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# Fixed Income

## 2015 CFA一级知识框架图



# Fixed Income整体框架

Definition ( features )

Type

Risk

Valuation

Trading strategy

一级

二级

三级

一级

Definition R51、R52

Type R54 (NEW)

Risk: interest rate risk R55 ★ & credit risk R56

Valuation R53★

# Reading 51

## Fixed-Income Securities: Defining Elements

考法：概念和名词对比

## 五要素

- Issuer
- Maturity / Tenor
- Par value
- Coupon rate & frequency
- Payment currency
  - Dual currency bond
  - Currency option bond

## Bond market ★★

Global bond	National	Domestic bond
		Foreign bond
	Eurobond	

## Legal issues

目的：降低credit risk



### 1. 按Issuer分类

### 还款来源

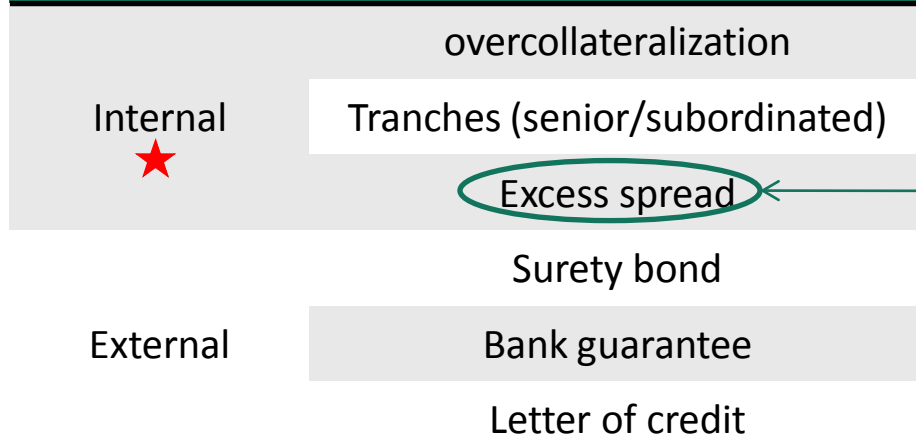
Sovereign bond	tax、print money
Non—sovereign bond	tax、revenue of project
Corporate bond	operation
Securitization	cash flow of underlying assets
<b>SPV: bankruptcy remote</b>	

### 2. 按collateral分类

### Collateral backing

Collateral trust bond	Financial assets
Equipment trust certificates	equipment or physical assets
MBS	Mortgage loans
Covered bond	“covered pool”

### 3. Credit enhancement



R 54: 信用増級-Reserve fund :

- ✓ Cash reserve
- ✓ Excess spread

### 4. Covenants ★

- Affirmative: **require**
- Negative: **limit/prohibit/not**

### 5. Tax

- OID (original issue discount tax provision)

## 按照cash flow的特征分类 ★ ★

### Principal

Plain vanilla bond/Bullet bond	
Amortizing loan	Fully amortizing Partially amortizing
Sinking fund provision	优点：降低credit risk 缺点：增加reinvestment risk

### Coupon

Floating rate security	① Coupon rate = reference rate + quoted margin
	② Coupon reset date
	③ Cap & floor
	④ 特殊的：variable-rate notes & inverse floater
Step up coupon bond	
Deferred coupon bond: zero coupon bond	
Credit linked coupon bond	
Pay-in-kind bond (PIK)	
Equity-linked notes (ELN)	
Indexed-linked bond	TIPS: Capital-indexed bond Principal protected bond

## Bonds with embedded option ★ ★

分类	性质
Callable bond	<p>① <math>r</math>下降, issuer赎回, benefit to issuer</p> <p>② 三种执行方式: American style\European style\Bermuda style</p> <p>③ Value of callable bond = value of identical noncallable bond – call option value</p>
Puttable bond	<p>① <math>r</math>上升, bondholder会卖还给issuer, benefit to bondholder</p> <p>② Value of puttable bond = value of identical nonputtable bond + put option value</p>
Convertible bond	<p>① 基本性质: 含有一个可以转换成股票的权利</p> <p>② 名词: Conversion premium、Conversion parity</p> <p>③ 优点</p>
Warrants	不是embedded option
Contingent convertible bonds (“CoCos”)	

# Reading 52

**Fixed-Income Markets: Issuance, Trading, and Funding**



## 分类 - by type of issuer

### Government and government - related sector ★

- Supranational organizations: IMF、world bank
- Sovereign governments: no credit risk, 发行量最大
- Non-sovereign (local) governments: high credit quality
- Quasi-government entities: agency bond

### Corporate sector

- Financial company: 发行量最大
- Non-financial company

### Securitization

## issuing & trading

发行参考利率：LIBOR

### Primary market ★★

1. Public offering
  - ① Underwritten offering：特殊的 - Grey market
  - ② Best efforts
  - ③ Auction
  - ④ Shelf registration
2. Private placement

### Secondary markets

1. Exchange market
2. OTC
3. Electronic Trading Network

## 不同机构的融资方式

### Corporate debt

- Bank debt
- Commercial paper ★ : 注意U.S commercial paper对比Eurocommercial paper
- Corporate bonds
- MTNs ★

### Funding of Bank

- Customer deposits
- Negotiable CDs
- Central bank funds market: central bank funds rate (FFR)
- Interbank funds
- Repurchase agreement ★ ★
  - Repo rate (计算、影响因素)
  - Repo margin (计算、影响因素)
  - Reverse repo agreement

# Reading 53

## Introduction to Fixed-Income Valuation

★★ (整章都非常重要)

# 计算price

**Value using single yield ( YTM )** →  $\text{bond price} = \frac{CPN_1}{(1+YTM/2)} + \frac{CPN_2}{(1+YTM/2)^2} + \dots + \frac{CPN_{2N} + Par}{(1+YTM/2)^{2N}}$

**No-arbitrage price** →  $\text{no-arbitrage price} = \frac{CPN_1}{(1+S_1)} + \frac{CPN_2}{(1+S_2)^2} + \dots + \frac{CPN_N + Par}{(1+S_N)^N}$

**Full price & Accrued interest** →

① Full Price = Clean Price + Accrued Interest

② Full price : 折现求和得到的价格

**Matrix pricing** →

**Linear interpolation**

① 已知 identical Treasury bond , 通过求 spread 得到

② Yield of identical Treasury bond 不知道 , 直接求解

## Price & Time

- 定性
- ① At maturity date, price = par
  - ② Discount: 随着到期日临近, price 上升
  - ③ Premium: 随着到期日临近, price 下降

定量 计算 the value change attributable to the passage of time

## FRN (floating rate notes)

- ① Price 和 Par value 的关系 ;
- ✓ Selling at par (credit unchanged): required margin = quoted margin
  - ✓ Selling at discount (credit downgrade): quoted margin < required margin
  - ✓ Selling at premium (credit upgrade): quoted margin > required margin
- ② 已知 price , 计算 required margin ;
- ③ 已知 required margin , 计算 price

# 计算yield

Current yield、YTM、YTC、YTP、YTW	
Effective yield	$\text{effective yield} = \left(1 + \frac{YTM}{m}\right)^m - 1$
$APR_m$	$\left(1 + \frac{APR_m}{m}\right)^m = \left(1 + \frac{APR_n}{n}\right)^n$
Option-adjusted yield (不用计算)	Callable bond: option-adjusted yield < YTM Puttable bond: option-adjusted yield > YTM
Discount yield (U.S. Treasury bills)	$PV = FV \times \left(1 - \frac{\text{days}}{\text{year}} \times DR\right)$
Add-on yield (LIBOR, bank CD rates)	$PV = \frac{FV}{\left(1 + \frac{\text{Days}}{\text{Year}} \times AOR\right)}$ <b>Bond equivalent yield for money market security</b>
Street convention yield & True yield (不用计算)	

# Yield curve & Yield spread

- Spot curve
  - Spot rate: 零息债券的折现率 = 零息债券的YTM
  - **Spot rate & Forward rate** (计算)
- Yield curve for coupon bonds (YTM) 不需要计算, 了解概念
- Par bond yield curve: par rate 不需要计算, 了解概念

<b>Benchmark spread</b>	<ul style="list-style-type: none"><li>① <b>G-spread</b>: the benchmark is government bond yield 计算</li><li>② Interpolated spread (I-spread): the benchmark is swap rate 概念</li></ul>
<b>Z-spread</b>	<p>The difference between the GS and the ZS :</p> <ul style="list-style-type: none"><li>① The steeper the benchmark spot rate curve, the greater the difference between the two spread measures.</li><li>② The earlier bond principal is paid, the greater the difference between the two spread measures</li></ul>
<b>OAS</b>	<ul style="list-style-type: none"><li>① Callable bond: <math>ZS &gt; OAS</math></li><li>② Putable bond: <math>ZS &lt; OAS</math></li></ul>

# Reading 54

**Introduction to Asset-Backed Securities**





各个参与人的角色★

## Definition ( features )



## Benefits of Securitization

- The seller of the collateral(originator or depositor, e.g. Bank)
- The SPV(issuer or trust;)
- Servicer(if different from the seller)

# RMBS ★★

## Classification of markets

条款	<ul style="list-style-type: none"><li>① Loan-to-value ratio(LTV)</li><li>② Term of a mortgage</li><li>③ Interest rate determination</li><li>④ Amortization schedule</li><li>⑤ Foreclosure: <b>Recourse loan &amp; Nonrecourse loan</b></li><li>⑥ Prepayment</li></ul>
分类	<p>Conforming loans → Agency RMBS</p> <p>Non-conforming loans → Non-Agency RMBS</p>

名词辨析

名词辨析

### MPS

Cash flow特点  
计算

- ① WAM、WAC
- ② Monthly cash flow for MPS= Monthly cash flow of the underlying pool of mortgages—servicing and other fees
- ③ Monthly cash flow of the underlying pool of mortgages=int. + scheduled prin. +prepayment (prin.)
- ④ Pass-through rate (net interest or net coupon)=mortgage rate on the underlying pool of mortgages—Servicing and other fees

Prepayment risk

- ① Contraction risk & Extension risk      名词辨析
- ② PSA、CPR、SMM      计算
- ③ Weighted average life: prepay导致WAL不一定

CMO

{ Sequential Pay tranches  
PAC & Support tranches

各个层次特点、风险特征的对比

## Non-Agency RMBS

Credit enhancement (同R51)

题目条件是  
哪一种信用  
增级方式?

## CMBS ★

性质	<ul style="list-style-type: none"><li>• <b>No recourse loan</b></li><li>• Debt to service coverage ratio 计算</li><li>• Loan to value ratio 计算</li></ul>
Balloon maturity provision	<b>Balloon risk (extension risk)</b> 概念
Call protection 方法、概念	<ul style="list-style-type: none"><li>• Loan level<ul style="list-style-type: none"><li>• Prepayment lockout.</li><li>• Defeasance.</li><li>• Prepayment penalty points.</li><li>• Yield maintenance charges( make-whole charge)</li></ul></li><li>• CMBS-level</li></ul>

## Non - mortgage ABS

Auto Loan Receivable-backed securities

Credit Card Receivable-backed securities ★

**non-amortizing loans  
lockout periods**

特点

**CDO**

**CDO manager**

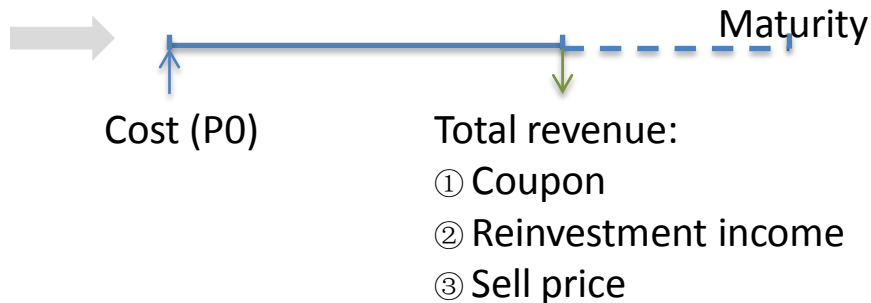
Senior tranche	Highest credit ratings
Mezzanine tranche	Credit ratings between senior and subordinated bond classes
Subordinate/residual or equity tranche	Receive the residual cash flow

# Reading 55

## Understanding Fixed-Income Risk and Return

★★（整章都非常重要）

## 计算total return(realized return)



$\Delta y$  影响

Total return

Price risk

$Y \uparrow \rightarrow P \downarrow$

Duration ★★★

Convexity ★★★

Yield volatility

①计算：

✓ Mac dur, MD, **ED**, approximation D

✓ **Money D, PVBP**

✓ Portfolio duration

② Interpreting duration (三个解释)

③ 影响因素

①计算：**EC**, approximation convexity

②性质：**涨多跌少**

$$\textcircled{3} \frac{\Delta P}{P} = [-MD \times (\Delta y)] + [0.5 \times Conv \times (\Delta y)^2]$$

④ **Callable bond : negative convexity (  $y \downarrow$  )**

**Putable bond : more convex (  $y \uparrow$  )**

## Spread risk

$$\% \Delta \text{bond value} = - \text{duration} (\Delta \text{spread}) + \frac{1}{2} \text{convexity} (\Delta \text{spread})^2$$

## Reinvestment risk

Y上升→RI上升

## Price risk & Reinvestment risk相互抵消

① Short investment horizon: market price risk > reinvestment risk

long investment horizon: market price risk < reinvestment risk

② **Duration gap** = Macaulay duration – investment horizon★★

✓ Positive gap exposes the investor to market price risk from increasing interest rates

✓ Negative gap exposes the investor to reinvestment risk from decreasing interest rates

# Reading 56

## Fundamentals of Credit Analysis



## Credit risk 构成

Default risk (PD)

Loss severity = 1-recovery rate → Seniority ranking★  
定性

Spread risk  $\xrightarrow{\text{原因}}$  { Credit migration risk  
Market liquidity risk

First lien loan

↓  
Senior > Subordinated

↓  
Secured > Unsecured

## Credit rating

Investment grade & Speculative grade

Issue & Issuer rating★ { Cross-default provision  
Notching: different ratings to bonds of the same issuer  
Structural subordination: 母公司债券评级 < 子公司

Risks in relying on agency ratings★ 考法: 评级缺点 (4条)

## 4C分析★

Character

Capacity

Industry analysis

Company fundamental

Ratio analysis

Collateral

→ 看公司资产的质量

Covenants (同R51)

考法:

1、判断是哪一C?

2、给出一公司情况, 判断rating高低

Yield  
spread

影响spread的因素★

Credit cycle

Economic conditions: 经济好, spread小

Financial market performance

Broker-dealer capital

General market demand and supply

了解

Credit analysis of  
different bond

High yield bond

Sovereign bond

Municipal bond



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