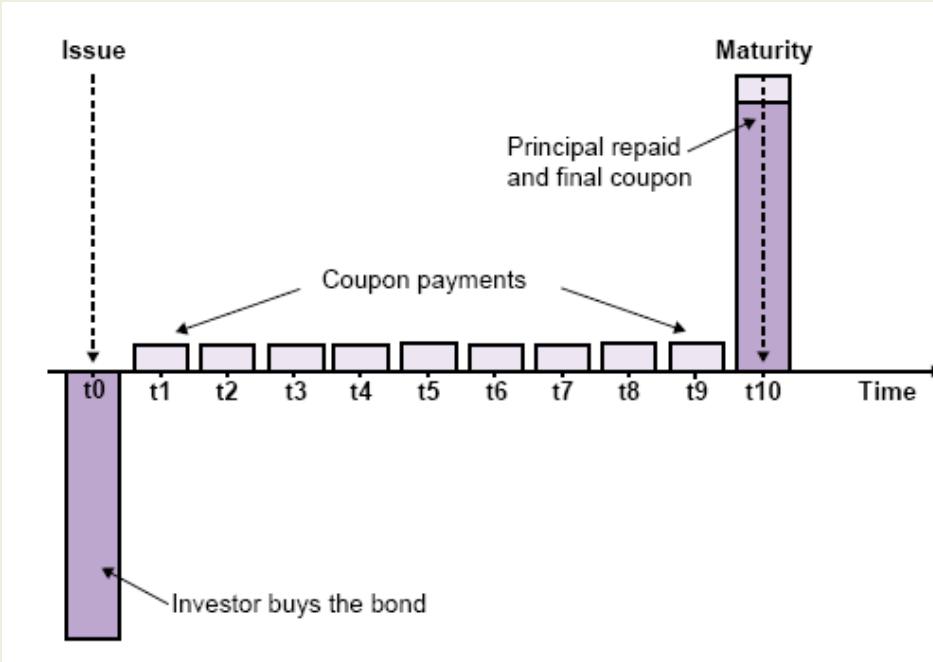
Bond Example – Zero Coupon Bond





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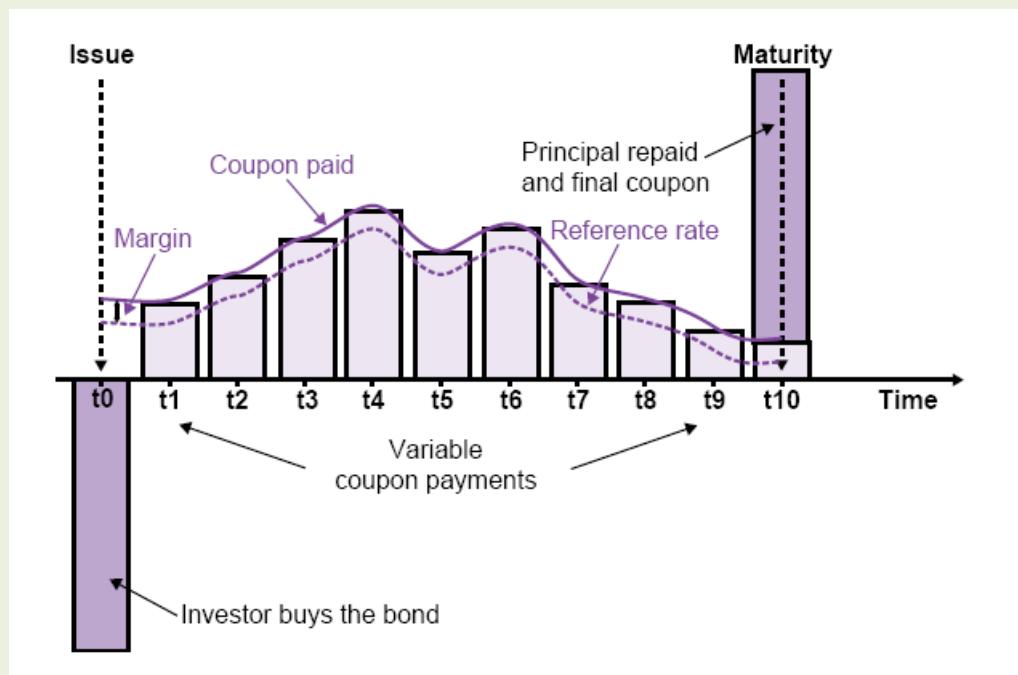
Bond Example – Straight Bond





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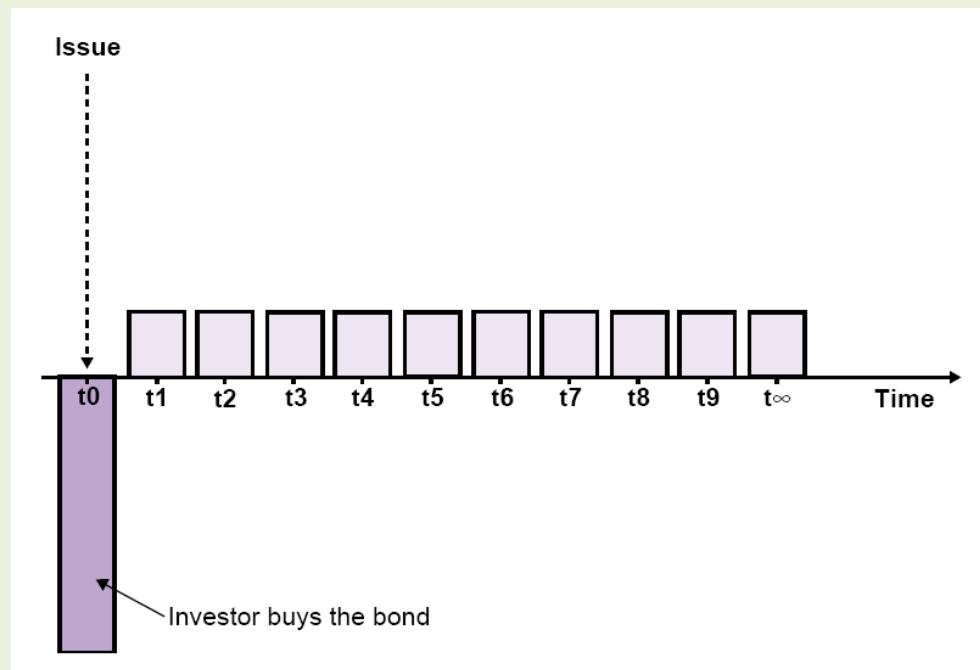
Bond Example – Floating Rate Note





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Bond Example – Perpetual Bond





Bond Price and Bond Yield

Bond are usually quoted as..

- A percentage of **Par Value**
 - US Government Bond are quoted in 1/32nd increment
 - Corporate Bond are quoted in 1/8th increment
- A Yield to Maturity
 - Annualized percentage return. This return also take into account the coupon payment(if any) until maturity.



Bond Price and Bond Yield

A Treasury Table(Straight Bond)

Rate	Maturity	Bid	Ask	Change	Ask\Yld
7 3/4	Feb. 01	105.12	105.14	+3	5.5

vary

- US Bond Par Value:
- Coupon Payment:
- Bid Price:
- Ask Price:
- Change:

\$1,000

fixed

$$\$1,000 \times 7.^{3/4} \% = \$77.5$$

fixed

$$(105+12/32)\% \times \$1,000 = \$1,053.75$$

vary

$$(105+14/32)\% \times \$1,000 = \$1,054.38$$

$$+3/32$$

If a bond is selling **above(below)** par value, it is selling at a **premium(discount)**

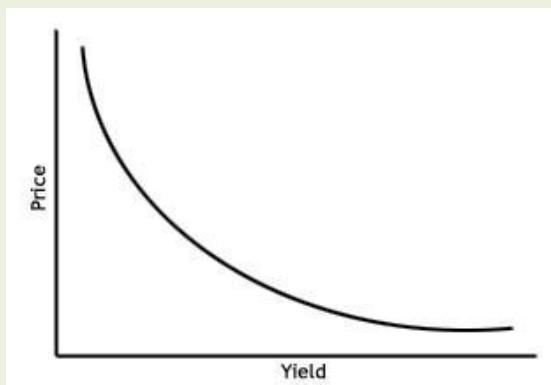


The Relationships

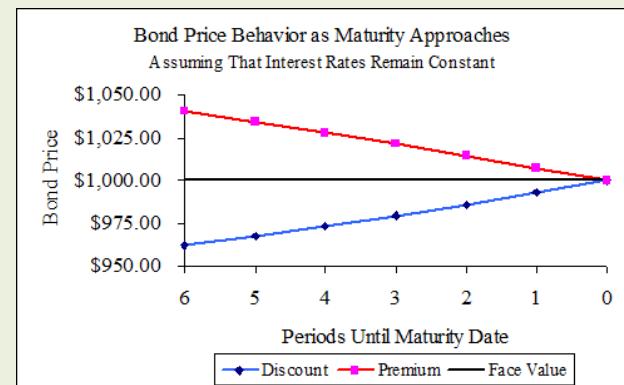
Coupon Rate vs. Yield vs. Price vs. Par

coupon rate	> yield	\leftrightarrow	price	> par(premium)
coupon rate	= yield	\leftrightarrow	price	= par
coupon rate	< yield	\leftrightarrow	price	< par(discount)

Price vs. Yield



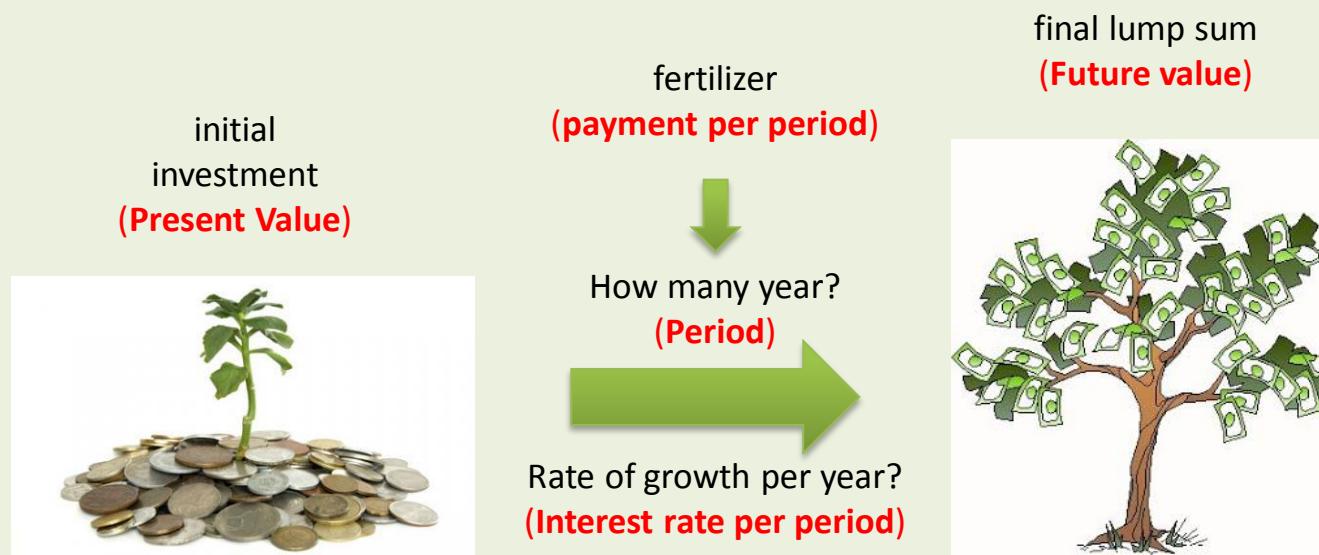
Price vs. Time





Basic Idea of Time Value of Money

What exactly is “Time Value of Money”?



Just like a tree, money grows through time



Basic Idea of Time Value of Money

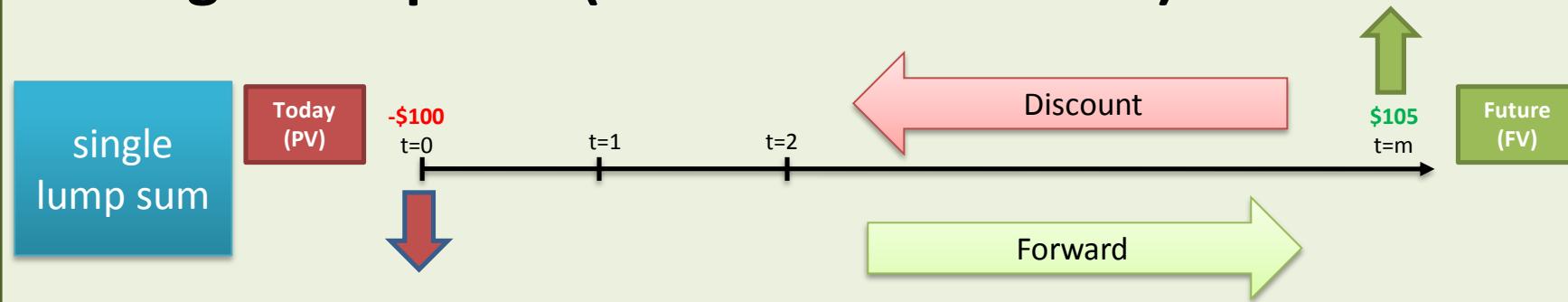
Let's make sense about it...

- If you put more(less) **initial investment** today, you **final lump sum** will be.....(.....)
- If **interest rate per period** is big(small), you **final lump sum will** be(.....)
- Given the same **initial investment** and **interest rate**, to get **2X** of a final lump sum, you will have to invest in.....time period

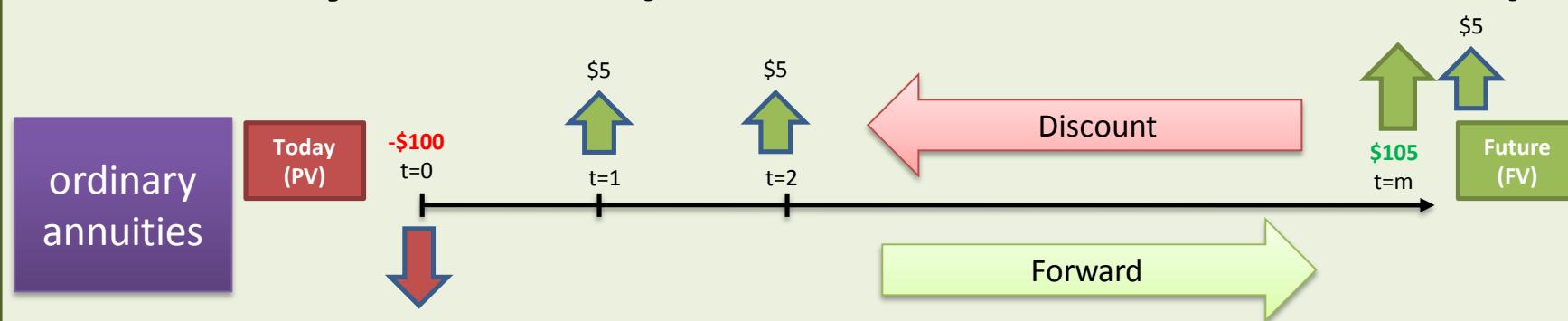


Timeline

Single Lump Sum(No PMT in between)



Ordinary Annuities(Constant PMT from $t=1$ to $t=m$)



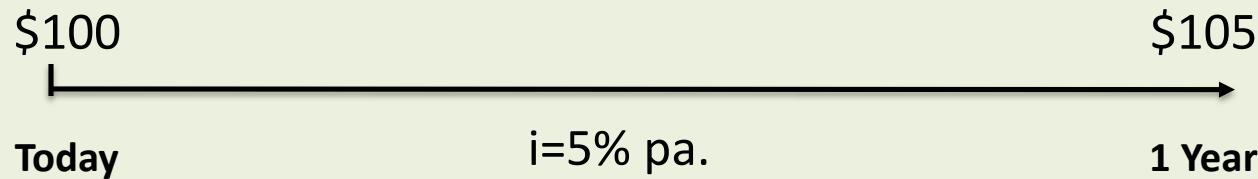


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single
lump sum

Time Value of Money

Simple Interest Rate



- 1 Year : $100 \times (1.05) = 105$
- How about deposit 500, i=7% in 1 year?
 - Ans.
- How about 2 years?

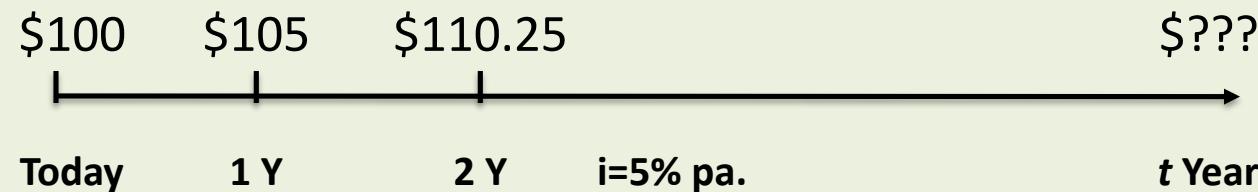


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lump sum

Time Value of Money

Compound Interest Rate



- At year 1 : $100 \times (1.05) = 105$
- At year 2 : $105 \times (1.05) = 110.25$
 - $100 \times (1.05) \times (1.05) = 100 \times (1.05)^2 = 110.25$



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single
lump sum

Time Value of Money

Annual Compounding

$$FV = PV(1 + i)^t$$

pa

Semi-Annual Compounding

$$FV = PV\left(1 + \frac{i}{2}\right)^{2 \times t}$$

pa

Quarterly Compounding

$$FV = PV\left(1 + \frac{i}{4}\right)^{4 \times t}$$

pa

Daily Compounding

$$FV = PV\left(1 + \frac{i}{365}\right)^{365 \times t}$$

pa

convention



single
lump sum

TVM Exercise

\$1000, 4% , annual compound, 5 years

- Ans.

\$1000, 4% , semi-annual compound, 5 years

- Ans.

\$1000, 4% , quarterly compound, 5 years

- Ans.

\$1000, 4% , daily compound, 5 years

- Ans.



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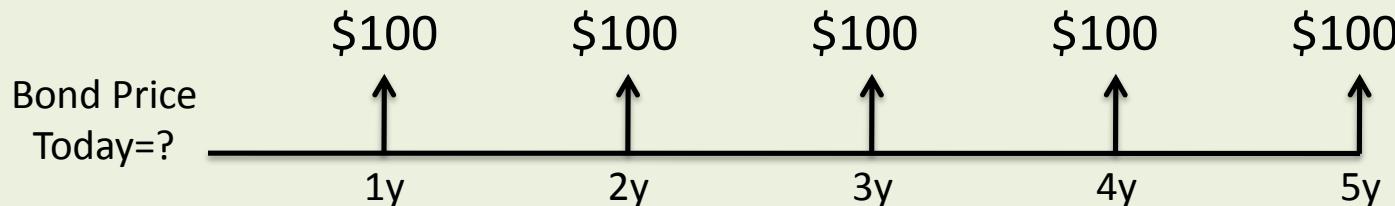
ordinary
annuities

Bond Valuation

Given a series of cash flow of a Bond, we can find the bond price with this formula

$$PV = \sum_{t=1}^n \frac{FV}{(1+i)^t}$$

Example: a series is given as follow



The price of this Bond is equal to the sum of the present value of each cash flow

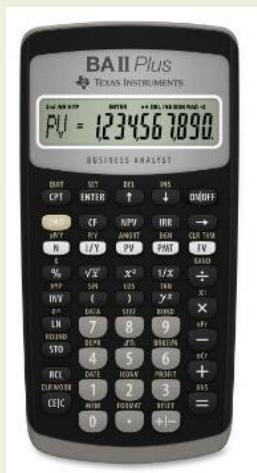


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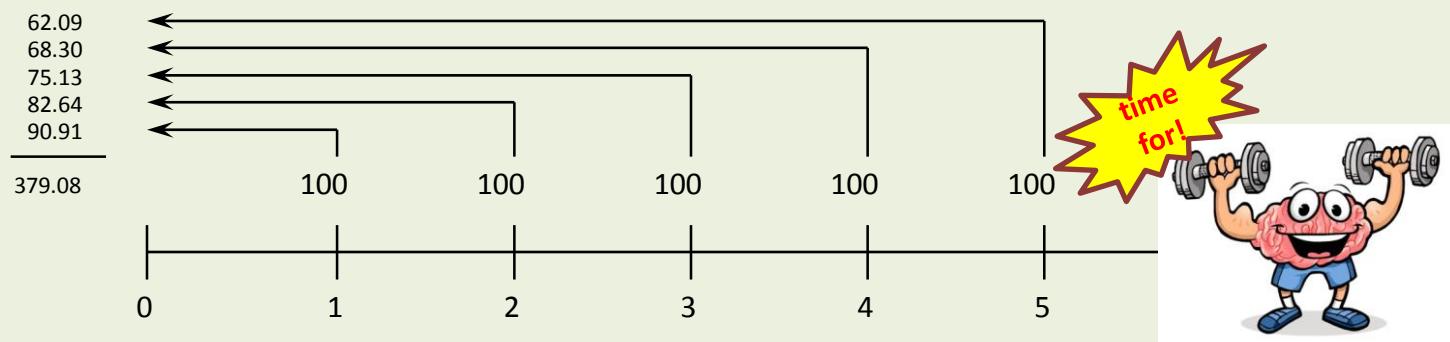
ordinary
annuities

Bond Valuation Example

Assuming an interest of 10% per year, we find that the Bond Price is:



$$PV_A = \frac{100}{(1.10)^1} + \frac{100}{(1.10)^2} + \frac{100}{(1.10)^3} + \frac{100}{(1.10)^4} + \frac{100}{(1.10)^5} = 379.08$$



Meaning: Invest 379.08 today, and receive 100 in year 1,2,3,4 and 5



The other facts of *i*

$$PV = \sum_{t=1}^n \frac{FV}{(1+i)^t}$$

“*i*”- Goes by many names

- Interest rate
- Discounting rate
- Bond Yield

**Notice: Bond Price will be Lower(Higher),
if “*i*” Increases(Decreases)**



Yield to Maturity

Given that we know bond price and cashflow, we can find the discounting rate that satisfies LHS=RHS

$$379.08 = \frac{100}{(1+YTM)^1} + \frac{100}{(1+YTM)^2} + \frac{100}{(1+YTM)^3} + \frac{100}{(1+YTM)^4} + \frac{100}{(1+YTM)^5}$$

- **YTM=10%**
- YTM is an **annual rate of return** of a bond if held until **maturity**
- **Meaning:** It is a way to compare Bonds with different face values, coupon payments, prices and maturities
- **Also:** YTMs of pure discounted treasury securities are used to plot Yield Curve



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Zero Yield Curve and Cost of Borrowing

A plot between theoretical spot rate Yield/Maturity



- Yield curve is served as a benchmark for other debt sectors
- Typically, interest rate at longer maturity > interest rate at shorter maturity
- Yield curve may change accord to demand/supply of bonds, expected inflation, public wealth and public **fear**



Credit Rating

Angel

Junky

Moody's	S&P	Meaning
Investment Grade Bonds		
Aaa	AAA	Bonds of the highest quality that offer the lowest degree of investment risk. Issuers are considered to be extremely stable and dependable.
Aa1, Aa2, Aa3	AA+, AA, AA-	Bonds are of high quality by all standards, but carry a slightly greater degree of long-term investment risk.
A1, A2, A3	A+, A, A-	Bonds with many positive investment qualities.
Baa1, Baa2, Baa3	BBB+, BBB, BBB-	Bonds of medium grade quality. Security currently appears sufficient, but may be unreliable over the long term.
Non Investment Grade Bonds (Junk Bonds)		
Ba1, Ba2, Ba3	BB+, BB, BB-	Bonds with speculative fundamentals. The security of future payments is only moderate.
B1, B2, B3	B+, B, B-	Bonds that are not considered to be attractive investments. Little assurance of long term payments.
Caa1, Caa2, Caa3	CCC+, CCC, CCC-	Bonds of poor quality. Issuers may be in default or are at risk of being in default.
Ca	CC	Bonds of highly speculative features. Often in default.
C	C	Lowest rated class of bonds.
--	D	In default.

Bond Derivatives – The Basic

- Forward & Future
- Option

This module does not cover pricing

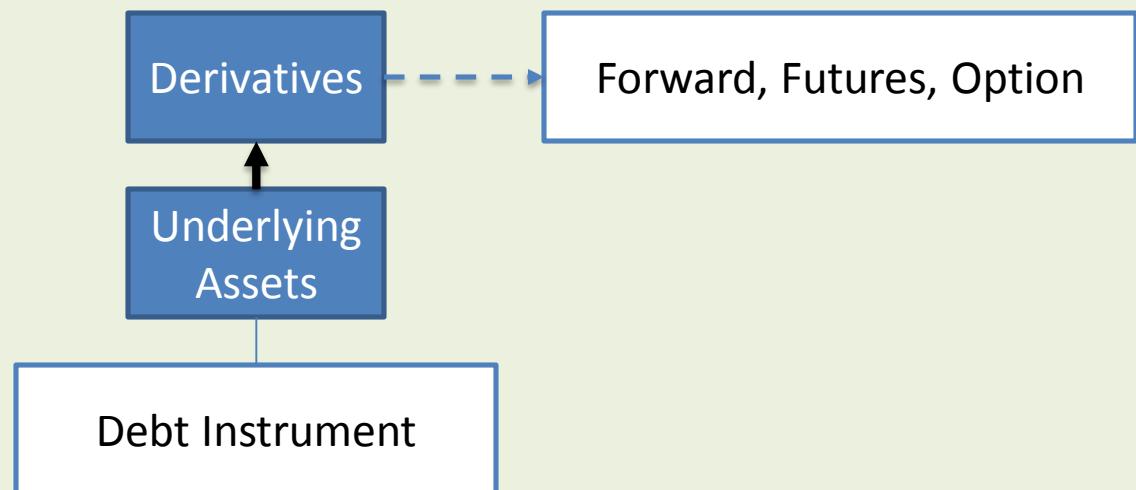




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What is Derivatives?

Derivative, by itself, has no value. Derivative derives value from Underlying Asset





Bond Derivatives

Bond Forwards/Futures

- **Underlying asset:** Bonds
- If you think the bond prices will **go up(go down)**, you would **long (short)**bond Forwards/Futures
 - Recall that Bond Prices **has** invert relationship with Interest Rate????
 - If you think the bond prices will **go up(go down)**, then your conjecture about the future yield curve is.....(.....)



Option Embedded Bonds

Recall

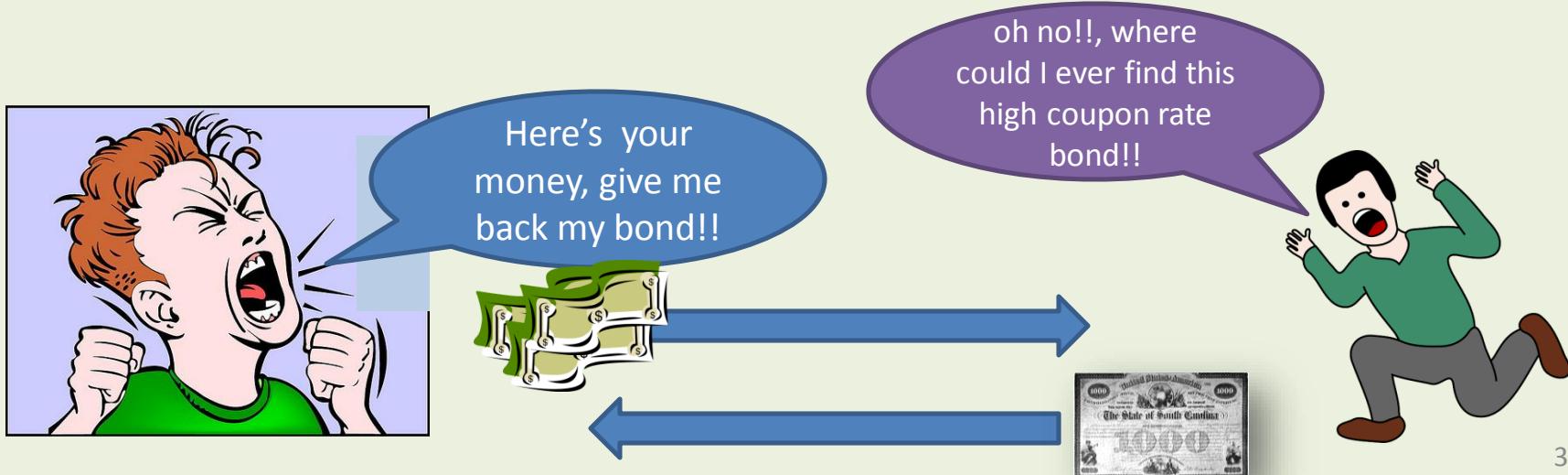
- **Call Option:** call option gives holder the right, but not obligation, to **BUY**
 - Intuitively, you have a motivation to buy, and you also want to buy **cheaper than spot price**
- **Put Option:** put option gives holder the right, but not obligation, to **SELL**
 - Intuitively, you have a motivation to sell , and you also want to sell more **expensive than spot price**



Callable Bond vs. Putable Bond

Callable Bond = Bond + Call Option

- Callable bond **gives issuer** the right, but not obligation to **buy back its bond**
- **Bond holder** has no choice but to yield the bond





Callable Bond vs. Putable Bond

Putable Bond = Bond + Put Option

- Putable bond **gives bond holder** the right, but not obligation, to sell back the bond to its issuer
- **Bond issuer** has no choice but to buy back the bond





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Motivation Behind a Derivation

Clearly, the concern over a bond was the prices and the interest rate, but what if, the concern is over the PROBABILITY OF DEFAULT?

- This is where **Credit Default Swap(CDS)** come in..



•If it is AAA bond, the probability is nil. But if it is a junk bond, the probability may goes as high as 80-90%

Would you hold it? If I say, I will assume your risk, and pay you back every penny



CDS is plain human language!!

Jane is holding a junky bond, though it pays 10%, it is very risky



Oooh, this is too
risky for me,
I don't like it!



Yep, I'm a
JUNKY but you
still want me!

You should
have read the
label before
you drink!

Well, if a bond could talk...



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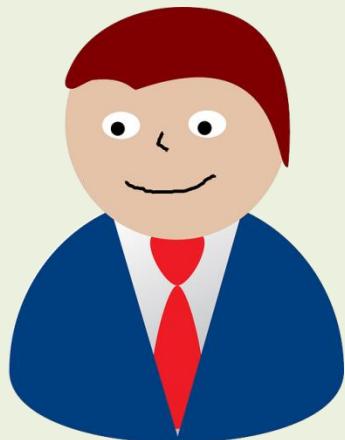
CDS is plain human language!!

Then, along came **Bob**, the smartest guy..., or so he thinks

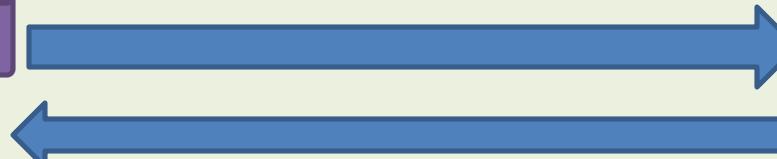
- **Bob** offers **Jane** an insurance, of sort..

How about this, you
pay me 2%, and I'll
cover your ass..et

Good deal, then I can
sleep at night. Here's
2%, and you'd better
keep your promises!!



CDS



otoriqbot.com

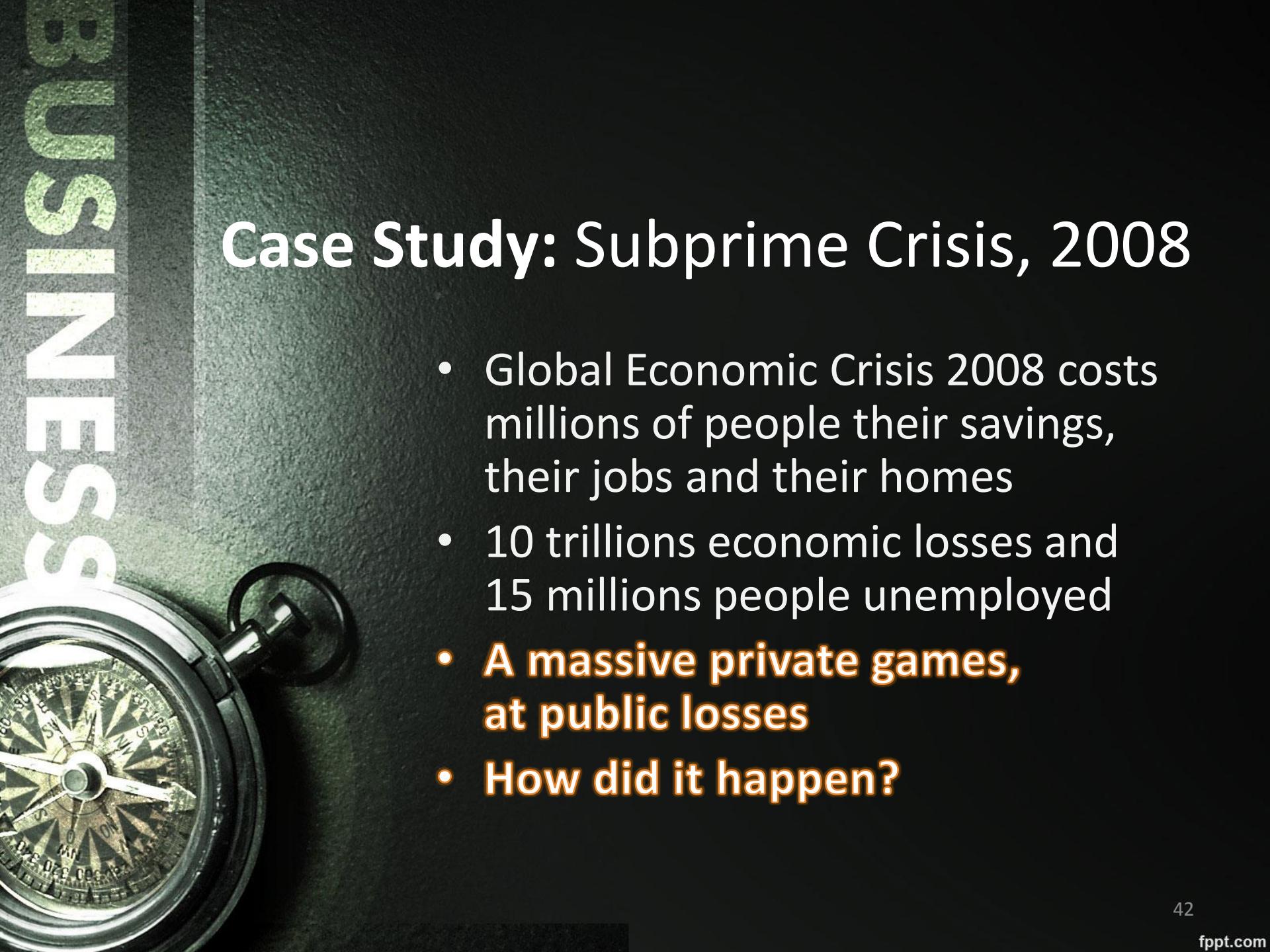




CDS is plain human language!!

All is well in a normal time, but

- There are too many **Jane**, **Bond** and **Bob**
- When all those **Junky Bonds** act up and **Bob** is too reckless to assess the risks and ****FAILS**** honor CDS contracts
 - All hell breaks loose.., Not just Jane, but the public pay the prices



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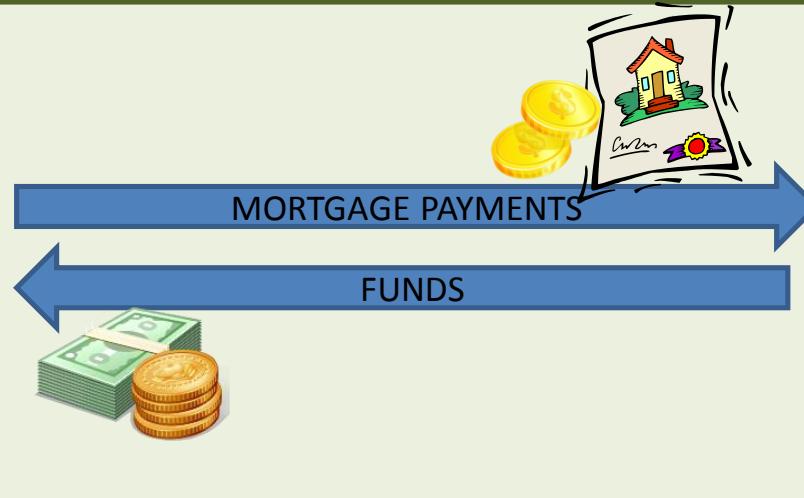
Case Study: Subprime Crisis, 2008

- Global Economic Crisis 2008 costs millions of people their savings, their jobs and their homes
- 10 trillions economic losses and 15 millions people unemployed
- **A massive private games, at public losses**
- **How did it happen?**



Mortgage Loan

American dreams..



Fannie Mae
Freddie Mac



Two parties meet thru a broker in mortgage markets

If the property owner fails to pay the lender, the lender has the right to foreclose the loan and seize the property

Mortgage is a 30-year loan contract, credibility of borrowers are usually carefully assessed and initial down payments are usually required



What went wrong?

What if lenders no longer wants to hold the risks, what can they do?

- Sell it to other risk takers like **Investment Banks**,
- From this point onwards, investment bank receives mortgage payment from home owner



Investment Banks then put all mortgages into a pool called collateralized debt obligations(CDO)

Such Investment Banks are..

- Merrill Lynch, Goldman Sachs, Morgan Stanley, Citigroup
- **American International Group(Bailed out)**
- **Lehman Brothers(Bankrupt)**



Collateralized Debt Obligation

CDO by design, suppose to help distribute risks..



Monthly payment goes to top tranche first, and so on..

CDO is also protected by Credit Default Swap, bumps its rating to up investment grades, AAA is the top rating – as good as T-Bonds

The biggest/largest CDO investors are: Retirement Fund/Pension Funds/Financial Institutions/Insurance/Sovereign Funds/Hedge Funds

The biggest/largest CDO/CDS writer: Lehman Brothers/AIG



Fallen Angels..

The US house prices increases every year, but with CDO/CDS,
the prices go beyond imagination

Investment Banks leveraged up, using borrowed money to buy
more mortgage and make more CDO.

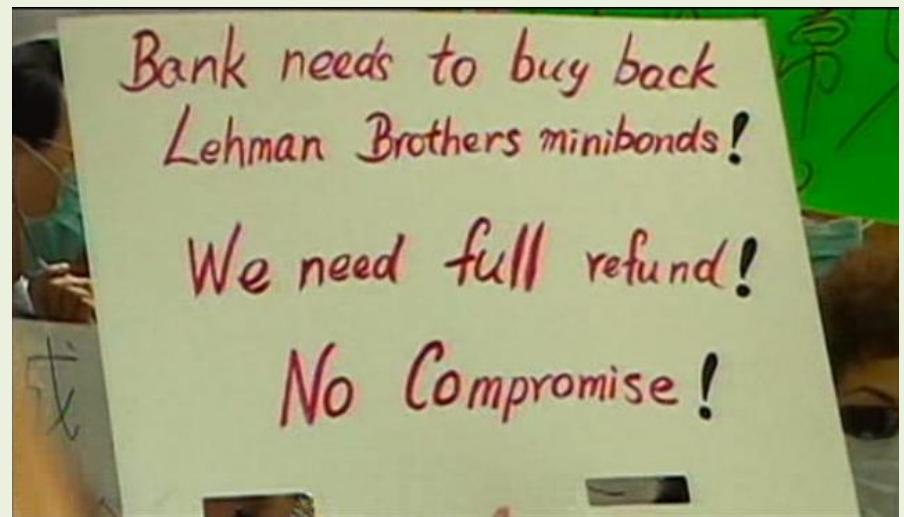
But underneath the CDO – most mortgage are subprime – a
risky borrower with highest probability of default...



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When Lehman Brothers Falls..

All investments, stocks
and bonds, **are lost**



Foreign transactions are immediately frozen, causing a massive
bad debts to banks/investors across the globe

Pension Fund/Retirement Fund investors suffers severely



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When Lehman Brothers Falls..

Commercial Papers Markets – the primary loans for company working capital and payroll – **collapses, forcing companies to go bankrupt**



United States and world-wide consumption plunges
Export sectors in China and world-wide halts, causing even more unemployment and resulting in **global economic recession**



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Conclusion?

- **Greed and recklessness** on Wall Street
- **Weak regulations** in banking sectors
- **No regulations** in derivative markets
- The financial institutions are too big to fail
- Rating agency just fails...

Note: None was held for responsibility, and bailed out money did not stop unemployment.

...Occupy Wall Street Begin...



Summary & QA

The Financial Crisis is right up at you door steps,
really..

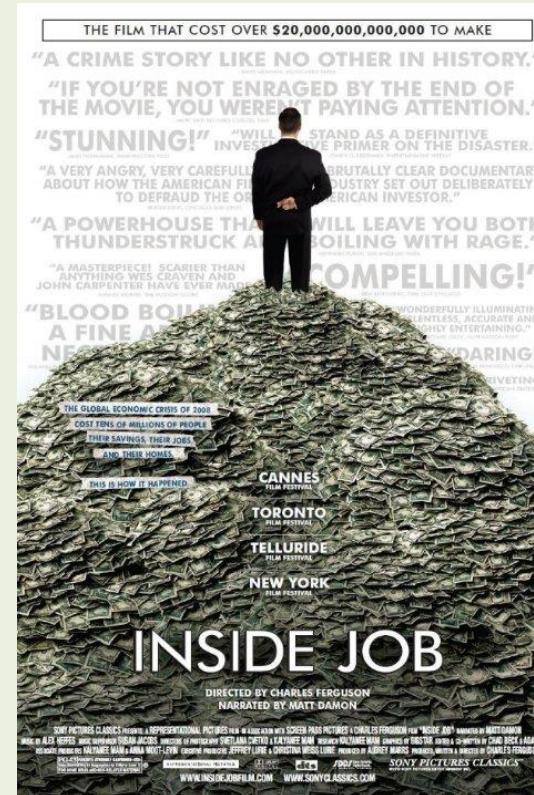
Regularly assessing your financial health is a must, i.e.,
if your income stops NOW, how many months can
you hold on

Investment is always risky, educate yourself, families
and friends. Not taking any risks, is a SURE risk as
well..



Recommended Films Based on True Story, of course!!

<http://billmoyers.com/content/six-films-on-the-financial-crisis/>





Educate yourself,
families and friends

ไม่มีรูปจนกว่าจะ
ผอ้ม

Sakda
Sappapanyawong
(A Sakda)

Friends

Following

Message

More

Timeline About Friends 9 Mutual Photos More



..Next Stop..

Module 4: Introduction to FX and Money Markets

- What/Why Money Market?
- What/Why Foreign Exchange Markets?
- The Linkage between the two markets
- Related **MM&FX derivatives**

In Sum: This module will explain the concept of MM&FX trading and most important MM&FX derivative securities i.e. interest rate swap