



FN 201 BUSINESS FINANCE



Lecture 8

Bond Valuation

What is Bond?

- Bond is Legal contract that specifies the rights and obligations of the bond issuer and the bond holders
- Debt instrument that pay pre-determined interest rate (coupon rate) over the life until maturity
- It becomes an important source of funding for firms in addition to bank loan
- Bond Features:
 - ▣ Face or Par Value
 - ▣ Coupon rate
 - ▣ Frequency of coupon payment
 - ▣ Maturity
 - ▣ Others covenants (rules and restrictions on the bond issuer and holders)

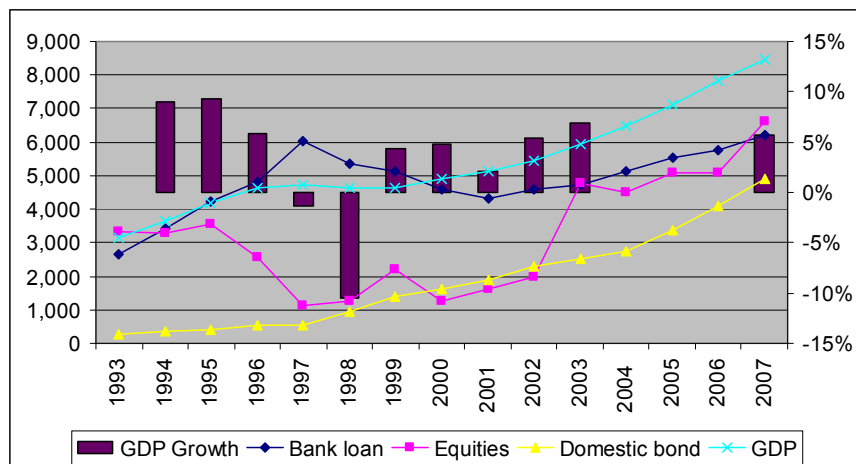


Outstanding of Registered Bonds

- As of 24 March 2010, total outstanding of Thai bond market was 6,117,631 Mln. (THB)
- Government Debt Securities
 - ▣ Treasury Bill
 - ▣ Government Bond
 - ▣ State Agency Bond
 - ▣ State-Owned Enterprise Bond
- Corporate Bond
 - ▣ LT Corporate Bond
 - ▣ Commercial Paper
- Foreign Bond

Bond market grows steadily as a way for corporate funding

THB



Thailand data - Outstanding

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TABLE 4: THAIBMA'S REGISTERED BOND OUTSTANDING (THB Mln)

Type	as of 30-Dec-08	as of 30-Dec-09	Growth
Government Bond	1,808,390.55	2,130,820.44	17.83%
Treasury Bills	81,000.00	206,540.00	154.99%
State Own Enterprise Bond	518,476.78	532,052.97	2.62%
-Guaranteed	379,107.28	372,182.87	-1.83%
-Non Guaranteed	139,369.50	159,870.10	14.71%
State Agency Bond	1,465,459.61	1,819,657.66	24.17%
Corporate Bond	937,335.59	1,123,638.02	19.88%
-Long-term Corporate Bond	793,640.85	1,048,956.97	32.17%
-Commercial Paper	143,694.74	74,681.05	-48.03%
Foreign Bond	43,962.00	55,962.00	27.30%
Total	4,854,624.53	5,868,671.09	20.89%

Source: ThaiBMA

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Types of debt securities

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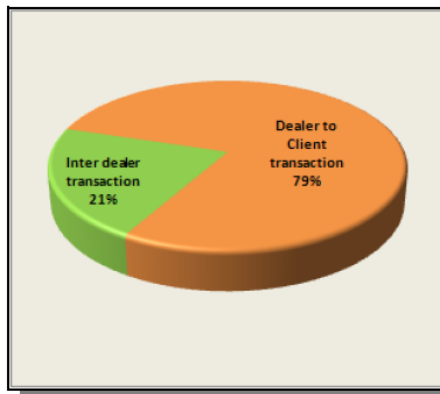
Trading-Thailand

- All government debt securities and most corporate bonds are registered with the Thai BMA
- Dealers are required to report all bond transactions to Thai BMA (The Thai Bond Market Association)
- Thai BMA monitors, complies and disseminate prices to the public (www.thaibma.or.th)
- Investors {banks, mutual funds, provident funds, government pension fund, insurance companies}
- SEC

Thailand data – Investors

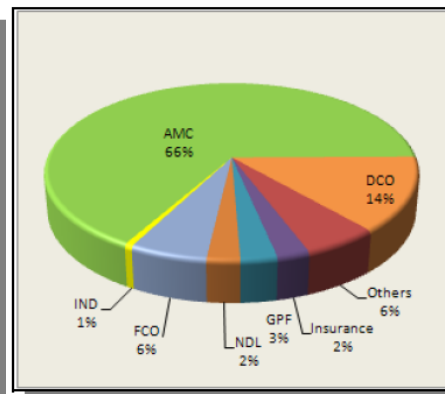
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FIGURE 9: COMPOSITION OF MARKET PARTICIPANTS
(Year 2009)



Source: ThaiBMA

FIGURE 11: COMPOSITION OF D2C TRANSACTIONS
(Year 2009)



Source: ThaiBMA

Bond characteristics

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Corporate bonds

- Subordinated bond / Junior bond
- Senior bond

- Unsecured bond
- Secured bond
- Asset-backed securities

Bond characteristics

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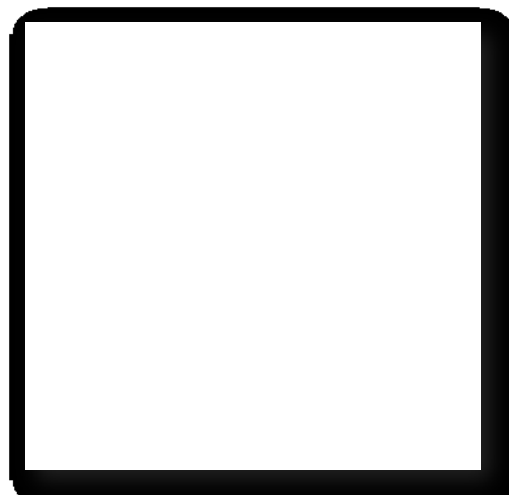
Corporate bonds

- Convertible bond
- Collable bond
- Puttable bond
- Step-up note : Single / multiple
- Floating-rate bond / Variable-rate bond

Bond characteristics

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Corporate bonds

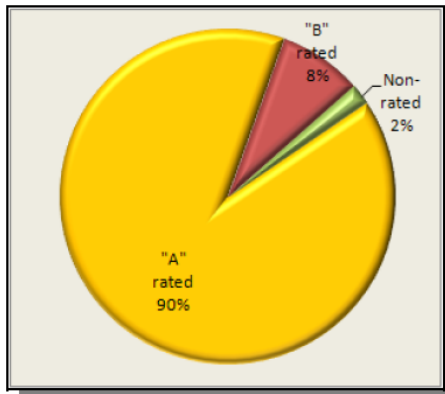


Bond markets

Thailand data – Corporate bonds

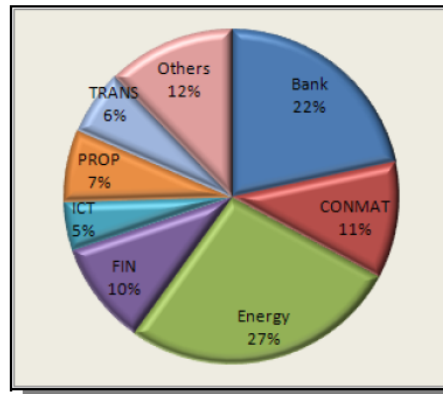
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FIGURE 5: CORPORATE BOND'S OUTSTANDING
BY RATING (as of Dec 30, 2009)



Source: ThaiBMA

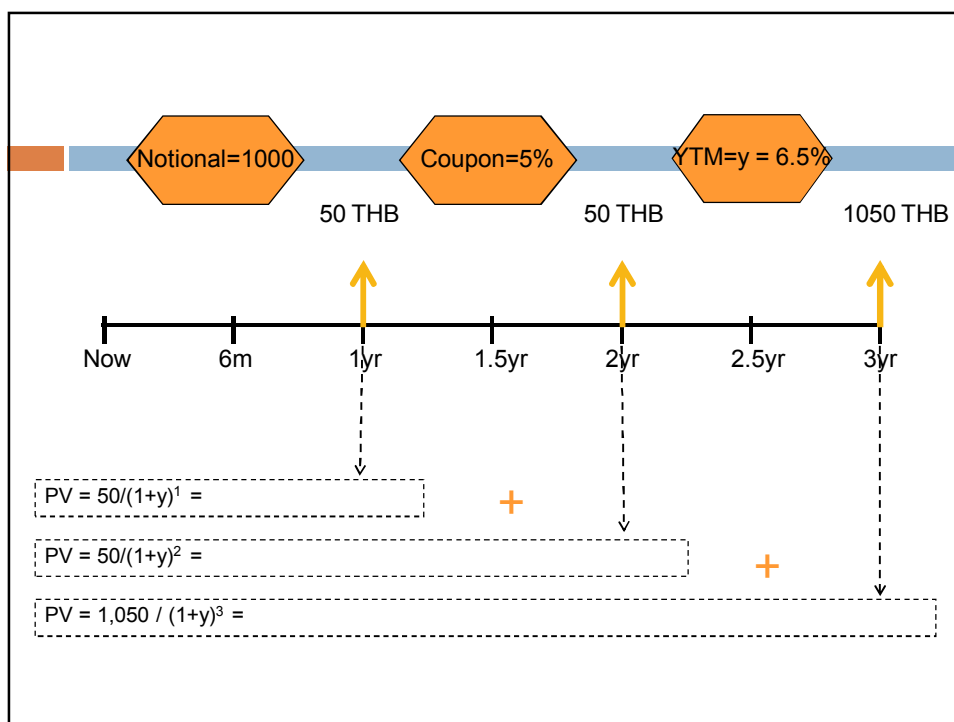
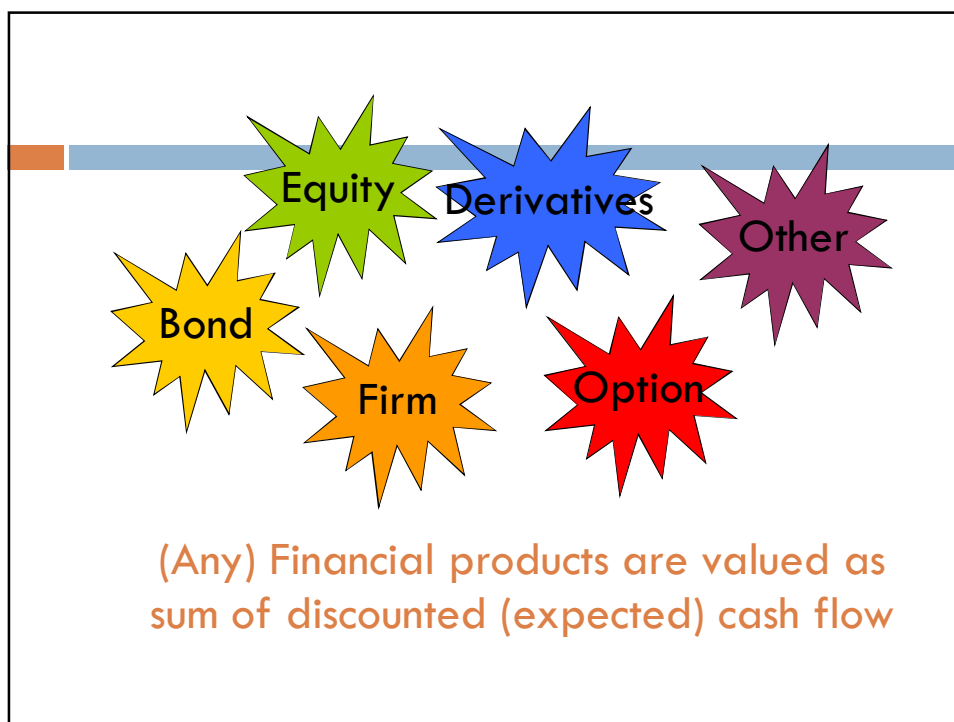
FIGURE 6: CORPORATE BOND'S OUTSTANDING
BY BUSINESS SECTOR (as of Dec 30, 2009)



Source: ThaiBMA

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Bond Valuation



$$\text{Bond Price} = \text{PV of coupons} + \text{PV of par value}$$

$$\text{Bond Price} = C * \text{Annuity factor}(y, T) + \text{Par} * \text{discount factor}(y, T)$$

Yield to Maturity (YTM)

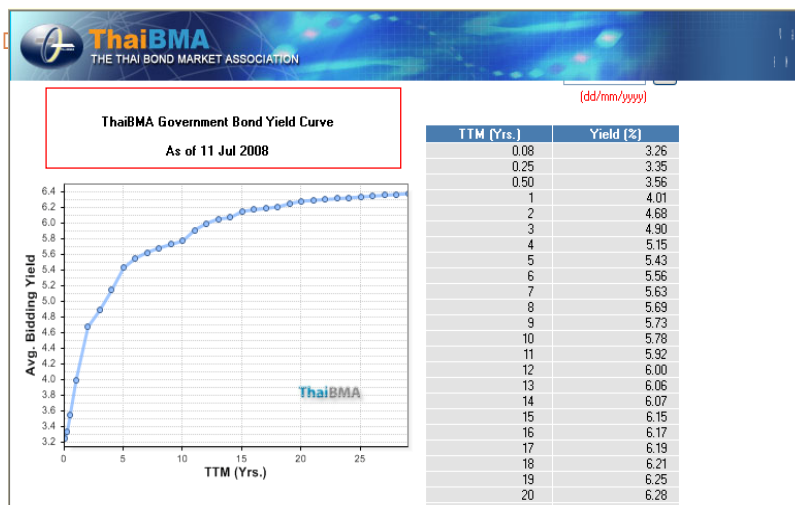
- Yield to maturity (YTM) is the rate of return (or yield) if bond is hold until maturity
- It is the single discount rate that is used to calculate the present value of cash flows, and therefore used to calculate the bond price.
- There is 1:1 relationship between bond price and yield to maturity.
- This is how bond price get quoted in the market.

Bond Quote

Treasury Bills	Government Bonds	State Owned Enterprise Bonds	State Agency Bonds	Corporate Bonds	Foreign Bonds
State Owned Enterprise Bonds Quoted Yields			Historical Quoted Yield >> 08/09/2008		Go! (dd/mm/yyyy)
08 September 2008					
Bond	Coupon	Maturity	TTM (Yrs.)	Quoted Date	Quoted Yield(%)
BMTA08DA	3.85	15/12/2008	0.27	08/09/2008	3.882471
BMTA08NA	3.78	04/11/2008	0.16	08/09/2008	3.880473
BMTA09DA	4.14	04/12/2009	1.24	08/09/2008	4.084864
BMTA09DA	4.225	28/10/2009	1.14	08/09/2008	4.046865
BMTA10DA	5.86	13/12/2010	2.26	08/09/2008	4.232227
BMTA10NA	4.53	04/11/2010	2.16	08/09/2008	4.216950
BMTA10DA	4.6	15/10/2010	2.10	08/09/2008	4.209115
BMTA11DA	5.325	25/01/2011	2.38	08/09/2008	4.255625
BMTA11DA	6	13/12/2011	3.26	08/09/2008	4.385197
BMTA11DA	4.72	15/10/2011	3.10	08/09/2008	4.360696
BMTA12DA	5.345	08/02/2012	3.42	08/09/2008	4.431282
BMTA128A	4.598	29/08/2012	3.98	08/09/2008	4.502289
BMTA12DA	4.77	13/12/2012	4.27	08/09/2008	4.549463
BMTA131A	4.95	25/01/2013	4.38	08/09/2008	4.581162
BMTA133A	4.1	26/03/2013	4.55	08/09/2008	4.622401
BMTA136A	3.4968	01/06/2013	4.73	08/09/2008	4.650081
BMTA136B	3.8668	14/06/2013	4.77	08/09/2008	4.661422
BMTA13DA	4.967	17/12/2013	5.28	08/09/2008	4.722664
BMTA13DA	4.738	29/10/2013	5.14	08/09/2008	4.708707
BMTA144A	4.17	10/04/2014	5.59	08/09/2008	4.764885
BMTA144B	4.12	24/04/2014	5.63	08/09/2008	4.772772
BMTA146A	3.808	07/06/2014	5.75	08/09/2008	4.799477
BMTA14DA	4.83	13/12/2014	6.27	08/09/2008	4.858313
BMTA152A	4.79	08/02/2015	6.42	08/09/2008	4.866520
BMTA155A	3.6468	01/06/2015	6.73	08/09/2008	4.882792
BMTA156B	4.03	14/06/2015	6.77	08/09/2008	4.884663
BMTA15DA	4.94	29/10/2015	7.14	08/09/2008	4.895778

Source: thaibma.or.th

Curve from Thai BMA



Ex.1

- A government bond issued in Germany has a coupon rate of 5%, face value of euros 100 and maturing in five years. The interest payments are made annually. Calculate the price of the bond (in euros) if the yield to maturity is 3.5%.
 - a. 100
 - b. 106.77
 - c. 106.33
 - d. None of the above

Ex. 2:

- 8% coupon, 30-yrs maturity bond with par value of \$1,000 paying 60 semiannual coupon of \$40 each.
- If YTM is 8% annually, or 4% per 6-month period, what is the price of this bond?
- If YTM is 10% annually, or 5% per 6-month period, what is the price of this bond?

Ex.3 : What can you get out from this result?

- Bond prices at different interest rates
- 8% coupon bond with par value of \$1,000, coupons paid semiannually

Bond Price at Given Market Interest Rates					
Time to Maturity	4%	6%	8%	10%	12%
1 yr	1038.83	1029.13	1000.00	981.41	963.33
10 yr	1327.03	1148.77	1000.00	875.35	770.6
20 yr	1547.11	1231.15	1000.00	828.41	699.07
30 yr	1695.22	1276.76	1000.00	810.71	676.77

Ex. 4: True or False

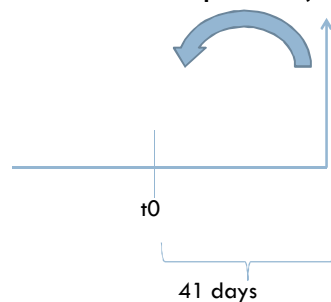
- Which of the following statements about the relationship between interest rates and bond prices is true?
 - I) There is an inverse relationship between bond prices and interest rates
 - II) There is a direct relationship between bond prices and interest rates
 - III) The price of short-term bonds fluctuates more than the price of long-term bonds for a given change in interest rates. (Assuming that coupon rate is the same for both)
 - IV) The price of long-term bonds fluctuates more than the price of short-term bonds for a given change in interest rates. (Assuming that the coupon rate is the same for both)

Ex. 5

- What would you expect the market price of the following bond to be? Which bond has higher price?
- 1) Notional = 100, 1 yr maturity, 8% annual coupon
 - ▣ 1.1) When the yield available on comparable bonds is 8%
 - ▣ 1.2) When the yield available on comparable bonds is 5%
- 2) Notional = 100, 7yr maturity, 8% annual coupon
 - ▣ 1.3) When the yield available on comparable bonds is 8%
 - ▣ 1.4) When the yield available on comparable bonds is 5%
- 3) Notional = 100, 7yr maturity, zero coupon
 - ▣ 1.5) When the yield available on comparable bonds is 8%
 - ▣ 1.6) When the yield available on comparable bonds is 5%

Ex6: Treasury Bill (TB)

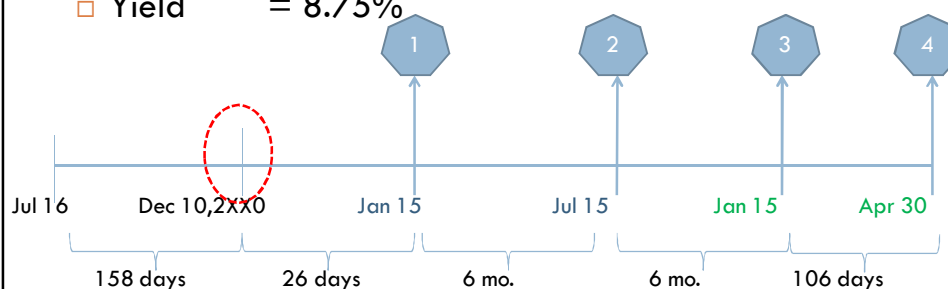
- Maturity = 41 days
- Yield = 6.41%
- Face = B100
- What is the price? (Hint: TB sold at discount)



- $P \cdot (1 + 6.41\% \cdot 41 / 365) = 100$
- $P = 100 / (1 + 6.41\% \cdot 41 / 365)$
- $P = 99.2851$

Ex7: Coupon Bond

- Bond pay interest every 6 months (Jul & Jan 15)
- Today = Dec 10, 2XX0, Maturity = Apr 30, 2XX2
- Face = B100
- Coupon = 11.25%
- Yield = 8.75%



- CF1 discount 26 days
- CF2 discount 6mo. + 26 days
- CF3 discount 12mo. + 26 days
- CF4 discount 12mo. + 26 days + 106 days
- Yield = 4.375% / 6 mo. Or 182.5 days
- We use actual / 365 days count convention

$$\square \text{ PV-CF1} = 5.625 / (1 + 4.375\%)^{26/182.5} = 5.5908$$

$$\square \text{ PV-CF2} = 5.625 / (1 + 4.375\%)^{1 + 26/182.5} = 5.3564$$

$$\square \text{ PV-CF3} = 5.625 / (1 + 4.375\%)^{2 + 26/182.5} = 5.1319$$

$$\square \text{ PV-CF4} = 100 + 5.625 / (1 + 4.375\%)^{2 + 132/182.5} = 91.9006$$

$$\square \text{ Price} = \text{PV-CF1} + \text{PV-CF2} + \text{PV-CF3} + \text{PV-CF4}$$

$$\square \text{ Price} = 107.9798$$

$$\square \text{ Gross (Dirty) Price} = 107.9798$$

□ But the first 158 days of interest belongs to first holder

□ If this is dirty price, what is the clean price?

Accrues interest – Coupon bonds

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Prices

- ▣ But the first 158 days of interest belongs to first holder
- ▣ If that is dirty price, what is the clean price (price net of accrued interest)?
- ▣ **Accrued interest:** The portion of the coupon payment accrued between the last coupon payment and the settlement day



Dirty vs Clean price

- ▣ Clean Price = Gross (Dirty / full) Price – Accrued IR
- ▣ Clean Price = $107.9798 - 5.625 \times 158 / 182.5$
- ▣ Clean Price = $107.9798 - 4.8699 = 103.109$
- ▣ Clean / Quoted price = 103.109
- ▣ Dirty / Gross / Full price = 107.9798

- Now we want to use Annuity Factor, and it should be exactly the same

□ **Gross Price** = $\text{Disc.Factor}(4.375\%, 26 \text{ days}) * CF1$
 $+ \text{Disc.Factor}(4.375\%, 26 \text{ days}) * C * \text{annuity factor}(4.375\%, 2)$
 $+ \text{Disc.Factor}(4.375\%, 2 + 132/182.5 \text{ days}) * \text{Face}$

□ $\text{Disc.Factor} = 1 / (1 + 4.375\%)^{26/182.5} = 0.9939$

□ (1) = $0.9939 * 5.625 = 5.5908$

□ (2) = $0.9939 * 5.625 * 1/r * (1 - 1/(1+r)^2) = 10.4884$

□ (3) = $100 + 5.625 / (1 + 4.375\%)^{2 + 132/182.5} = 91.9006$

□ **Gross Price** = $5.5908 + 10.4884 + 91.9006 = 107.9798$

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Q & A