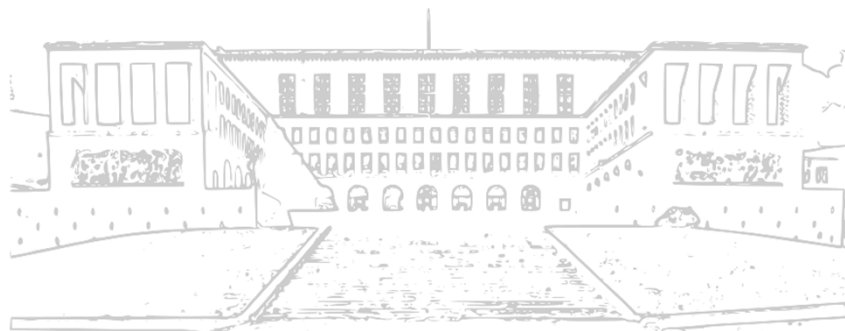


FINANCIAL MARKETS AND INSTITUTIONS

BOND MARKETS

A.Y. 2017/2018

Prof. Alberto Dreassi – adreassi@units.it



AGENDA

- Capital market features and participants
- Bond features
- Bond types
- Financial guarantees
- Evaluation

CAPITAL MARKETS

Main features:

- **Long-term**, compared to managing treasuries in money markets
- **Interest-rate risk reduction** for borrowers instead of short-term changes in costs of capital
- **Higher cost of borrowing**: especially, **credit risk premium**
- **Very active markets**, but less than money markets
- **Very diverse and competitive**, but not for all securities/firms
- Bonds > Stocks

3

CAPITAL MARKETS

Main participants:

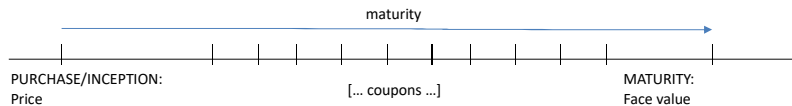
- **Issuers of bonds**: governments and corporations
- **Issuers of stock**: corporations (some within the public sector)
- **Lenders**:
 - **households**, directly or indirectly
 - **financial intermediaries**
 - **corporations** (f.i. within groups)
 - **governments** (f.i. “strategic” interests)

4

BONDS: FEATURES

Bond features:

- Represent a debt owed by an issuer to the investor



- Specified IR:
 - Typically, nominally fixed, or variable (f.i. Euribor1m+spread)
 - Quite frequently with *caps* and *floors*
 - Interesting variations: *step-up/down* (coupons grow/shrink over time)
 - Other structures:
 - linked (f.i. on currencies)
 - structured (f.i. path-dependent, *reverse floater*, ...)

5

BONDS: FEATURES

Bond features:

- Specified maturity dates for principal and interests:
 - Par/face/maturity/nominal value, usually at maturity
 - Coupon rate and timing of coupon payments
 - Partial exceptions: *perpetuity/console* and ZC
- If payment requirements are missed, bondholders have a claim over debtor's assets

See some statistics at <http://stats.bis.org/statx/srs/table/c1>

6

BONDS: CATEGORIES

Government bonds (1/2)

- Notes/bills/treasuries (1y-10y) and bonds (10y-30+y) – names vary widely across countries
- Considered default-risk free... more likely it is relatively small, leading to lower IR
- Typical risks are the usual:
 - Interest-rate risk
 - Inflation risk
 - Currency risk (and some are issued in third-country currencies)
 - Liquidity risk (not all secondary markets are equal)



(cont.)

7

BONDS: CATEGORIES

Government bonds (2/2)

- ZC (from 3 months to 2 years) or coupon bonds
- Increasing amount of alternative structures:
 - Usually fixed IR, but variable are possible
 - Linked/structured to inflation, or longevity
- Coupons are usually paid annually or semi-annually
- Other government-related entities might be allowed to issue own debt securities (f.i. municipal bonds) – in this case they could present also risks of default

MARKETS

A 100-Year Bond for a 99-Year-Old Country

Austria issued the first public, centurylong bond by a eurozone government

- Oversubscribed (3.5 bln €)
- Maturity 09/2117
- IR: 2.1%

8

BONDS: CATEGORIES

Corporate bonds

- Features embrace all potential variations
 - Frequently involve *covenants* (on dividends, on additional debt, on specific company measures, on M&A, ...) to reduce moral hazard
 - Several are callable:
 - may be redeemed before maturity, after a waiting period at par or at a higher value
 - can reduce future costs of falling IR
 - also, to fulfill sinking bonds' requirements (proportionally and periodically reimburse an issue)
 - additionally, to avoid restrictive covenants
 - finally, to be flexible in altering companies' capital structure
 - Some encompass collateral, mentioned in the bonds' indenture
 - Involve various degrees of default risk
- (cont.)



9

BONDS: CATEGORIES

Corporate bonds (cont.)

- some are convertible into common stock:
 - at a specific price, usually anticipating a rise in its level to be exercised
 - avoids negative signaling of overvalued equity of a direct issue of stocks
 - usually means lower IR
- secured (mortgage or other tangibles – *asset backed securities* or ABS) – with higher priority in case of default Vs. unsecured (called debentures) – with lower priority and higher IR
- some issues can be separated in senior/mezzanine/junior tranches, with decreasing subordination of lenders' claims in case of default
- Investment grade (at or above Moody's Baa or S&P's BBB) Vs. high-yields bonds



M. Milken:

- inventor of «junk» bonds in late 70s
- earning more than 1 bln USD by mid 80s
- paid with jailtime and 1.1 bln USD in fines for several misbehaviour indictions

10

FINANCIAL GUARANTEES

A form of protection:

- **Internal:**
 - can be purchased by weaker issuers to increase market's appetite for their bonds
 - are issued by financial intermediaries (especially banks and insurers, but also others)
 - creditworthiness is transferred from guarantor to issuer (plus benefit of correlation)
- **External:**
 - bondholders can purchase a guarantee over a specified issuer
 - some insurance policies and guarantees specifically address this issue
 - some of these can be traded independently from the underlying bond (f.i. credit default swaps – CDS)
 - CDS ≠ insurance

11

EXAMPLES

1. How do European countries' current ratings (investment grade) relate with their long-term IR? Any comments?

Rat. S&P	Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AAA	DEN	4.43	4.35	3.74	3.31	4	4.15	3.44	3.57	1.74	1.61
AAA	FIN	4.26	4.16	3.6	3.28	4.05	4.14	3.87	3.49	2.28	1.75
AAA	GER	4.18	4.17	3.56	3.32	4.02	4.03	3.07	3.26	1.82	1.51
AAA	LUX	3.62	3.01	2.55	2.82	3.83	4.47	4.18	3.76	2.07	1.6
AAA	NET	4.19	4.18	3.56	3.33	4.05	4.13	3.76	3.47	2.2	1.74
AAA	SWE	4.7	4.65	3.84	3.33	3.9	4.09	2.8	3.37	1.7	1.8
AAA	UK	4.31	4.84	4.6	3.97	4.94	4.26	3.17	4.01	2.04	1.82
AA+	AUS	4.22	4.27	3.56	3.33	4.06	4.22	4	3.75	3.27	1.92
AA+	FRA	4.22	4.2	3.58	3.34	4.07	4.15	3.6	3.52	3.18	2.17
AA	BEL	4.28	4.26	3.59	3.37	4.06	4.25	4.13	3.75	4.11	2.31
AA	CZR	4.1	4.68	3.91	3.39	3.94	4.56	4.21	4.28	3.39	1.96
A	POL	5.66	6.67	5.97	4.95	5.17	5.81	5.46	6.13	5.68	3.91
A	SLK	4.98	5.16	4.04	3.59	4.25	4.48	4.69	4.11	5.22	3.93
A-	SLO	6.65	5.14	3.87	3.73	4.23	4.39	4.7	4	6.74	4.81
BBB+	IRE	4.27	4.2	3.52	3.32	4.04	4.25	5.2	4.83	7.71	4.18
BBB+	LAT	4.62	5.06	4.29	3.6	4.92	5.71	10.64	13.76	5.74	3.21
BBB+	MAL	5.54	4.71	4.71	4.39	4.34	4.63	4.35	4.5	4.3	3.73
BBB	BUL	7.2	6.06	4.48	3.66	4.27	5.07	7.14	6.65	5.3	3.27
BBB	ITA	4.38	4.32	3.71	3.54	4.26	4.4	4.62	4.08	6.54	4.21
BBB	LIT	5.85	4.81	3.85	3.62	4.28	4.73	13.95	8.15	5.35	3.97
BBB-	SPA	4.24	4.19	3.59	3.33	4.07	4.18	4.15	3.99	5.41	5.05

Rating	Av. IR	N.
AAA	1.69	7
AA+	2.05	2
AA	2.14	2
A	3.92	2
A-	4.81	1
BBB+	3.71	3
BBB	3.82	3
BBB-	5.05	1

12

EXAMPLES

2. Consider the following three bonds, all with face value of 1,000 and annual coupons:

	Maturity	Coupon
Bond1	5y	5%
Bond2	10y	7%
Bond3	15y	9%

- What is their current price if required YTM equals 8% or 10% for all three?
- What is their current price if required YTM equals 9% for 5y, 11% for 10y and 13% for 15y (i.e. considering liquidity premiums)?

a) Calculate the present value of future cash flows under 8% and 10% YTM

$$PV_{h,k} = \sum_{t=1}^{N_h} \frac{1,000 \cdot i_h}{(1 + YTM_k)^t} + \frac{1,000}{(1 + YTM_k)^{N_h}}$$

H / K	8%	10%
1	880.22	810.46
2	932.90	815.66
3	1,085.59	923.94

b) Calculate the PV under different YTM:

H / K	YTM	PV
1	9%	844.41
2	11%	764.43
3	13%	741.50

13

EXAMPLES

3. Consider the following bonds, all with face value of 100 and annual coupons (some adjustments were made, but these are real bonds and prices as of 7/10/2013):

	Maturity	Coupon %	Price
Mediobanca	ott-16	4.625	105.41
Volkswagen	ott-16	1	100.04
Heineken	ott-16	4.625	110.3
Dexia	ott-18	4.25	95.01
Renault	ott-18	3.625	100.78
Enel	ott-18	5.75	114.46
IntesaSP	ott-23	6.625	104.74
FRA_gov	ott-23	4.25	116.27
USA_gov	ott-23	1.625	93.15

- Which one has the highest YTM? Why?

a) Estimate the YTM (or IRR) on contractual cashflows through spreadsheet

$$0 = \sum_{t=1}^{N_h} \frac{100 \cdot i_h}{(1 + YTM_k)^t} + \frac{100}{(1 + YTM_k)^{N_h}} - P_{h,k}$$

	YTM	Rating
Mediobanca	2.723%	BBB
Volkswagen	0.986%	A-
Heineken	1.115%	BBB+
Dexia	5.416%	BB-
Renault	3.452%	BB+
Enel	2.626%	BBB
IntesaSP	5.982%	BBB+
FRA_gov	2.401%	AA+
USA_gov	2.404%	AA+

14

EXAMPLES

4. The following graph presents the performance of selected Bloomberg's indexes on sovereign bonds (vs. the US, in orange). Any comments?

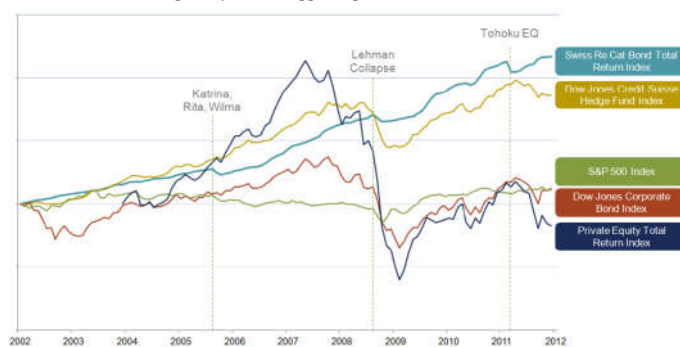


15

EXAMPLES

5. Among all potential variations, 'cat bonds' rise up as an interesting category. Most part pays a coupon until a catastrophe or similar trigger event occurs, after which the coupon or even the principal are reduced or waived. Currently they total an outstanding of nearly 20 bln \$.

- Who could be interested in selling these securities?
- Who could be interested in buying these securities?
- If we compare this market to the traditional one, what would be the consequence on cat-bonds, in our demand/supply framework, of the recent drop in yields of traditional bonds?
- What is the following comparison suggesting?



16

EXAMPLES

6. A bank invests in a portfolio with the following assets (assume that market IR are 4,5%):

- 1) 1 mln € (face value) in a 10 year government bond with a 6% coupon paid annually
- 2) 0.5 mln € (face value) in a zero-coupon bond due in 5 years
- 3) 1.5 mln € in a mutual fund of bonds with a 6.5 years duration

Calculate the price change of this portfolio if market IR rise to 5,5%

a) Calculate prices and durations:

$$DUR_1 = \left(\sum_{t=1}^{10} t \cdot \frac{60,000}{1.045^t} + 10 \cdot \frac{1,000,000}{1.045^{10}} \right) / \left(\sum_{t=1}^{10} \frac{60,000}{1.045^t} + \frac{1,000,000}{1.045^{10}} \right) = 7.94 \quad \begin{array}{l} DUR_2 = 5 \\ DUR_3 = 6.5 \end{array}$$

$$P_1 = \sum_{t=1}^{10} \frac{60,000}{1.045^t} + \frac{1,000,000}{1.045^{10}} = 1,118,691.77$$

$$P_2 = \frac{500,000}{1.045^5} = 401,225.52$$

$$P_3 = 1,500,000$$

$$DUR_p = \frac{7.94 \cdot 1,118,691.77 + 5 \cdot 401,225.52 + 6.5 \cdot 1,500,000}{1,118,691.77 + 401,225.52 + 1,500,000} = 6.83$$

b) Calculate the change in portfolio's value: $\% \Delta P \approx -6.83 \cdot \frac{1\%}{1 + 4.5\%} = -6.54\%$