CFA 一级百题预测

1. **QUANTITATIVE METHODS**

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6. Fixed Income

6.1. Basic Features of A Fixed-Income Security

6.1.1. 重要知识点

6.1.1.1. 描述 basic features of a fixed-income security

- ➢ **Issuer**
    - ■ Supranational organizations
    - ■ Sovereign (national) governments
    - ■ Non-sovereign (local) governments
    - ■ Quasi-government entities
    - ■ Companies (i.e., corporate issuers)
- ➢ **Maturity:** the date when the issuer is obligated to redeem the bond by paying the outstanding principal amount.
- ➢ **Tenor:** the time remaining until the bond's maturity date.
- ➢ **Term to maturity**
    - ■ Money market securities: fixed-income securities with maturities at issuance (original maturity) of one year or less.
    - ■ Capital market securities: fixed-income securities with original maturities that are longer than one year.
    - ■ Perpetual bonds: the consols issued by the sovereign government in the United Kingdom, which have no stated maturity date.
- ➢ **Par value/face value/ maturity value/principal/redemption value**
- ➢ **Coupon rate and frequency**
- ➢ **Currency**
    - ■ **Dual-currency bond:** make coupon payments in one currency and pay the par value at maturity in another currency.
    - ■ **Currency option bond:** a combination of a single-currency bond plus a foreign currency option.

6.1.2. 基础题

Q-1.   A sovereign bond which has a maturity of 15 years can be described as a:

A.   perpetual bond.

B.   pure discount bond.

C.   capital market security.

Q-2. China Construction Development Corporation needs to finance a three-year construction project in Singapore. The corporation plans to issue a bond with coupon payments to be paid in Chinese yuan and principal to be repaid in Singapore dollars. This bond is most likely an example of a:

A. dual currency bond.

B. currency option bond.

C. foreign currency bond.

6.2. Sectors of the Bond Market

6.2.1. 重要知识点

6.2.1.1. Sectors of the bond market
- ➢ The places where fixed-income securities are issued and traded
    - ■ **National bond market**
        - ◆ **Domestic bond:** Bonds issued by entities that are incorporated in that country.
        - ◆ **Foreign bond:** Bonds <u>sold in a country</u> and <u>denominated in that country's currency</u> by an entity from another country (foreign country) are referred to as foreign bonds.
    - ■ **Eurobond market**
        - ◆ **Eurobond:** Type of bond issued internationally, outside the jurisdiction of the country in whose currency the bond is denominated. Bonds issued and traded on the Eurobond market.
    - ■ **Global bonds:** issued simultaneously in the Eurobond market and in at least one domestic bond market.

6.2.2. 基础题

Q-3. A South Korean electronics company issued bonds denominated in US dollars in the United States and registered with the SEC. These bonds are most likely known as a

A. Foreign bond.

B. Eurobond.

C. Global bond.

6.3. Issuer's Legal Information

6.3.1. 重要知识点

6.3.1.1. Issuing entities:

- ➤ **Sovereign bonds:** are backed by the "full faith and credit" of the national government.
- ➤ **Corporate bonds:** the issuer is usually the corporate legal entity.
- ➤ **Securitized bonds:** is legally independent and is considered bankruptcy remote from the seller of the loans which is called <u>special purpose entities (SPEs)</u> in U.S, and <u>special purpose vehicles (SPVs)</u> in Europe.
  - ■ SPV is <u>bankruptcy remote</u> because the assets can provide cash flows to support the payment of the bond even if the company defaults.
  - ■ The transfer of assets by the sponsor is considered a legal sale; once the assets have been securitized, the sponsor no longer has ownership rights.
  - ■ Any party making claims following the bankruptcy of the sponsor would be unable to recover the assets or their proceeds.

6.3.1.2. Sources of repayment:

Types of bond	Source of repayment
Supranational organizations	■ Repayment of previous loans ■ Paid-in capital from its members
Sovereign bonds	■ Tax revenues ■ Print money
Non-sovereign debt	■ General taxing authority of issuer ■ Cash flows of the financed project (revenues) ■ Special taxes or fees
Corporate bonds	■ Cash flows from operations
Securitizations	■ Cash flows generated by one or more underlying financial assets.

6.3.2. 基础题

Q-4. Agency bonds are issued by:

A. local governments.

B.   national governments.

C.   quasi-government entities.

Q-5.   Which of the following are most likely a kind of supranational bonds? Bonds issued by the:

A.   Federal Farm Agency of the United States.

B.   Government of Malaysia.

C.   European Investment Bank.

6.4.   Collateral and Credit Enhancements

6.4.1.   重要知识点

6.4.1.1.   Collateral

➢   Asset or collateral backing: a way to reduce credit risk.

■   Unsecured bonds: have no collateral; bondholders have only a general claim on the issuer's assets and cash flows.

■   Secured bonds: Are backed by assets or financial guarantees pledged to ensure debt repayment in the case of default.

■   Unsecured bonds are paid after secured bonds in the event of default.

■   In many jurisdictions, debentures are unsecured bonds, with no collateral backing assigned to the bondholders.

➢   Types of collateral backing:

Types of bond	Collateral backing
Collateral trust bonds	Financial assets
Equipment trust certificates	Specific types of equipment or physical assets (e.g. railroad cards, oil drilling)
Mortgage-backed securities (MBS)	Mortgage loans
Covered bond	A segregated pool of assets called a "covered pool"

6.4.1.2.   Credit enhancement: a variety of provisions used to reduce the credit risk of a bond issue.

➢   **Internal credit enhancement:**

■   **Overcollateralization:** the process of posting more collateral than is needed to obtain or secure financing.

■   **Reserve accounts or reserve funds:** provide credit support by paying for

possible future losses.

- ◆ Cash reserve fund: deposit of cash that can be used to absorb losses.

- ◆ Excess spread: involves the allocation into an account of any amounts left over after paying out the interest to bondholders.

- **Divide a bond into tranches with different seniority of claims:** any losses of assets supporting a securitized bond are first absorbed by the bonds with the lowest seniority, then the bonds with the next-lowest priority of claims——<u>waterfall structure.</u>

➤ **External credit enhancement:**

- **Surety bond:** issued <u>by insurance companies</u> and is a promise to make up any shortfall in the cash available to service the debt.

- **Bank guarantee:** similar to surety bond, the major difference is that it issued by <u>a bank.</u>

- **Letter of credit:** a promise to lend money to the issuing entity if it does not have enough cash to make the promised payments on the covered debt.

➤ **Limitation of external credit enhancement:**

- while external credit enhancements increase the credit quality of debt issues and decrease the yields, <u>deterioration of credit quality</u> of the guarantor will also <u>reduce the credit quality</u> of the covered issue.

- Surety bonds, bank guarantees, and letters of credit expose the investor to <u>third-party (or counterparty) risk,</u> the possibility that a guarantor cannot meet its obligations.

➤ **A cash collateral account:** the issuer immediately borrows the credit enhancement amount and then invests that amount usually in highly rated short-term commercial paper. A cash collateral account mitigates investors' exposure to the third-party risk, which is the possibility that a guarantor cannot meet its obligation.

6.4.2. 基础题

Q-6. Which of the following is most likely a form of internal credit enhancement?

A. Letter of credit

B. surety bond

C. Overcollateralization

Q-7. Which of the following external credit enhancement has the least amount of third-party risk?

A. Surety bond

B. Letter of credit

C. Cash collateral account

6.5. Bond Indenture, Affirmative and Negative Covenants

6.5.1. 重要知识点

6.5.1.1. 描述 functions of a bond indenture

➢ Describes the form of the bond, the obligations of the issuer, and the rights of the bondholders.

6.5.1.2. 区分 negative covenants 和 affirmative covenants

➢ **Negative covenants:** frequently costly and do materially constrain the issuer's potential business decisions.

■ Restrictions on asset disposals.

■ Negative pledges

■ Restrictions on prior claims.

➢ **Affirmative covenants:** are typically administrative in nature.

■ Comply with all laws and regulations;

■ Maintain its current lines of business;

■ Insure and maintain its assets, and pay taxes as they come due.

6.5.2. 基础题

Q-8. Which of the following content is included in negative bond covenants. The issuer is:

A. required to pay taxes as they come due.

B. prohibited from investing in risky projects.

C. required to maintain its current lines of business.

Q-9. An analyst reviews a corporate bond indenture that contains these two covenants:

1   The borrower will pay interest semiannually and principal at maturity.

2   The borrower will not incur additional debt if its debt-to-capital ratio is more than 50%.

What types of covenants are these?

A.   Covenant 1 is affirmative, and Covenant 2 is negative.

B.   Both are affirmative covenants.

C.   Covenant 1 is negative, and Covenant 2 is affirmative.

6.6.   Taxation of Bond Income

6.6.1.   重要知识点

6.6.1.1.   Tax consideration

➢   **Interest income:** taxed as ordinary income at the same rate as wage and salary income.

■   Interest income from bonds issued by municipal government: tax-exempt.

➢   **Capital gain:** gain or loss between purchase price and selling price.

■   **税率高低比较：利息税税率高于资本利得税税率。**

➢   **Original issue discount (OID) bonds:** a portion of the discount from par at issuance is treated as taxable interest income each year.

■   This allows investors to increase their cost basis in the bonds so that at maturity, they face no capital gain or loss.

■   **Pure-discount bonds:** a portion of the discount from par at issuance is treated as taxable interest income.

■   **Premium bonds:** allow investors to deduct a prorated portion of the amount paid in excess of the bond's par value from their taxable income every tax year until maturity.

6.6.2.   基础题

Q-10.   Ted Nguyen is an investor domiciled in a country with an original issue discount tax provision. He purchases a zero-coupon bond at a deep discount to par value with the intention of holding the bond until maturity. At maturity, he will most likely face:

A.   neither a capital loss nor gain.

B.   a capital loss.

C.   a capital gain.

6.7. Cash Flow Structure

6.7.1. 重要知识点

6.7.1.1. Principal repayment structure

- ➢ **Principal repayment structure**
  - ■ **Bullet structure**
    - ◆ periodic interest payment(coupon payments) over the life of the bond.
    - ◆ entire principal value at maturity.
  - ■ **Amortizing structure: repay part of principal at each payment date.**
    - ◆ fully amortizing structure: equally periodic payment (interest + principal).
    - ◆ partially amortizing structure: a balloon payment at maturity, which repays the remaining principal as a lump sum.
  - ■ **Sinking fund provision**
    - ◆ requires the issuer to retire a portion of a bond issue at specified times during the bonds' life.
    - ◆ The issuer can usually repurchase the bonds at the market price, at par, or at a specified sinking fund price, whichever is the lowest.
  - ■ **Advantages and disadvantages of sinking fund provision**
    - ◆ **Advantages:** less credit risk due to the periodic redemptions of the principal.
    - ◆ **Disadvantages:** more reinvestment risk. When interest rate decreases, the market price is greater than the redemption price.
      - ✓ First, investors face reinvestment risk, the risk associated with having to reinvest cash flows at an interest rate that may be lower than the current yield to maturity.
      - ✓ Another potential disadvantage for investors occurs if the issuer has the option to repurchase bonds at below market prices.
- ➢ **Coupon payment structure**
  - ■ **Floating-rate notes:** coupon rates that are adjusted based on a reference rate such as LIBOR.
    - ◆ Coupon rate = reference rate $\pm$ quoted margin
    - ◆ The coupon rate determined at the coupon reset date is the rate that the issuer promises to pay at the next coupon date.
    - ◆ Cap and floor
      - ✓ The upper limit is called the cap.

- ✓ The lower limit is called the floor.
- ✓ When a floating-rate security has both an upper limit and a lower limit, the feature is called a collar.
  - ◆ Inverse floaters (also called reverse floaters) have coupon rates that move in the opposite direction from the change in the reference rate.
- ■ **Step-up coupon bonds:** may be fixed or floating, increasing by specified margins at specified dates.
- ■ **Credit-linked coupon bond:** has a coupon that changes when the bond's credit rating changes.
- ■ **Pay-in-kind (PIK) bond:** allows the issuer to pay interest in the form of additional amounts of the bond issue rather than as a cash payment.
- ■ **Deferred coupon bonds (split coupon bond):** interest payments are deferred for a specified number of years.
  - ➢ **Index-linked bond:** has its coupon payments and/or principal repayment linked to a specified index.
    - ■ **Equity-linked notes (ELNs):** no periodic interest payment and the payment at maturity are based on an equity index.
    - ■ **Inflation-linked bonds/linkers:** are an example of index-linked bonds.
      - ◆ **Indexed-annuity bonds:** are fully amortized bonds, in contrast to interest-indexed and capital-indexed bonds that are non-amortizing coupon bonds
      - ◆ **Indexed zero-coupon bonds:** The principal amount to be repaid at maturity increases in line with increases in the price index during the bond's life;
      - ◆ **Interest-indexed bonds:** pay a fixed nominal principal amount at maturity, and the inflation adjustment applies to the interest payments only.
      - ◆ **Capital-indexed bonds:** pay a fixed coupon rate but it is applied to a principal amount that increases in line with increases in the index during the bond's life.
    - ■ **Principal protected bonds:** promise to pay at least the principal at maturity.

6.7.2. 基础题

Q-11. A bond that is characterized by a fixed periodic payment schedule that reduces the bond's outstanding principal amount to zero by the maturity date is best described as a:

A. bullet bond.

B. plain vanilla bond.

C. fully amortized bond.

Q-12. Relative to a fully amortized bond, the coupon payments of an otherwise similar partially amortized bond are:

A. lower or equal.

B. equal.

C. higher or equal.

Q-13. Which of the following terms in a bond issue most likely helps to reduce credit risk?:

A. Sinking fund arrangement

B. Floating rate note

C. Term maturity structure

Q-14. If interest rates are expected to decline, an investor can earn a higher coupon interest rate by purchasing a (n):

A. callable bond.

B. inverse floater.

C. floater with a cap.

Q-15. A 5-year floating rate security was issued on January 1, 2006. The coupon rate formula was 1-year LIBOR + 300 bps with a cap of 10% and a floor of 5% and annual reset. The 1-year LIBOR rate on January 1st of each year of the security's life is provided in the following table:

Year	1-Year LIBOR
2006	3.5%
2007	4.0%
2008	3.0%
2009	2.0%

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2010	1.5%

During 2010, the payments owed by the issuer were based on a coupon rate closest to:

A. 4.5%.

B. 5.0%.

C. 6.5%.

Q-16. A 10-year, capital-indexed bond linked to the Consumer Price Index (CPI) is issued with a coupon rate of 8% and a par value of 1,000. The bond pays interest semi-annually. During the first six months after the bond's issuance, the annualized CPI increases by 6%. On the first coupon payment date, the bond's:

A. coupon rate increases to 11%.

B. coupon payment is equal to 41.2.

C. principal amount increases to 1,100.

Q-17. A company issues a 10-year bond on 1 January 2014. Its contract requires that the coupon rate increase by specified margins at specified dates as shown in the following table:

Coupon Payment Date Range	Coupon Rate
1 Jan 2014–31 Dec 2015	4.00%
1 Jan 2016–31 Dec 2017	5.00%
1 Jan 2018–31 Dec 2019	7.50%
1 Jan 2020–31 Dec 2023	9.00%

The security is *most likely* a (n):

A. step-up note.

B. deferred coupon bond.

C. floating rate bond.

6.8. Contingency Provisions

6.8.1. 重要知识点

6.8.1.1. Callable bond

> **Call option**: allow the issuer to redeem bonds at a specified call price.

$$V_{callable\ bond} = V_{pure\ bond} - V_{call\ option}$$

■ **If interest rates fall**

- ◆ Issuer can retire the bond paying high coupon rate, and replace it with lower coupon bonds.
- ◆ When the bond is called, the proceeds can only be reinvested at a lower interest rate.
- ■ Three styles of exercise for callable bonds
  - ◆ **American style:** sometimes referred to as continuously callable, for which the issuer has the right to call a bond at any time starting on the first call date;
  - ◆ **European style:** the issuer has the right to call a bond only once on the call date;
  - ◆ **Bermuda style:** the issuer has the right to call bonds on specified dates following the call protection period.
- ➢ **Make-whole call provision:** requires the issuer to make a lump-sum payment to the bondholders based on the present value of the future coupon payments and principal repayment not paid because of the bond being redeemed early.

6.8.1.2. Putable bond

- ➢ **Put option:** allow the bondholder to sell bonds back to the issuer at a specified put price

$$V_{putable\ bonds} = V_{pure\ bonds} + V_{put\ option}$$

- ■ **If interest rates rise**
  - ◆ The bondholders can sell the bond back to the issuer and get cash.
  - ◆ When the bond is put, the proceeds can be reinvested at a higher interest rate.

6.8.1.3. Convertible bond

- ➢ **Conversion option:** (benefit bondholders) allow the bondholder to exchange bonds for a specified number of shares of the issuer's common stock.
- ➢ **Conversion price:** the price per share at which the convertible bond can be converted into shares.
- ➢ **Conversion ratio:** the number of common shares that each bond can be converted into.
- ➢ **Conversion value:** parity value, the current share price multiplied by the conversion ratio.
- ➢ **Conversion parity:**
  - ■ At parity: conversion value = convertible bond's price
  - ■ Above parity: conversion value > convertible bond's price
  - ■ Below parity: conversion value < convertible bond's price

6.8.1.4. Warrants and contingent convertible bond

➢ **Warrants:** (benefit bondholders) entitles the bondholder to buy the underlying stock of the issuing company at a fixed exercise price until the expiration date.

➢ **Contingent convertible bonds ("CoCos"):** bonds that convert from debt to common equity automatically if a specific event occurs.

  ■ Banks must maintain specific levels of equity financing. If a bank's equity falls below the required level, CoCos are automatically converted to common stocks.

6.8.2. 基础题

Q-18. An analyst stated that a callable bond has less reinvestment risk and more price appreciation potential than an otherwise identical option-free bond. The analyst's statement most likely is:

A. incorrect with respect to both reinvestment risk and price appreciation potential.

B. incorrect with respect to reinvestment risk, but correct with respect to price appreciation potential.

C. correct with respect to reinvestment risk, but incorrect with respect to price appreciation potential.

Q-19. Assume that a convertible bond has a par value of $1,500,000 and is currently priced at $1,800,000. The underlying share price is $50,000 and the conversion ratio is 40:1. The conversion condition for this bond is:

A. Above parity.

B. Parity.

C. Below parity.

Q-20. Compared with an otherwise identical option-free bond, when interest rates fall, the price of a callable bond will:

A. Rise more.

B. Rise less.

C. Fall less.

Q-21. Which of the following embedded options most likely provides a right to the issuer?

A. Conversion provision

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B. Put feature

C. Call feature

Q-22. On 15 December 2013, Alpha Corp. issued a 10-year callable bond paying an annual coupon of 8%. The bond is callable in whole or in part at any time after 15 December 2018. This type of callable bond is most likely referred to as:

A. American style.

B. European style.

C. Bermuda style.

6.9. Primary Market and Secondary Market

6.9.1. 重要知识点

6.9.1.1. Primary market

➢ **Public offering:** Primary bond markets are markets in which issuers initially sell bonds to investors to raise capital.

■ **Underwritten offering:** with the investment bank or syndicate purchasing the entire issue and selling the bonds to dealers.

◆ Grey market ("when issued" market): is a forward market for bonds about to be issued.

■ **Best efforts offering:** the investment bank only serves as a broker.

■ **Auction:** commonly used by issuing government debts.

■ **Shelf registration:** allows certain authorized issuers to offer additional bonds to the general public without having to prepare a new and separate offering circular for each bond issue.

➢ **Private placement:** sale of an entire issue to a qualified investor or a group of investors, which are typically large institutions.

6.9.1.2. Secondary markets

➢ **Secondary markets:** also called the "aftermarket," are where existing securities are traded among investors.

■ **Exchange market:** transaction must obey the rules imposed by the exchange.

■ **OTC Dealer Market (largest):** dealers post bid and ask price.

◆ Spread between bid and ask prices are narrower (wider) for liquid (less liquid) issues

■ Electronic Trading Network (growth)

➢ **Trade settlement:**

- Corporate bonds: third trading day after trade date (T+3).
- Government bonds: the next trading day after the trade date (T+1).
- Money market securities: on the day of trade date.

6.9.2. 基础题

Q-23. The primary market for bonds is a market:

A. in which bonds are issued for the first time to raise capital.

B. that has a specific location where the trading of bonds takes place.

C. in which existing bonds are traded among individuals and institutions.

Q-24. In major developed bond markets, newly issued sovereign bonds are most often sold to

the public via a(n):

A. auction.

B. private placement.

C. best efforts offering.

6.10. Bonds Issued by Government, Nonsovereign Governments, Government Agencies, and Supranational Entities

6.10.1. 重要知识点

6.10.1.1. Sovereign government bond, non-sovereign government bond, government agency bonds and supranational bonds

- ➢ **Sovereign bonds:** are backed by the "full faith and credit" of the national government.
  - Highly rated sovereign bonds denominated in local currency are virtually free of credit risk.
  - Denominated in the local currency or a foreign currency.
    - ◆ Credit ratings are higher for a sovereign's local currency bonds
- ➢ **Nonsovereign government bonds:** issued by governments but not the national government.
  - *High credit quality*, but lower than sovereign bonds
  - Municipal bond (in the U.S.)
    - ◆ GO (general obligation)/Tax-Backed Debt : Support by taxing power of local government

- ✓ Almost no credit risk
- ✓ Require voter approval
- ◆ Revenue Bonds
  - ✓ Supported only through revenues generated by projects.
  - ✓ Involve more risk, provide higher yield.
- ➢ **Agency bonds (quasi-government bonds):** issued by entities created by national government and may be explicitly or implicitly backed by government.
- ➢ **Supranational bonds:** issued by supranational agencies (multilateral agencies, e.g., the IMF, the World Bank) those operate across national.
  - ■ Highly rated supranational agencies, such as the World Bank, frequently issue large-size bond issues that are often used as benchmarks issues when there is no liquid sovereign bond available.
  - ■ E.g., World bank, the IMF, the Asian Development Bank.

6.10.2. 基础题

Q-25. Compared with sovereign bonds, the yield of non-sovereign bonds with similar characteristics most likely is:

A. Lower.

B. The same.

C. Higher.

Q-26. The bond issued by a multilateral agency such as the International Monetary Fund (IMF) can be regarded as a:

A. Sovereign bond.

B. Supranational bond.

C. Quasi-government bond.

6.11. Bonds Issued by Corporation

6.11.1. 重要知识点

6.11.1.1. Classification of corporate bond

- ➢ **Bank debt**
  - ■ Bilateral loan: is a loan from a single lender to a single borrower.
  - ■ Syndicated loan: is a loan from a group of lenders, called the "syndicate," to a

single borrower.

- ➤ **Commercial paper:** short term, unsecured, low rate (issued by corporations of high credit quality) debt.
  - Exempt from registration, <u>directly placed</u> (sold directly by issuer) or <u>dealer placed</u> (sold to investor through agents/brokers).
  - There is very <u>little secondary trading</u> of commercial paper.
  - In most cases, maturing commercial paper is paid with the proceeds of new issuances of commercial paper.
  - Rollover risk: a risk that the issuer will be unable to issue new paper at maturity.
  - U.S commercial paper Vs. Eurocommercial paper.

Feature	U.S commercial paper	Eurocommercial paper
Currency	U.S dollar	Any currency
Maturity	Overnight to 270 days	Overnight to 364 days
Interest	Discount basis (pure discount security)	Interest-bearing basis (add-on yield)
Settlement	T+0	T+2
Negotiable	Can be sold to another	Can be sold to another

- ➤ **Corporate bonds:** may have a term maturity structure or a serial maturity structure and may have a sinking fund provision.
  - Serial bond issue: with <u>several maturity dates</u> (known at issuance) and can be redeemed periodically.
  - Term maturity structure: all the bonds <u>maturing on the same date</u>.
- ➤ **Medium-term notes:** corporate issues that can be structured to meet the requirements of investors.

6.11.2. 基础题

Q-27. When issuing debt, a company may use a sinking fund arrangement as a means of reducing:

A. credit risk.
B. inflation risk.
C. interest rate risk.

Q-28. A loan made by a group of banks to a private company is most likely:

A. a bilateral loan.

B. a syndicated loan.

C. a private placement.

6.12. Short-Term Funding Available to Banks

6.12.1. 重要知识点

6.12.1.1. Short-term funding available to banks

➢ **Customers deposits:** including checking accounts, savings accounts, and money market mutual funds

➢ **Certificates of deposit (CDs):** interest-bearing CDs that mature on specific dates and are offered in a range of short-term maturities.

  ■ Negotiable certificates of deposit: CDs which may be sold in the wholesale market

➢ **Central bank funds market:** banks may buy or sell excess reserves deposited with their central bank.

➢ **Interbank funds:** banks make unsecured loans to one another for periods up to a year.

6.12.1.2. Repurchase agreement(repos)

➢ **Repurchase agreement (repos):** is the sale of a security with a simultaneous agreement by the seller to buy the same security back from the purchaser at an agreed-on price and future date.

➢ **Reverse repo agreement:** taking the opposite side of a repurchase transaction, lending funds by buying the collateral security.

➢ **Repo rate:** the interest rate on a repurchase agreement.

  ■ The repo rate is lower when

    ◆ Repo term is shorter

    ◆ Credit quality of the collateral security is higher

    ◆ Collateral security is delivered to the lender

    ◆ Interest rate for alternative sources of funds are lower

➢ **Repo margin (haircut):** the difference between the market value of the security used as collateral and the value of the loan.

  ■ The repo margin is lower when

    ◆ Repo term is shorter

- ◆ Credit quality of the collateral security is higher
- ◆ Credit quality of the borrower is higher
- ◆ Collateral security is in high demand or low supply
- ➢ Advantage of Repurchase (repo) Agreement
  - ■ Repurchase agreements are <u>not regulated</u> by the Federal Reserve.
  - ■ Collateral position of the lender in a repo is better in the event of bankruptcy of the dealer. (<u>liquidity</u>)

6.12.2. 基础题

Q-29. In a repurchase agreement, the repo margin will be lower the:

A. higher the quality of the collateral.

B. lower the demand for the collateral.

C. higher the supply of the collateral.

Q-30. Which of the following is least likely a short-term funding method available to banks?

A. Central bank funds

B. Syndicated loans

C. Negotiable certificate of deposits

Q-31. A repurchase agreement is most comparable to a(n):

A. Interbank deposit.

B. Collateralized loan.

C. Negotiable certificate of deposit.

6.13. Structured financial instruments

6.13.1. 重要知识点

6.13.1.1. Structured financial instruments

- ➢ **Structured financial instruments** represent a broad sector of financial instruments. This sector includes asset-backed securities (ABS) and collateralized debt obligations (CDOs) and other structured financial instruments.
- ➢ **Four broad categories of instruments**
  - ■ Capital protected instruments
    - ◆ The combination of the zero coupon bond and the call option can be prepackaged as a structured financial instrument called a **guarantee**

certificate.

◆ Capital protected instruments offer different levels of capital protection. A guarantee certificate offers full capital protection. Other structured financial instruments may offer only partial capital protection.

■ **Yield Enhancement Instruments**

◆ Yield enhancement refers to increasing risk exposure in the hope of realizing a higher expected return. A **credit linked note (CLN)** is an example of a yield enhancement instrument.

◆ It is a type of bond that pays regular coupons but whose redemption value depends on the occurrence of a well-defined credit event, such as a rating downgrade or the default of an underlying asset.

◆ A CLN allows the issuer to transfer the effect of a particular credit event to investors. Thus, the issuer is the protection buyer and the investor is the protection seller.

■ **Participation Instruments**

◆ **A participation instrument** is one that allows investors to participate in the return of an underlying asset. **Floating-rate bonds** can be viewed as a type of participation instrument.

◆ Most participation instruments are designed to give investors indirect exposure to a particular index or asset price.

◆ Many structured products sold to individuals are participation instruments linked to an equity index. In contrast to capital protected instruments that offer equity exposure, these participation instruments usually **do not offer capital protection.**

■ **Leveraged Instruments**

◆ Leveraged instruments are structured financial instruments created to magnify returns and offer the possibility of high payoffs from small investments. An **inverse floater** is an example of a leveraged instrument.

◆ Inverse floater coupon rate = C – (L × R);

✓ where C is the maximum coupon rate reached if the reference rate is equal to zero, L is the coupon leverage, and R is the reference rate on the reset date.

◆ Inverse floaters with a coupon leverage greater than zero but lower than one are called <u>deleveraged inverse floaters</u>. Inverse floaters with a coupon leverage greater than one are called <u>leveraged inverse floaters</u>.

6.13.2. 基础题

Q-32. If an investor holds a credit-linked note and the credit event does not occur, the investor receives:

A. All promised cash flows as scheduled.

B. All coupon payments as scheduled but not the par value at maturity.

C. All coupon payments as scheduled and the par value minus the nominal value of the reference asset to which the credit-linked note is linked at maturity.

Q-33. A structured financial instrument whose coupon rate is determined by the formula 5 %-(0.5×Libor) is most likely:

A. A leveraged inverse floater.

B. A yield enhancement instrument.

C. A deleveraged inverse floater.

6.14. Bond Valuation with YTM

6.14.1. 重要知识点

6.14.1.1. Bond valuation with YTM

➢ **Critical assumptions:**

■ hold the bond until maturity.

■ full, timely coupon, principal payments (no default).

■ coupons are reinvested at original YTM.

➢ 对于年付息 1 次、剩余期限为 N 年的债券，

$$price = \frac{coupon}{(1+YTM)} + \frac{coupon}{(1+YTM)^2} + ... + \frac{coupon + pricipal}{(1+YTM)^N}$$

➢ 对于年付息 2 次、剩余期限为 N 年的债券，

$$price = \frac{coupon}{(1+\dfrac{YTM}{2})} + \frac{coupon}{(1+\dfrac{YTM}{2})^2} + ... + \frac{coupon + pricipal}{(1+\dfrac{YTM}{2})^N}$$

➢ **Relationships between price and yield**

■ A bond's price and YTM are <u>inversely related</u>.

■ A bond will be priced at a <u>discount (premium)</u> to par value if coupon rate is <u>less (more)</u> than its YTM.

- ■ For a given change in yield, the percentage price increase is <u>greater</u> than the percentage price decrease.
- ➢ Value of a zero-coupon bond

$$\text{bond value} = \frac{\text{maturity value}}{(1+\dfrac{i}{2})^{\text{number of years} \times 2}}$$

6.14.2. 基础题

Q-34. An investor who owns a bond with a 9% coupon rate that pays interest semiannually and matures in three years is considering its sale. If the required rate of return on the bond is 11%, the price of the bond per 100 of par value is closest to:

A. 95.00.

B. 95.11.

C. 105.15.

Q-35. Given two otherwise identical bonds, when interest rates rise, the price of Bond A declines more than the price of Bond B. Compared with Bond B, Bond A most likely:

A. has a shorter maturity.

B. is callable.

C. has a lower coupon.

Q-36. Consider a $100 par value bond with a 10% coupon paid annually, maturing in 10 years. If the bond currently sells for $97.12, the yield to maturity is closest to:

A. 9.45%.

B. 10.15%.

C. 10.48%.

Q-37. How much will the value of a three-year $100 par value coupon bond with annual payments, a coupon rate of 10%, and a discount rate of 6% most likely change if market interest rates immediately increase by 2%？

A. -5.04.

B. -5.54.

C. -5.85.

6.15. Arbitrage-Free Valuation

6.15.1. 重要知识点

6.15.1.1. Arbitrage-free valuation

➢ Spot rates: a sequence of market discount rates that correspond to the cash flow dates; yields-to-maturity on zero-coupon bonds maturing at the date of each cash flow.

> The no-arbitrage price of a bond is calculated using spot rates:

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

6.15.2. 基础题

Q-38. Rule Ltd. recently issued deferred-coupon bonds for which no coupon payments will be paid in the first three years of the bond's life. Regular annual coupon payments at a rate of 10% will then be made until the bonds mature at the end of seven years. The spot rates for various maturities are given in the following table.

Time to Maturity	Spot Rate
1 year	9.0%
2 year	8.5%
3 year	8.0%
4 year	7.5%
5 year	7.0%
6 year	6.5%
7 year	6.0%

On the basis of these spot rates, the price of the bond today is closest to:

A. 92.71.

B. 94.63.

C. 102.57.

Q-39. A three-year spot rate of 8% is most likely the:

A. yield to maturity on a coupon-paying bond maturing at the end of Year 3.

B. coupon rate in Year 3 on a coupon-paying bond maturing at the end of Year 6.

C. yield to maturity on a zero-coupon bond maturing at the end of Year 3.

6.16. Relationship Between Price and Time

6.16.1. 重要知识点

6.16.1.1. Relationship between price and time

> As maturity approaching, the bond's price moves to the principal.
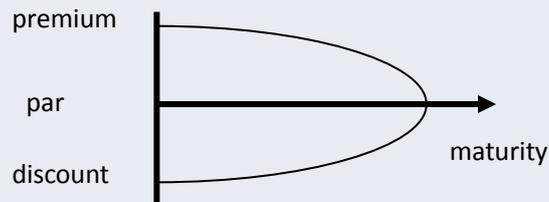
6.16.2. 基础题

Q-40. Assume a bond with a 10% coupon rate, and paid annually and 3 years to maturity. When a discount rate of 8%, the value of the bond today is $105.15. One day later, the discount rate increases to 12%. Assuming the discount rate remains at 12% over the remaining life of the bond, the price of the bond between today and maturity will:

A. Decreases then remains unchanged

B. Increases then decreases

C. Decreases then increases

Q-41. Consider a $100 par value bond with a 7 percent coupon paid annually and 5 years to maturity. At a discount rate of 6.0 percent, the value of the bond is $104.21. One year later, the appropriate discount rate has risen to 6.5 percent and the bond's value is $101.71. What part of this change in value is most likely attributable to the passage of
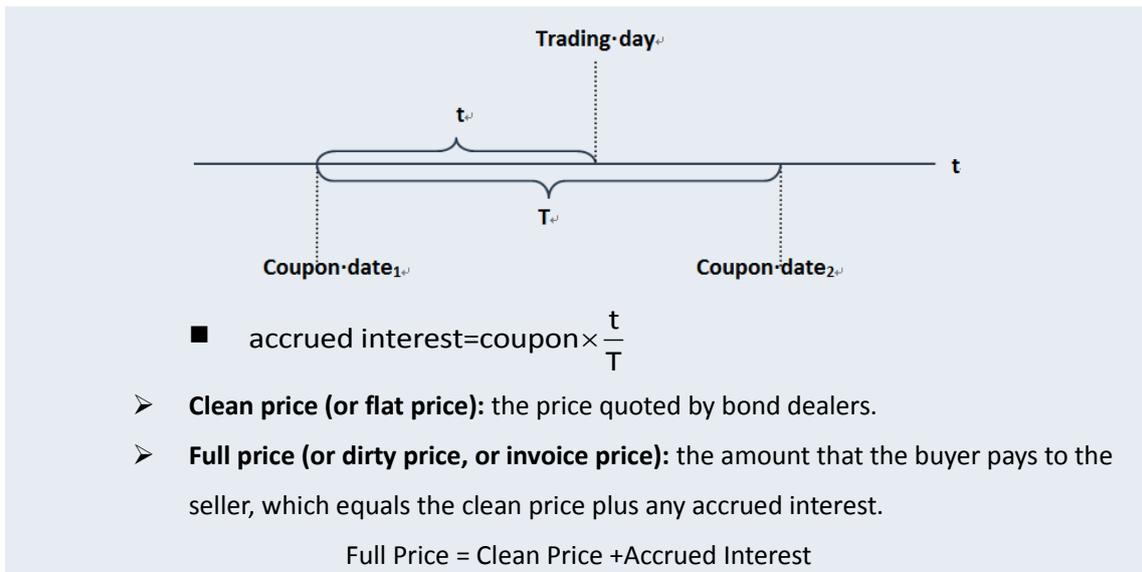
time?

A. $0.37

B. $0.74

C. $1.76

6.17. Flat Price, Accrued Interest and Full Price

6.17.1. 重要知识点

6.17.1.1. Flat price, accrued interest full price

➢ **Accrued interest:** the interest received by the seller when a bond trades between coupon dates.

Trading·day

t

T

Coupon·date$_1$ Coupon·date$_2$

- accrued interest=coupon$\times\dfrac{t}{T}$

  ➤ **Clean price (or flat price):** the price quoted by bond dealers.
  ➤ **Full price (or dirty price, or invoice price):** the amount that the buyer pays to the seller, which equals the clean price plus any accrued interest.

  Full Price = Clean Price +Accrued Interest

6.17.2. 基础题

Q-42. An investor sells a bond at the quoted price of $96.50. In addition, she receives accrued interest of $3.20. The flat price of the bond is equal to the:

A. par value plus accrued interest.
B. agreed on bond price plus accrued interest.
C. agreed on bond price excluding accrued interest.

Q-43. Bond A, described in the exhibit below, is sold for settlement on 21 June 2015. The full price that bond A will settle at on 21 June 2015 is closest to:

- Annual coupon:8%
- Coupon payment frequency: semiannual
- Interest payment date:5 April and 5 October
- Maturity date: 5 October 2017
- Day count convention:30/360
- Annual yield-to-maturity:6%

A. 104.58.
B. 105.26.
C. 105.89.

6.18. Matrix Pricing

6.18.1. 重要知识点

6.18.1.1. Matrix pricing

➢ Matrix pricing: estimate the market discount rate and price based on the quoted or flat prices of more frequently traded comparable bonds.

➢ Linear interpolation can be used when the maturities between the valued bond and the traded bond are different.

6.18.2. 基础题

Q-44. An analyst needs to assign a value to an illiquid three-year, 5.0% annual coupon payment corporate bond. The analyst identifies two corporate bonds that have similar credit quality: One is a two-year, 6.0% annual coupon payment bond priced at 106.500 per 100 of par value, and the other is a four-year, 5.0% annual coupon payment bond priced at 106.250 per 100 of par value. Using matrix pricing, the estimated price of the illiquid bond per 100 of par value is closest to:

A. 105.763.

B. 106.375.

C. 106.775.

6.19. Yield Measure

6.19.1. 重要知识点

6.19.1.1. Yield measures

➢ Yield measures for fixed-rate bonds

■ The effective yield of a bond depends on its periodicity, or annual frequency of coupon payments.

$$\text{Effective yield} = (1 + \frac{\text{YTM}}{\text{m}})^{\text{m}} - 1$$

◆ For annual-pay bond: effective yield = YTM

◆ For bonds with greater periodicity, the effective yields is greater than YTM

■ Convert an annual percentage rate for m periods per year (APR_m), to an annual percentage rate for n per year (APR_n)

$$(1 + \frac{APR_m}{m})^m = (1 + \frac{APR_n}{n})^n$$

➢ Current yield is the ratio of a bond's annual coupon payment to its price.

- current yield= $\dfrac{\text{sum of coupon payment received over the year}}{\text{flat bond price}}$

- For a callable/putable bond, a yield-to-call/yield-to-put may be calculated using each of the call/put dates and prices. The lowest of these yields and YTM is a callable bond's yield-to-worst.

- Floating-rate note yields
  - The margin used to calculate the bond coupon payments is called the quoted margin.
  - The margin used to calculate the return of the FRN to its par value is called the required margin (discount margin).
    - Selling at par(credit unchanged): required margin = quoted margin
    - Selling at discount(downgrade of credit): quoted margin < required margin
    - Selling at premium(upgrade of credit): quoted margin > required margin

- Yield for money market instruments
  - Yield quoted on a discount basis: quote on U.S. Treasury bills.

$$\text{DR} = \frac{\text{year}}{\text{days}} * \left(\frac{\text{FV} - \text{PV}}{\text{FV}} \right)$$

  where DR is the yield quoted on a discount basis.

  - Yield quoted on an add-on basis: LIBOR, bank CD rates.

$$\text{AOR} = \frac{\text{year}}{\text{days}} * \left(\frac{\text{FV} - \text{PV}}{\text{PV}} \right)$$

  where AOR is the yield quoted on an add-on basis. Both discount basis and add-on yields in the money market are quoted as simple annual interest and can be based on a 360-day or 365-day basis.

  - Bond equivalent yield for money market security is an add-on yield based on a 365-day year.

$$\text{BEY} = \frac{365}{\text{days}} * \left(\frac{\text{FV} - \text{PV}}{\text{PV}} \right)$$

  where AOR is the yield quoted on an add-on basis.

6.19.2. 基础题

Q-45. The current yield for a 6% coupon, 8-year bond, with a maturity par value of $100 and currently priced at $92.50 is closest to:

A.   6.00%.

B.   6.49%.

C.   7.25%.

Q-46. A 180-day commercial paper issue is quoted at a discount rate of 6.50% for a 360-day year. The bond equivalent yield for this instrument is closest to:

A.   6.50%.

B.   6.72%.

C.   6.81%.

Q-47. An analyst evaluates the following information relating to floating rate notes (FRNs) issued at par value that have 6-month Libor as a reference rate:

Floating Rate Note	Quoted Margin	Discount Margin
X	0.60%	0.45%
Y	0.70%	0.70%
Z	0.80%	0.85%

Based only on the information provided, the FRN that will be priced at a discount on the next reset date is:

A.   FRN X.

B.   FRN Y.

C.   FRN Z.

Q-48. A bond with 6 years remaining until maturity is currently trading for 99 per 100 of par value. The par value of the bond is 1000, The bond offers a 4% coupon rate with interest paid semiannually. The bond is first callable in 3 years at 101 per 100 of par value, the bond's annual yield-to-call is closest to:

A.   2.34%.

B.   4.36%.

C.   4.68%.

6.20. Yield Curve

6.20.1. 重要知识点

6.20.1.1. Yield curve

➢ **Yield curve:** yield 与 maturity 之间的关系

➢ **Spot curve(spot rate yield curve):** a yield curve for single payments in the future

➢ **Yield for coupon bonds:** shows the YTM for coupon bonds at various maturities, which can be calculated by linear interpolation.

➢ **Par curve** (=par bond yield curve): shows the relationships between yields-to-maturity and time-to-maturity.

➢ **Forward curve:** shows the future rates for bonds or money market securities for the same maturities for annual periods in the future

6.20.2. 基础题

Q-49.   A yield curve constructed from a sequence of yields-to-maturity on zero-coupon bonds

is the:

A.   Par curve.

B.   Spot curve.

C.   Forward curve.

Q-50.   To obtain the spot yield curve, a bond analyst would most likely use the most:

A.   Recently issued and actively traded government bonds.

B.   Seasoned and actively traded government bonds.

C.   Recently issued and actively traded corporate bonds.

Q-51.   Which of the following statements is most likely correct regarding the spot and forward

curves. The spot curve:

A.   Cannot be calculated from the forward curve, but the forward curve can be calculated from the spot curve.

B.   Can be calculated from the forward curve, and the forward curve can be calculated from the spot curve.

C.   Can be calculated from the forward curve, but the forward curve cannot be calculated from the spot curve.

6.21. Forward Rate

6.21.1. 重要知识点

6.21.1.1. Forward rate

➢ **Forward rate:** is the interest rate on a bond or money market instrument traded in a forward market.

➢ Forward rate 与 spot rate 之间的转换公式

$$(1+S_T)^T = (1+S_1)(1+1y1y)...(1+(T-1)y1y)$$

6.21.1.2. 使用 forward rate 计算 bond price

$$\text{bond value} = \frac{CF_1}{(1+S_1)} + \frac{CF_2}{(1+S_1)(1+1y1y)} + ... + \frac{CF_n}{(1+S_1)(1+1y1y)...(1+(T-1)y1y)}$$

6.21.2. 基础题

Q-52. Using the following US Treasury forward rates, the value of a 2.5-year $100 par value Treasury bond with a 6% coupon rate is closest to:

Period	Years	Forward Rate
1	0.5	1.50%
2	1	2.50%
3	1.5	3.30%
4	2	3.90%
5	2.5	4.30%

A. $104.19.

B. $107.03.

C. $109.87.

Q-53. Assume the following annual forward rates were calculated from the yield curve:

Time Period	Forward Rate
0y1y	0.50%
1y1y	0.70%
2y1y	1.00%
3y1y	1.50%

4y1y	2.20%

The four-year spot rate is closest to:

A.   0.924%.

B.   1.348%.

C.   1.178%.

6.22. Yield Spread

6.22.1. 重要知识点

6.22.1.1. Yield spread

➤ **Yield spread:** is the difference in yield between different fixed income securities.

➤ **Benchmark spread:** the yield spread over a specific benchmark, usually measured in basis points.

■ **G-spread:** the benchmark is government bond yield

$$G-spread = YTM_{bond} - YTM_{treasury}$$

■ **Interpolated spread/I-spread:** the benchmark is swap rate

■ **Z-spread:** is based on the entire benchmark spot curve. It is the constant spread that is added to each spot rate such that the present value of the cash flows matches the price of the bond.

$$P_{market} = \frac{CF_1}{(1+R_2+Z)^1} + \frac{CF_2}{(1+R_2+Z)^2} + ...$$

➤ **Option-adjusted spread (OAS):** is the Z-spread minus the theoretical value of the embedded call option.

■ Callable bond: ZS>OAS

■ Putable bond: ZS<OAS

6.22.2. 基础题

Q-54. A 3-year, U.K. Government Benchmark Bond is issued with a coupon rate of 2% and a price of 100.25. A 3-year, U.K. Government Corporate Bond is issued with a coupon rate of 5% and a price of 100.65. Both bonds pay interest annually. The current three-year EUR interest rate swap benchmark is 2.12%. The G-spread in basis points(bps) on the U.K. corporate bond is closest to:

A.   285 bps.

B.   264 bps.

C.   300 bps.

Q-55.   The yield spread of a specific bond relative to the standard swap rate in that currency
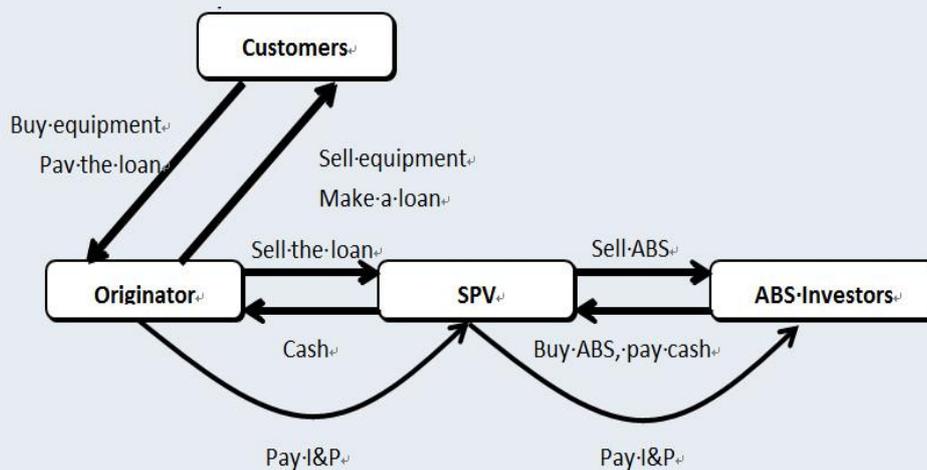
of the same tenor is most likely:

A.   I-spread.

B.   Z-spread.

C.   G-spread.

6.23. Securitization Process and Advantages

6.23.1. 重要知识点

6.23.1.1. Securitization process

6.23.1.2. Benefits of securitization

- ➢ Lowers or removes the wall between ultimate investors and originating borrowers.
- ➢ Securitization reduces liquidity risk in the financial system.
  - ■ Securitization allows for the creation of tradable securities with better liquidity than the original loans on the bank's balance sheet.
  - ■ Makes financial markets more efficient and improves liquidity for the underlying financial claims.
- ➢ Benefits of SPV in securitization: sell the loan to SPV instead of using it as collateral
  - ■ Protect investors from the issuer's bankruptcy.
  - ■ Securitization can have lower credit cost than a corporate bond secured by the same collateral.
- ➢ Funding cost of issuing an asset-backed bond is less than that of issuing a corporate bond.

6.23.2. 基础题

Q-56. A BBB rated corporation wishes to issue debt to finance its operations at the lowest cost possible. If it decides to sell a pool of receivables into a special purpose vehicle (SPV), its primary motivation is most likely to:

A. receive a guaranty from the SPV to improve the corporation's credit rating.

B. allow the corporation to retain a first lien on the assets of the SPV.

C. segregate the assets into a bankruptcy-remote entity for bondholders.

6.24. Characteristics of Mortgage Loan

6.24.1. 重要知识点

6.24.1.1. Mortgage loan

➢ **Foreclosure:** allows the lender to take possession of the mortgaged property and then sell it in order to recover funds toward satisfying the debt obligation

■ **Recourse loan:** the lender has a claim against the borrower for the shortfall between the amount of the mortgage balance outstanding and the proceeds received from the sale of the property.

■ **Nonrecourse loan:** the lender does not have such a claim, so the lender can look only to the property to recover the outstanding mortgage balance.

■ **Strategic default:** A strategic default is *less likely* in a recourse provision because the lender can seek restitution from the borrower's other assets and/or income in an attempt to recover the shortfall.

6.24.1.2. Interest rate of mortgage loan

➢ Interest rate determination: mortgage rate or contract rate

■ **Fixed rate:** the mortgage rate remains the same during the life of the mortgages.

■ **Adjustable or variable rate:** The mortgage rate is reset periodically (daily, weekly, monthly, or annually).

◆ Indexed-referenced ARM

◆ reviewable ARM

■ **Initial period fixed rate**

◆ Rollover or renegotiable mortgage: the adjustment calls for a fixed rate.

◆ Hybrid mortgage: the mortgage starts out with a fixed rate and then becomes an adjustable rate after a specified initial term.

◆ Convertible mortgage: the mortgage rate is initially either a fixed rate or

adjustable rate. At some point, the borrower has the option to convert the mortgage into a fixed rate or an adjustable rate for the remainder of the mortgage's life.

6.24.1.3. Amortization schedule of mortgage loan

- ➢ Periodic mortgage payments assuming no prepayments are made: interest payments and scheduled principal repayments
- ➢ The amortization of a loan: gradual reduction of the amount borrowed over time.
    - ■ Fully amortizing loan: the sum of all the scheduled principal repayments during the mortgage's life is such that when the last mortgage payment is made, the loan is fully repaid.
    - ■ Partially amortizing loan: the sum of all the scheduled principal repayments is less than the amount borrowed (balloon payment).
    - ■ Interest-only mortgage (IO): if no scheduled principal repayment is specified for a certain number of years.

6.24.1.4. Types of Agency RMBS

- ➢ Government National Mortgage Association (Ginnie Mae).
- ➢ Federal Home Loan Mortgage Corporation (Freddie Mac).
- ➢ Federal National Mortgage Association (Fannie Mae).

6.24.1.5. Conforming and non-conforming

- ➢ If a loan satisfies the underwriting standards for inclusions as collateral for an agency MBS, it is called a conforming mortgage.
- ➢ Nonconforming mortgage pass-through securities are issued by thrifts, commercial banks, and private conduits.

6.24.2. 基础题

Q-57. Relative to a non-recourse mortgage loan, in a recourse mortgage loan the:

A. lender can change the interest rate charged.

B. borrower does not have a strategic default option.

C. borrower is not liable for any shortfall between the property sale proceeds and the loan amount.

Q-58. In a mortgage pass-through security the pass-through rate:

A. Is adjusted as market rates rise or fall.

B. Is equal to the mortgage rate on the underlying pool of mortgages.

C. Adjusts the rate on the underlying pool of mortgages by a servicing fee.

6.25. Prepayment Risk

6.25.1. 重要知识点

6.25.1.1. Prepayment risk

> **Contraction risk**

  ■ The proceeds received must now be invested at lower interest rates.

  ■ Price appreciation is not as great as that of an otherwise identical bond that does not have a prepayment or call option.

> **Extension risk**

  ■ The value of the security has fallen because interest rates are higher.

  ■ Income they receive can potentially reinvest is typically limited to the interest payment and scheduled principal repayments.

6.25.1.2. Prepayment risk measurement

> Two industry conventions: CPR and PSA.

  ■ Single monthly mortality(SMM): monthly measure

$$SMM = \frac{Prepayment\ for\ month}{(Beginning\ mortgage\ balance\ for\ month - scheduled\ principal\ repayment\ for\ month)}$$

  ■ Public Securities Association (PSA)

  ◆ The PSA prepayment benchmark assumption: prepayment rates are low for newly originated mortgages and then speed up as the mortgages become seasoned.

  ✓ Benchmark: 100PSA.

  ✓ PSA assumption>100PSA: prepayment faster than the benchmark.

  ✓ PSA assumption<100PSA: prepayment slower than the benchmark.

  ◆ The PSA standard benchmark:100%PSA

  ✓ CPR=0.2% for the first month after origination, increasing by 0.2% per month up to 30 months. For example, the CPR in month 14 is 2.8%;

  ✓ CPR=6% for months 30 to 360;

  ✓ After 30 months, no prepayment rate is added.

6.25.2. 基础题

Q-59. As interest rates rise and fall, investors in mortgaged-backed securities most likely face what type of risk?

A. Extension risk and contraction risk

B. Single-month mortality (SMM) risk and contraction risk

C. Conditional prepayment rate (CPR) risk and extension risk

Q-60. Assume that an investor has invested in a mortgage pool with a $100,000 principal balance outstanding. The scheduled monthly principal payment is $28.61.

The mortgage pool has a conditional prepayment rate (CPR) of 6% and pool is seasoned.

The single monthly mortality rate is closest to:

A. 0.005098.

B. 0.005113.

C. 0.005143.

6.26. Collateralized Mortgage Obligations(CMO)

6.26.1. 重要知识点

6.26.1.1. Different types of CMOs

➢ **Sequential pay tranches**

■ Each class of bonds is retired sequentially in sequential pay CMO.

■ The CMO structure with sequential-pay tranches allows investors concerned about extension risk to invest in shorter-term tranches and those concerned about contraction risk to invest in the longer-term tranche

Tranche	Contraction risk	Extension risk
A (sequential pay)	HIGH	LOW
B (sequential pay)		
C (sequential pay)		
D (sequential pay)	LOW	HIGH

6.26.1.2. PAC and support structure

➢ **PAC and support tranches**

■ A PAC is a tranche that is amortized based on a sinking fund schedule that is established within a specified band over the collateral's life

➢ **PAC and support tranches in prepayment risk**

■ The greater certainty of the cash flow for the PAC bonds comes at the expense of the non-PAC tranches (support tranches). It is these tranches that absorb

the prepayment risk.

- PAC tranches have protection against both extension risk and contraction risk, providing two-sided prepayment protection.
- Support tranches expose investors to the greatest level of prepayment risk while provide prepayment protection for the PAC tranches.
- The extent of prepayment risk protection provided by a support tranche increases as its par value increases relative to its associated PAC tranche.
- If the support tranches are paid off quickly because of faster-than-expected prepayments, they no longer provide any protection for the PAC tranches
- Reduce the extension risk: Support tranches do not receive any principal until the PAC tranches receive their scheduled principal repayment
- Reduce the contraction risk: Support tranches absorb any principal repayments in excess of the scheduled principal repayments that are made

Tranche	Contraction risk	Extension risk
A (PAC I)	LOW	LOW
B (PAC I)		
B (PAC II)		
B (PAC II)		
Support tranche	HIGH	HIGH

> **Initial PAC collar**

- The lower and upper PSA prepayment assumptions are called the "initial PAC collar" or the "initial PAC band." The PAC collar for a CMO is typically dictated by market conditions.
- For example

  The average life for a hypothetical structure that includes a PAC I tranche and a support tranche at various PSA speeds, assuming the PSA speed stays at that level for the entire life of the PAC tranche.

PSA	PAC Tranche(P)		Support Tranche(S)
50	10.2		24.9
75	8.6		22.7
100	6.5	Initial Collar	20.0

165	6.5	10.7
250	6.5	3.3
300	5.5	1.9
350	4.0	1.4

- ◆ When PSA speed in a certain range(100<PSA Speed<250, as showed above), the average life of PAC I tranche are stable (6.5 years, as showed above);

- ◆ When PSA speed exceed upper limit of initial collar(PSA Speed>250, as showed above), the average life of PAC I tranche would shorten (5.5 or 4.0 years, as showed above);

- ◆ When PSA speed exceed lower limit of initial collar(PSA Speed<100, as showed above), the average life of PAC I tranche would extend (22.7 or 24.9 years, as showed above).

6.26.2. 基础题

Q-61. Which investment will most likely expose investors to the greatest level of extension risk?

A. Shorter-term tranches in a collateralized mortgage obligation structure

B. Commercial mortgage-backed securities with a balloon payment

C. Planned amortization class tranches in a collateralized mortgage obligation structure

Q-62. In a securitization structure, credit tranching allows investors to choose between:

A. extension risk and contraction risk.

B. subordinated bonds and senior bonds.

C. partially amortizing loans and fully amortizing loans.

6.27. Non-Agency RMBS

6.27.1. 重要知识点

6.27.1.1. Difference between agency RMBS vs non-agency RMBS

➢ RMBS issued by Government Sponsored Enterprises (GSEs): credit risk is reduced by the guarantee of the Government Sponsored Enterprises (GSE) itself; RMBS issued by non-agency: use credit enhancements to reduce credit risk.

➢ Government Sponsored Enterprise (GSE) RMBS must satisfy specific underwriting standards established by various government agencies; No restrictions apply to the

types of mortgage loans that can be used to back a non-agency RMBS.

6.27.1.2. Internal and External Credit Enhancement

- ➢ **Internal credit enhancements**

  - ■ **Senior/subordinated structure:** the subordinated bond classes(junior bond classes or non-senior bond classes) provide credit support for the senior bond classes

    - ◆ **The subordination levels** are set at the time of issuance and change over time as voluntary prepayments and defaults occur

    - ◆ A deal designed to keep the amount of credit enhancement from deteriorating over time

      - ✓ Shifting interest mechanism: locks out subordinated bond classes from receiving payments for a period of time if the credit enhancement for senior tranches deteriorates because of poor performance of the collateral

  - ■ **Reserve funds**：provide credit support by paying for possible future losses

    - ◆ Cash reserve fund: deposit of cash provided to the SPV from the proceeds of the sale of the loan pool by the entity seeking to raise funds

    - ◆ Excess spread amount

      - ✓ allocation into an account of any amount resulting from monthly funds remaining after paying out the interest to the bond classes

- ➢ **External credit enhancements:** Credit support in the case of defaults resulting in losses in the pool of loans is provided in the form of a financial guarantee by a third party to the transaction.

  - ■ The most common third party financial guarantors are monoline insurance companies, referred to as a monoline insurer

    - ◆ Private insurance company whose business is restricted to providing guarantees for financial products, such as municipal securities and ABS.

6.27.2. 基础题

Q-63. An asset-backed securitization with a waterfall structure is most likely using which type of credit enhancement?

A. Subordination

B. Time tranching

C. Special-purpose entity (SPE)

6.28. CMBS

6.28.1. 重要知识点

6.28.1.1. CMBS characteristics

➢ CMBS are <u>no recourse loans</u>;

■ Therefore, analysis of CMBS securities focuses on the property and not the borrower

$$\text{Debt-to-service coverage ratio=} \frac{\text{net operating income}}{\text{debt service}}$$

$$\text{Loan-to-value ratio=} \frac{\text{current mortgage amount}}{\text{current appraised value}}$$

6.28.1.2. CMBS basic structure

➢ **Call protection (loan level)**

◆ **Prepayment lockout.** is a contractual agreement that prohibits any prepayments during a specified period of time.

◆ **Defeasance.** The borrower provides sufficient funds for the servicer to invest in a portfolio of government securities that replicates the cash flows that would exist in the absence of prepayments.

✓ The cost of assembling such a portfolio is the cost of defeasing the loan that must be repaid by the issuer.

◆ **Prepayment penalty points.** Predetermined penalties that a borrower who want to refinance must pay.

◆ **Yield maintenance charges (make-whole charge).** is a penalty paid by the borrower that makes refinancing solely to get a lower mortgage rate uneconomical for the borrower.

✓ Designed to make the lender indifferent as to the timing of prepayments.

➢ **Balloon maturity provisions**

■ Balloon loans require substantial principal payment at the end of the term of the loan

■ If the borrower fails to make the balloon payment, the borrower is in default (extension risk)

■ The lender may modify the original loan terms and charge a higher interest rate, called "workout period".

6.28.2. 基础题

Q-64. Credit risk is a factor for commercial mortgage-backed securities because they are backed by mortgage loans that:

A. are non-recourse.

B. have limited call protection.

C. have no prepayment penalty points.

Q-65. A key distinction between commercial mortgage-backed securities (CMBSs) and residential mortgage-backed securities (RMBSs) is that CMBSs most likely:

A. have balloon maturities.

B. have amortizing principal.

C. do not have call protection.

6.29. Non-Mortgage Asset-Backed Securities

6.29.1. 重要知识点

6.29.1.1. Auto loan receivable-backed securities

- ➢ Cash flows
  - ■ Regularly scheduled monthly loan payments (interest payments and scheduled principal repayments).
  - ■ Any prepayments.
    - ◆ Sales, trade-ins requiring full payoff of the loan, repossession and subsequent resale of vehicles.
    - ◆ insurance proceeds received upon loss or destruction of vehicles.
    - ◆ payoffs of the loan with cash to save on the interest cost, refinancing of the loans at a lower interest rate.
- ➢ Credit enhancement
  - ■ Senior/subordinated.
  - ■ Reserve account, overcollateralization, and excess interest on the receivables.

6.29.1.2. Credit card receivable-backed securities

- ➢ Cash flow:
  - ■ Finance charges collected, Fees, Principal repayments.
- ➢ Lockout periods: cash flow paid out based on finance charges collected and fee.
  - ■ After lockout periods: principal no longer reinvested but paid to investors.

6.29.2. 基础题

Q-66. Which of the following is least likely a feature of an auto loan ABS?

A. Non-amortizing collateral

B. Overcollateralization

C. Senior/subordinated tranche structure

Q-67. Which of the following is least likely a feature of a credit card receivable ABS?

A. An early amortization provision

B. Amortizing collateral

C. A lockout period

6.30. CDO

### 6.30.1. 重要知识点

6.30.1.1. CDO

- ➢ Collateralized debt obligation (CDO)

Corporate bonds	Collateralized bond obligation (CBO)
Emerging market bonds	
Leveraged Bank loans	Collateralized loan obligation (CLO)
ABS, RMBS, CMBS and other CDOs	Structured finance CDOs
A portfolio of credit default swaps	Synthetic CDOs

- ➢ Structure of CDO transaction

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

- ➢ Interest rate swap:

$$pool \xrightarrow[\text{fixed}]{\text{float}} CDO \xrightarrow{\text{float}} investor$$

Fixed ↓ ↑ Float

swap
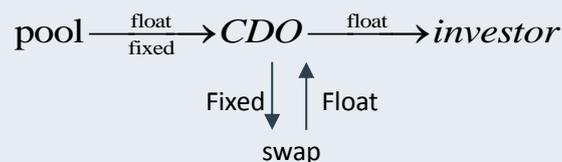
6.30.2. 基础题

Q-68. Which scenario is most likely to result in a competitive return to a CDO equity holder?

A. The collateral earns a higher yield than the bond classes.

B. The senior bond class experiences early principal repayment.

C. The debt funding costs are higher than the CDO return.

6.31. Covered Bonds

6.31.1. 重要知识点

6.31.1.1. Covered Bonds

➢ Covered bonds are senior debt obligations issued by a financial institution and backed by a segregated pool of assets that typically consist of commercial or residential mortgages or public sector assets.

➢ Advantages
- Dual recourse nature;
- Strict eligibility criteria;
- Dynamic cover pool;
- Redemption regimes in the event of sponsor default.

➢ As a result, covered bonds usually carry lower credit risks and offer lower yields than otherwise similar ABS.

6.31.2. 基础题

Q-69. Which statement about covered bonds is least accurate?

A. Covered bonds provide investors with dual recourse, to the cover pool and also to the issuer.

B. Covered bonds usually carry higher credit risks and offer higher yields than otherwise similar ABS.

C. Covered bonds have a dynamic cover pool, meaning sponsors must replace any prepaid or non-performing assets.

6.32. Sources of Return from Investing in A Fixed-Rate Bond

6.32.1. 重要知识点

6.32.1.1. Three sources of return:

➢ Coupon and principal payments

➢ Reinvestment of coupon payments

➢ Capital gain or loss if bond is sold before maturity

- Total return: future value of reinvested coupon interest payments and the sale price (par value if the bond is held to maturity)

- A point on the trajectory represents the carrying value of the bond at that time. The carrying value is the purchase price plus the amortized amount of the discount if the bond is purchased at a price below par value, while it is the purchase price minus the amortized amount of the premium if the bond is purchased at a price above par value.

6.32.1.2. Annualized holding period return: calculated as the compound annual return earned from the holding period

$$\text{aunalized holding period return} = (\frac{\text{total return}}{\text{bond price}})^{1/n} - 1$$

6.32.1.3. Relationship with investment horizon and YTM

- An investor who holds a fixed-rate bond to maturity will earn an annualized rate of return equal to the YTM of the bond when purchased.

- An investor who sells a bond prior to maturity will earn a rate of return equal to the YTM at purchase if the YTM at sale has not changed since purchase.

- If the market YTM for the bond, our assumed reinvestment rate, increases (decreases) after the bond is purchased but before the first coupon date, a buy-and-hold investor's realized return will be higher (lower) than the YTM of the bond when purchased.

- If the market YTM for the bond, our assumed reinvestment rate, increases after the bond is purchased but before the first coupon date, a bond investor will earn a rate of return that is lower (higher) than the YTM at bond purchase if the bond is held for a short period.

- If the market YTM for the bond, our assumed reinvestment rate, decreases after the bond is purchased but before the first coupon date, a bond investor will earn a rate of return that is lower (higher) than the YTM at bond purchase if the bond is held for a long period.

6.32.1.4. Relationship with investment horizon and price risk, reinvestment risk

- **Short investment horizon:**
  - market price risk > reinvestment risk
  - annualized holding period return is negatively related with YTM

- **Long investment horizon:**
  - market price risk < reinvestment risk
  - annualized holding period return is positively related with YTM

6.32.2. 基础题

Q-70. An investor purchases a nine-year, 8% annual coupon payment bond at a price equal to par value. After the bond is purchased and before the first coupon is received, interest rates increase to 10%. The investor sells the bond after five years. Assume that interest rates remain unchanged at 10% over the five-year holding period. Assuming that all coupons are reinvested over the holding period, the investor's five-year horizon yield is closest to:

A. 5.66%.

B. 6.11%.

C. 7.34%.

Q-71. Consider bonds that have the same yield to maturity and maturity. The bond with the greatest reinvestment risk is most likely the one selling at:

A. par.

B. a discount.

C. a premium.

6.33. Macaulay, Modified and Effective Durations, Money Duration and PVBP

6.33.1. 重要知识点

6.33.1.1. 定义、计算及解释 macaulay duration, modified duration 和 effective duration

> **Interest rate risk:** 债券价格对利率变化的敏感程度，价格对利率变化越敏感，价格波动的可能性就越高

> **Duration:** a measure of a bond's interest rate risk or sensitivity of a bond's full price to a change in its yield.

> **Macaulay duration:** weighted average of the time to receipt of the bond's promised payments.

- Macaulay duration $= \dfrac{\sum\limits_{t=1}^{n} t \times PVCF_t}{\sum PVCF_t (= P_0)} = \sum\limits_{t=1}^{n} [t \times (PVCF_t / P_0)]$

> **Modified duration:** provides a linear estimate of the percentage price change for a

bond given a 1% change in its yield-to-maturity.

- $$\text{Modified duration} = \frac{\text{Macaulay duration}}{1 + \text{periodic market yield}}$$

➢ **Approximate modified duration** $= \frac{V_- - V_+}{2 \times V_0 \times \Delta YTM}$

➢ **Effective duration:** a linear estimate the percentage change in price given a 1% change in a benchmark yield curve.

- Effective duration $= \frac{V_- - V_+}{2 \times V_0 \times \Delta \text{Curve}}$

6.33.1.2. Money duration and PVBP

➢ Money duration: a measure of the percentage price change of a bond given a change in its yield-to-maturity and it is calculated as the annual modified duration times the full price of the bond

Money duration=annual modified duration × full price of bond

Money duration per 100 units of par value=annual modified duration × full price of bond per 100 of par value

➢ PVBP (=price value of a basis point): the money change in full price of a bond when its YTM changes by one basis point (0.01%)

$$PVBP = \frac{(PV_-) - (PV_+)}{2}$$

PVBP=money duration×0.01

6.33.1.3. Duration 的影响因素

➢ Lower coupon means higher duration.

➢ Longer maturity means higher duration.

➢ Lower market yield means higher duration

➢ A put or call provision means lower duration

6.33.1.4. Duration of perpetual bond and zero-coupon bond

➢ A **perpetuity or perpetual bond (consols):** a bond that does not mature. There is no principal to redeem. The investor receives a fixed coupon payment forever, unless the bond is callable. Non-callable perpetuities are rare.

- **Macaulay duration of perpetuity or perpetual bond** $= \frac{1 + YTM}{YTM}$

➢ Duration of zero-coupon bond is equal to time-to-maturity.

6.33.1.5. Portfolio duration

> ➤ Calculate the weighted average of durations of bonds in the portfolio.

> $$\text{Portfolio duration} = w_1 D_1 + w_2 D_2 + \ldots\ldots + w_n D_n$$

> ➤ Limitations: the measure of portfolio duration implicitly assumes a parallel shift in the yield curve.
>
> - ■ A parallel yield curve shift implies that all rates change by the same amount in the same direction.
> - ■ In reality, interest rate changes frequently result in a steeper or flatter yield curve. (non-parallel shifts → key rate duration)

6.33.1.6. Empirical Duration

> ➤ A measure of a bond's sensitivity to a change in the benchmark yield curve at a specific maturity segment.
>
> ➤ In contrast to effective duration, key rate durations help identify "shaping risk" for a bond-that is, a bond's sensitivity to changes in the shape of the benchmark yield curve. (such as: yield curve becoming steeper or flatter).
>
> - ■ For a government bond (with little or no credit risk): we would expect analytical and empirical duration to be similar because benchmark yield changes largely drive bond prices.
> - ■ For high-yield bond: Since credit spreads and benchmark yields are negatively correlated under a market stress scenario, wider credit spreads will partially or fully offset the decline in government benchmark yields, resulting in lower empirical duration estimates than analytical duration estimates.

6.33.2. 基础题

Q-72. An investor buys a 6% annual payment bond with three years to maturity. The bond has a yield-to-maturity of 8% and is currently priced at 948.45806 per 1000 of par. The bond's Macaulay duration is closest to:

A. 2.66.

B. 2.83.

C. 3.00.

Q-73. In a rising interest rate environment, the effective duration of a putable bond relative to an otherwise identical non-putable bond, will most likely be:

A. higher.

B. lower.

C.   the same.

Q-74.   A fixed-income security's current price is $103.25. The manager estimates that the price will rise to $106.75 if interest rates decrease 0.35% or fall to $102.10 if interest rates increase 0.35%. The security's effective duration is *closest* to:

A.   6.22.
B.   6.43.
C.   6.51.

Q-75.   An eight-year, 3.5% annual coupon bond is priced at 92.1492, with a yield to maturity of 4.7% and a Macaulay duration of 7.0705. If rates decrease by 75 bps, the percentage price change of the bond is closest to:
A.   - 5.30%.
B.   5.07%.
C.   5.30%.

Q-76.   Which of the following statements is *least* accurate regarding the factors that affect the interest rate risk characteristics of an option-free bond?
A.   The longer the bond's maturity, the greater the bond's price sensitivity to changes in interest rates.
B.   The lower the coupon rate, the greater the bond's price sensitivity to changes in interest rates.
C.   The higher the yield, the greater the bond's price sensitivity to changes in interest rates.

Q-77.   Assuming no change in the credit risk of a bond, the presence of an embedded put option:
A.   reduces the effective duration of the bond.
B.   increases the effective duration of the bond.
C.   does not change the effective duration of the bond.

Q-78.   A portfolio manager holds the following three bonds, which are option-free and have the indicated durations.   .

Bond	Par Value Owned	Market Value Owned	Duration

50-93

A	$8,000,000	$12,000,000	3
B	$8,000,000	$6,000,000	7
C	$4,000,000	$6,000,000	6

The portfolio's duration is closest to:

A.   4.75.

B.   5.20.

C.   5.33.

Q-79.   One limitation as to why using the average duration of the bonds in a portfolio does not properly reflect that portfolio's yield curve risk is that the approach assumes:

A.   a parallel shift in the yield curve.

B.   all the bonds have the same discount rate.

C.   a non-parallel shift in the yield curve.

Q-80.   The option-free bonds issued by ALS Corp. are currently priced at 105.85. Based on a portfolio manager's valuation model, a 1bp increase in interest rates will result in the bond price falling to 105.75 whereas a 1bp decrease in interest rates will result in the bond price rising to 105.90. The price value of a basis point (PVBP) for the bonds is closest to:

A.   0.025.

B.   0.050.

C.   0.075.

Q-81.   Using the information below, which bond has the greatest money duration per 100 of par value assuming annual coupon payments and no accrued interest?

bond	Time-to-maturity	Price per 100 of par value	Coupon rate	Yield-to-maturity	Modified duration
A	8 years	95.00	2.00%	5.5%	7.75
B	6 years	85.00	2.40%	4.5%	5.75
C	12years	90.00	3.00%	6.0%	10.50

A.   Bond A

B.   Bond B

C.   Bond C

51-93

Q-82. Which of the following statements about Macaulay duration is correct?

A. A bond's coupon rate and Macaulay duration are positively related

B. A bond's Macaulay duration is inversely related to its yield-to-maturity

C. The Macaulay duration of a zero-coupon bond is less than its time-to-maturity

Q-83. Empirical duration is likely the best measure of the impact of yield changes on portfolio value, especially under stressed market conditions, for a portfolio consisting of:

A. 100% sovereign bonds of several AAA rated euro area issuers.

B. 100% covered bonds of several AAA rated euro area corporate issuers.

C. 25% AAA rated sovereign bonds, 25% AAA rated corporate bonds, and 50% high-yield (i.e., speculative-grade) corporate bonds, all from various euro area sovereign and corporate issuers.

6.34. Duration Gap

6.34.1. 重要知识点

6.34.1.1. Duration gap

> **Duration gap = Macaulay duration – investment horizon**
> - If investment horizon > Macaulay duration, then reinvestment risk dominates price risk, investor's risk is to lower interest rates.
> - If investment horizon = Macaulay duration, then reinvestment risk offsets price risk.
> - If investment horizon < Macaulay duration, then price risk dominates reinvestment risk, investor's risk is to higher interest rates.

6.34.2. 基础题

Q-84. When the investor's investment horizon is larger than the Macaulay duration of the bond she owns:

A. The investor is hedged against interest rate risk.

B. Reinvestment risk dominates, and the investor is at risk of lower rates.

C. Market price risk dominates, and the investor is at risk of higher rates.

Q-85. A long-term bond investor with an investment horizon of 8 years invests in option-free, fixed-rate bonds with a Macaulay duration of 10.5. The investor most likely currently has a:

A. positive duration gap and is currently exposed to the risk of lower interest rates.

B. positive duration gap and is currently exposed to the risk of higher interest rates.

C. negative duration gap and is currently exposed to the risk of higher interest rates.

6.35. Convexity

6.35.1. 重要知识点

6.35.1.1. Approximate convexity and effective convexity

➢ **Approximate convexity:** a measure of the curvature of the price-yield curve.

$$\text{approximate convexity} = \frac{V_- + V_+ - 2V_0}{(\Delta YTM)^2 V_0}$$

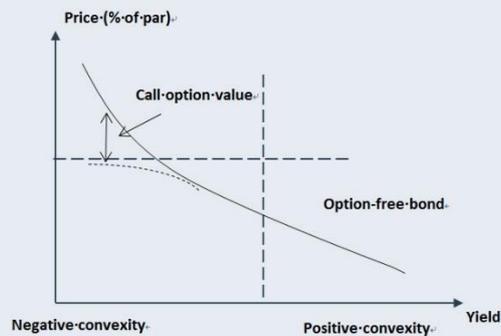➢ **Effective convexity:** appropriate for bonds with embedded options.

$$\text{Effective convexity} = \frac{V_- + V_+ - 2V_0}{(\Delta curve)^2 V_0}$$

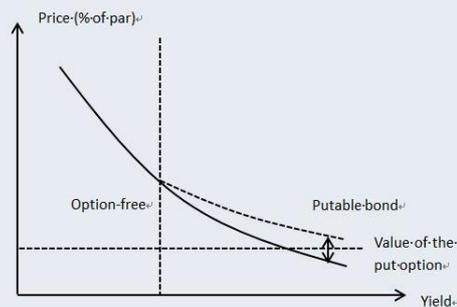### 6.35.1.2. Measurement of Interest Rate Risk

$$\%\Delta \text{ full price} = -\text{annual modified duration}(\Delta YTM) + \frac{1}{2}\text{annual convexity}(\Delta YTM)^2$$

6.35.1.3. callable and putable convexity

➢ **For callable bond**, the effective convexity may be negative if yield is lower.

➢ **For putable bond**, the effective convexity may be higher than that of comparable pure bond.

6.35.2. 基础题

Q-86. The option-free bonds of Argus Corporation have a duration of eight years. When interest rates rise by 100 bps, the bond's price declines by 7.9%. When interest rates fall by 100 bps, however, the price rises by 8.2%. The asymmetrical price change is most likely caused by the:

A. coupon effect.

B. maturity effect.

C. convexity effect.

Q-87. A bond has a Macaulay duration of 8.0, modified duration of 8.5, and convexity of 72.50. If the bond's yield to maturity decreases by 40 bps, the expected percentage price change is closest to:

A. 3.46%.

B. 3.57%.

C. 3.25%.

Q-88. A bond is currently trading for 98.722 per 100 of par value. If the bond's yield-to-maturity (YTM) rises by 10 basis points, the bond's full price is expected to fall to 98.669. If the bond's YTM decreases by 10 basis points, the bond's full price is expected to increase to 98.782. The bond's approximate convexity is closest to::

A. 0.0071

B. 70.906

C. 1144.628

Q-89. Which of the following most likely exhibits negative convexity?

A. An option-free bond

B. A callable bond

C. A putable bond.

6.36. Credit Risk and Credit-Related Risk

6.36.1. 重要知识点

6.36.1.1. Credit risk and credit-related risk

➢ **Credit risk:** the risk associated with losses stemming from the failure of a borrower to make timely and full payments of interest or principal. Credit has two components:

■ **Default risk:** the probability that a borrower fails to pay interest or repay principal when due.

■ **Loss severity, or loss given fault:** is the portion of a bond's value (including

unpaid interest) an investor loses, in the event of default.

- ➢ Expected loss = Default probability × Loss severity given default
  - ◼ Loss severity given default = 1 – Recovery rate
- ➢ **Spread risk:**
  - ◼ Credit migration (or downgrade risk): this is the risk that a bond issuer's creditworthiness deteriorates, or migrates lower, leading investors to believe the risk of default is higher and thus causing the yield spreads on the issuer's bonds to widen and the price of its bonds to fall.
  - ◼ Market liquidity risk: this is the risk that the price at which investors can actually transact may differ from the price indicated in the market.

6.36.2. 基础题

Q-90. The risk that a bond's creditworthiness declines is best described by:

A. Credit migration risk.

B. Market liquidity risk.

C. Spread widening risk.

Q-91. A company receives a ratings upgrade and the price increases on its fixed-rate bond.

The reason of the price increase was most likely a(n):

A. Decrease in the bond's credit spread.

B. Increase in the bond's liquidity spread.

C. Increase of the bond's underlying benchmark rate.

6.37. Seniority Rankings of Corporate Debt

6.37.1. 重要知识点

6.37.1.1. Seniority rankings of corporate debt
- ➢ Priority of claims: in the event of default, unsecured debt holders claim rank below (i.e., get paid after) those of secured creditors.
  - ◼ Secured debt is backed by collateral
  - ◼ Unsecured debt (debentures) represents a general claim to the issuer's assets and cash flows.
  - ◼ General seniority ranking for debt repayment priority
    - ◆ First lien or first mortgage

- ◆ Senior secured debt
- ◆ Junior secured debt
- ◆ Senior unsecured debt
- ◆ Senior subordinated debt
- ◆ Subordinated debt
- ◆ Junior subordinated debt
- ➢ All debt within the same category is said to rank pari passu, or have same priority of claims

6.37.1.2. Pari Passu

- ➢ All creditors at the same level of the capital structure are treated as one class; thus, a senior unsecured bondholder whose debt is due in 30 years has the same pro rata claim in bankruptcy as one whose debt matures in six months. This provision is referred to as bonds ranking pari passu ("on an equal footing") in right of payment.

6.37.2. 基础题

Q-92. In the event of bankruptcy, claims at the same level of the capital structure are:

A. on an equal footing, regardless of size, maturity, or time outstanding.

B. paid in the order of maturity from shortest to longest, regardless of size or time outstanding.

C. paid on a first-in, first-out (FIFO) basis so that the longest-standing claims are satisfied first, regardless of size or maturity.

Q-93. The Zera Company has borrowed capital by issuing a number of different securities. Which of the following most likely ranks the highest with respect to priority of payments?

A. Subordinated loan

B. Third lien debt

C. Senior unsecured bond

6.38. Credit Rating

6.38.1. 重要知识点

6.38.1.1. Credit rating

- ➢ Three major credit ratings agencies: Moody's, S&P, Fitch

> ➢ Different credit ratings: Triple A, investment grade(BBB 及以上), non-investment
>
> grade(BB+及以下)

6.38.1.2. Issuer credit rating and issue ratings

> ➢ Issuer credit rating (corporate family ratings): a debt issuer's overall
> creditworthiness and typically apply to a firm's senior unsecured debt.
> ➢ Issue ratings (corporate credit rating): credit risk of a specific debt issue

6.38.1.3. Notching

> ➢ Notching: assign different ratings to bonds of the same issuer by rating agencies
> > ■ Notching is less common for highly rated issuers than for lower-rated issuers.
> > For lower-rated issuers, higher default risk leads to significant differences
> > between recovery rates of debt with different seniority rankings, leading to
> > more notching.

6.38.1.4. Structural subordination

> ➢ **Structural subordination:** Arises in a holding company structure when the debt of
> operating subsidiaries is serviced by the cash flow and assets of the subsidiaries
> before funds can be passed to the holding company to service debt at the parent
> level.

6.38.1.5. Cross default provision

> ➢ **Cross default provision:** Provisions whereby events of default such as
> non-payment of interest on one bond on all outstanding debt; implies the same
> default probability for all issues.

6.38.1.6. Risks in relying on agency ratings

> ➢ Credit ratings are dynamic
> ➢ Rating agencies are not perfect.
> ➢ Event risk is difficult to assess.
> ➢ Credit ratings lag market pricing.

6.38.2. 基础题

Q-94. A problem for bond investors relying on credit ratings as a basis for buy and sell decisions is that credit ratings:

A. are historically inaccurate.

B. can badly lag changes in bond prices.

C. are less reliable for investment-grade bonds.

Q-95. Which of the following three companies will most likely have notching issues, when they issue corporate bonds?

A. Company A with AAA rating

B. Company B with AA rating

C. Company C with BBB rating

6.39. Four Cs of Credit Analysis

6.39.1. 重要知识点

6.39.1.1. Four Cs of credit analysis

- ➢ **Capacity**
    - ◼ Industry structure
    - ◼ Industry fundamentals
        - ◆ Industry cyclicality
        - ◆ Industry growth prospects
        - ◆ Industry published statistics
    - ◼ Company fundamentals
        - ◆ Competitive position
        - ◆ Ratios and ratio analysis
- ➢ **Collateral**
    - ◼ Intangible assets
        - ◆ Patents are considered high-quality intangible assets because they can be more easily sold to generate cash flows as compared to other intangibles.
        - ◆ Goodwill is not considered a high-quality intangible asset and is usually written down when the company performance is poor.
    - ◼ Depreciation
        - ◆ High depreciation expense relative to capital expenditures may signal that management is not investing sufficiently in the company.
    - ◼ Equity market capitalization
    - ◼ Human and intellectual capital
- ➢ **Covenants**
    - ◼ Affirmative covenant
    - ◼ Negative covenants
- ➢ **Character**

- Soundness of strategy
- Track record
- Accounting policies and tax strategies
- Fraud and malfeasance record

6.39.2. 基础题

Q-96. Which of the following should be assessed when a credit analyst analyzes the collateral of a company?

A. Cash flows of the company

B. Soundness of management's strategy

C. Value of the company's assets in relation to the level of debt

Q-97. Which of the following is least likely a component of the "Four Cs of Credit Analysis" framework?

A. Covenants

B. Competition

C. Collateral

Q-98. A credit analyst observes the following information for Hoda Corp. and its industry.

	Hoda Corp.	Industry Median
Return on capital (%)	20.50%	22.0%
Total debt/Total capital (%)	50.0%	15.5%
FFO/Total debt (%)	42.50%	40.75%
Total debt/EBITDA (x)	3.5x	1.5x
EBITDA interest coverage (x)	4.5x	7.9x

Based on this information, it is *most likely* that the credit risk of Hoda Corp. is:

A. below its industry peers.

B. similar to its industry peers.

C. above its industry peers.

Q-99. Using the "Four Cs of Credit Analysis" framework, which of the following is the least

likely factor to be considered under the category of "capacity"?

A. Industry fundamentals

B. History of fraud or malfeasance

C. Level of competition

6.40. Factors Influence Yield Spreads

6.40.1. 重要知识点

6.40.1.1. yield spread

> The higher the credit risk, the greater the return potential and the higher the volatility of that return.

> Yield for a given maturity on corporate bond= real interest rate+ expected inflation rate + liquidity premium + credit spread+ tax impact

  ■ It is not possible to directly observe the market's assessment of the components separately—analysts can only observe the total yield spread.

> Factors affect the spreads on corporate bonds

  ■ Credit cycle: credit spreads narrows as the credit cycle improves

  ■ Economic conditions: A strengthening economy will cause credit spreads to narrow

  ■ Broker-dealer capital: yield spreads are narrower when broker-dealers provide sufficient capital

  ■ General market demand and supply: credit spreads narrow in times of high demand for bonds

  ■ Financial performance of the issuer: Good news increases the attractiveness of buying and holding bonds issued by the corporation, which raises bond prices and narrows spreads.

6.40.2. 基础题

Q-100. Holding all other factors constant, the most likely effect of low demand and heavy new

issue supply on bond yield spreads is that yield spreads will:

A. widen.

B. tighten.

C. not be affected.

Q-101. Which of the following is *least likely* a component of yield spread?

A. Expected inflation rate

B. Taxation

C. Credit risk

6.41. High Yield, Sovereign, and Municipal Debt

6.41.1. 重要知识点

6.41.1.1. High yield debt

➢ High yield debt=non-investment grade bond=junk bonds(rated below Baa3/BBB-)

➢ Special considerations of high-yield credit analysis:

■ Greater focus on issuer liquidity and cash flow.

■ Detailed financial projections.

■ Detailed understanding and analysis of the debt structure.

■ Understanding of an issuer's corporate structure.

■ Covenant analysis.

6.41.1.2. Sovereign debt

➢ The basic framework for evaluating sovereign credit and assigning sovereign debt ratings:

■ Institutional effectiveness and political risks

■ Economic structure and growth prospects

■ External liquidity and international investment position

■ Fiscal performance, flexibility, and debt burden

■ Monetary flexibility.

6.41.1.3. Municipal debt

➢ GO bonds

■ backed by the taxing authority of the issuing municipality.

■ The credit analysis has some similarities to sovereign analysis.

➢ Revenue bonds

■ Support specific projects, such as toll roads, bridges, airports, and other infrastructure.

■ The creditworthiness comes from the revenues generated by usage fees and tolls levied.

■ Often have higher credit risk than GO bonds.

■ Analysis of revenue bonds is similar to those for analyzing corporate bonds.

6.41.2. 基础题

Q-102. Which of the following factors in credit analysis is more important for general obligation non-sovereign government debt than for sovereign debt?

A. Per capita income

B. Power to levy and collect taxes

C. Requirement to balance an operating budget

6.42. 进阶题

Q-1. A 5-year, 5% semiannual coupon payment corporate bond is priced at 104.967 per 100 of par value. The bond's yield-to-maturity, quoted on a semiannual bond basis, is 3.897%. An analyst has been asked to convert to a monthly periodicity. Under this conversion, the yield-to-maturity is closest to:

A. 3.87%.
B. 4.95%.
C. 7.67%.

Q-2. A 10% coupon bond with annual payments, maturing in 3 years, is priced at 105. The bond is callable in one year at a call price of 104 or two years at a call price of 102. The bonds yield to worst most likely occurs when the bond is:

A. Called in year 1.
B. Called in year2.
C. Held until maturity.

Q-3. Assume the US Treasury forward rates as follows, the value of a 2 year $1000 par value semi-annual Treasury bond with a 6% coupon rate is closest to:

Period	Forward Rate
1	1.40%
2	2.00%
3	2.50%
4	2.90%

A. $1076.82
B. $1074.33
C. $1072.46

Q-4. Which of the following 90-day money market instruments *most likely* offers the investor the highest rate of return?

Money Market Instrument	Quoted Rate	Quotation Basis	Day Convention
Instrument A	5.80%	360	Discount rate

Instrument B	5.65%	365	Discount rate
Instrument C	5.88%	365	Add-on rate

A. Instrument C

B. Instrument A

C. Instrument B

Q-5. An option-adjusted-spread(OAS) on a callable bond is the Z-spread:

A. Over the benchmark spot curve.

B. Minus the standard swap rate in that currency of the same tenor.

C. Minus the value of the embedded call option expressed in basis points per year.

Q-6. Which of the following sources of return is *most likely* exposed to interest rate risk for

an investor of a fixed-rate bond who holds the bond until maturity?

A. Capital gain or loss

B. Redemption of principal

C. Reinvestment of coupon payments

Q-7. An investor buys a three-year bond with a 5% coupon rate paid annually. The bond,

with a yield-to-maturity of 3%, is purchased at a price of 105.657223 per 100 of par

value. Assuming a 5-basis point change in yield-to-maturity, the bond's approximate

modified duration is closest to:

A. 2.78.

B. 2.86.

C. 5.56.

Q-8. In a recent presentation, Terry made two statements about Macaulay duration:

Statement 1: "Macaulay duration will decrease as time passes and immediately

increase after coupon payment."

Statement 2: "Macaulay duration will increase as time passes and immediately

decrease after coupon payment."

Are Terry's two statements correct?

A. Yes for Statement 1 and no for Statement 2

B. No for Statement 1 and yes for Statement 2

C. No for both statements

Q-9. A bond with exactly nine years remaining until maturity offers a 3% coupon rate with annual coupons. The bond, with a yield-to-maturity of 5%, is priced at 85.784357 per 100 of par value. The estimated price value of a basis point for the bond is closest to:

A. 0.0086.

B. 0.0648.

C. 0.1295.

Q-10. A bond is currently trading for 98.722 per 100 of par value. If the bond's yield-to-maturity(YTM) rises by 10 basis points, the bond's full price is expected to fall to 98.669. if the bond's YTM decreases by 10 basis points, the bond's full price is expected to increase to 98.782. The bond's approximate convexity is closest to:

A. 0.0071.

B. 70.906.

C. 1144.628.

Q-11. The duration of an option-free bond priced at $900 is 8.5. If yields decrease by 150 basis points, the most accurate statement about the actual price of the bond after the decrease in yields is that the actual price will be:

A. Equal to $1,014.75.

B. Greater than 1,014.75.

C. Less than 1,014.75 because the lower level of yields increases the bond's interest rate risk.

Q-12. An investor purchases an annual coupon bond with a 8% coupon rate and exactly 20 years remaining until maturity at a price equal to par value. The investor's investment horizon is eight years. The modified duration of the bond is 12.480 years. The duration gap at the time of purchase is closest to:

A. -6.842.

B. 4.480.

C. 5.478.

Q-13. A credit analyst observes the following information for Alpha Co. at fiscal years ending 20X7 and 20X8. Excerpt from the Consolidated Income Statement of Alpha Co. for the fiscal years ending 31 December 20X7and 20X8 (in millions)

	20X7	20X8
Gross profit	$549.0	$506.0
Operating expenses	451.0	372.0
Operating profit	98.0	134.0
Interest expense	29.0	35.0
Income before taxes	69.0	99.0
Income taxes (at 30%)	22.0	31.0
Net income	47.0	68.0
Additional information		
Depreciation and amortization	26.0	34.0

Based on this information, over this period Alpha's interest coverage ratio has:

A. Remained unchanged.
B. Improved.
C. Deteriorated.

Q-14. The fund manager is concern about the fact that market interest rates will go up unexpectedly and lead to prepayment rates that are much lower than previous expectation. He also expresses his expectation for a relatively long-term investment (average life of greater than five years) and does not want to receive any cash flow from coming years. The endowment fund manager's concern about the impact of movements in market interest rates is best described as a concern about:

A. Extension risk.
B. Prepayment risk.
C. Contraction risk.

Q-15. Two different structures of collateralized mortgage obligations (CMO) are being considered for issuance:
Structure 1: $400 million of pass-through will be used as collateral for two sequential pay tranches: $325 million worth of bonds of Tranche X and $75 million of bonds of

Tranche Y. The principal for Tranche X must be completely paid off before any payments are made to Tranche Y.

Structure 2: $400 million of pass-through will be used as collateral for $325 million of E bonds in a planned amortization class (PAC) tranche and $75 million of F bonds in a support tranche.

Which of the following statements is *least* accurate? The:

A. X bonds have less contraction risk than the Y bonds.

B. X bonds have less extension risk than the Y bonds.

C. E bonds have less contraction risk than the F bonds.

Solutions

6. Fixed Income

6.1. 基础题

Q-1.   Solution: C.

A capital market security has an original maturity longer than one year. A is incorrect because a perpetual bond does not have a stated maturity date. Thus, the sovereign bond, which has a maturity of 15 years, cannot be a perpetual bond. B is incorrect because a pure discount bond is a bond issued at a discount to par value and redeemed at par. Some sovereign bonds (e.g., Treasury bills) are pure discount bonds, but others are not.

Q-2.   Solution: A.

A dual currency bond makes coupon payments in one currency and pays the par value at maturity in another currency.

B is incorrect because a currency option bond gives bondholders the right to choose the currency in which they want to receive interest payments and principal repayments.

C is incorrect because a foreign currency bond is issued in foreign currency for both principal and interest payments.

Q-3.   Solution: A.

Bonds issued by entities that are incorporated in another country are called foreign bonds. Therefore, the bonds issued by a South Korean company in the United States are known as foreign bonds.

B is incorrect because Eurobonds are bonds issued internationally, outside the jurisdiction of any single country to bypass the legal, regulatory, and tax constraints imposed on bond issuers and investors. The bonds registered with the SEC are not classified as Eurobonds.

C is incorrect because global bonds are bonds that are issued simultaneously in the Eurobond market and in at least one domestic bond market.

Q-4.   Solution: C.

C is correct. Agency bonds are issued by quasi-government entities. These entities are agencies and organizations usually established by national governments to perform various functions for them. A and B are incorrect because local and national governments issue non-sovereign and sovereign bonds, respectively.

Q-5.   Solution: C.

Supranational bonds are bonds issued by such supranational agencies as the European Investment Bank and the International Monetary Fund.

A is incorrect because bonds issued by Federal Farm Agency of the United States are a type of quasi-government bonds.

B is incorrect because bonds issued by the government of Malaysia are a type of government bonds.

Q-6.   Solution: C.

Overcollateralization is a form of internal credit enhancement in which more collateral is posted than is needed to obtain or secure financing. It provides an additional credit buffer in the event of default by providing more assets to repay the lender.

A is incorrect because a letter of credit is a credit line provided by a financial institution to reimburse any cash flow shortfalls from the assets backing the issue.

B is incorrect because a surety bond is a guarantee issued by a rated and regulated insurance company to reimburse investors for any losses incurred if the issuer defaults.

Q-7.   Solution: C.

The third-party (or counterparty) risk for a surety bond and a letter of credit arises from both future promises to pay. In contrast, a cash collateral account allows the issuer to immediately borrow the credit-enhancement amount and then invest it.

Q-8.   Solution: B.

Prohibiting the issuer from investing in risky projects restricts the issuer's potential business decisions. This restriction is referred to as negative bond covenants.

A and C are incorrect because paying taxes as they come due and maintaining the current lines of business are positive covenants.

Q-9.   Solution: A.

Paying interest and principal is one of the most common affirmative covenants. Negative covenants set forth certain limitations and restrictions on the borrower's activities. The more common restrictive covenants are those that impose limitations on the borrower's ability to incur additional debt, such as specifying a debt-to-capital ratio, unless certain tests are satisfied.

Q-10.   Solution: A.

An original issue discount tax provision allows the investor to increase the cost basis of the bond, so when the bond matures, the investor faces no capital gain or loss.

Q-11.   Solution: C.

A fully amortized bond calls for equal cash payments by the bond's issuer prior to maturity. Each fixed payment includes both an interest payment component and a principal repayment component such that the bond's outstanding principal amount is reduced to zero by the maturity date.

A and B are incorrect because a bullet bond or plain vanilla bond only make interest payments prior to maturity. The entire principal repayment occurs at maturity.

Q-12.   Solution: C.

Except at maturity, the principal repayments are lower for a partially amortized bond than for an otherwise similar fully amortized bond. Consequently, the principal amounts outstanding and, therefore, the amounts of interest payments are higher for a partially amortized bond than for a fully amortized bond, all else equal. The only exception is the first interest payment, which is the same for both repayment structures. This is because no principal repayment has been made by the time the first coupon is paid.

Q-13.   Solution: A.

A sinking fund arrangement is a way to reduce credit risk by making the issuer set aside funds over time to retire the bond issue.

Q-14.   Solution: B.

Inverse floaters have a coupon formula such that the coupon rate increases when the reference rate decreases and decreases when the reference rate increases. The coupon rate moves in the opposite direction from the change in the reference rate.

Q-15.   Solution: B.

LIBOR + 300 bps at the reset date is 1.5% + 3.00% = 4.5%, which is below the floor of 5.00%, so the coupon rate will be equal to the floor.

Q-16.   Solution: B.

Capital-indexed bonds pay a fixed coupon rate that is applied to a principal amount that increases in line with increases in the index during the bond's life. If the consumer price index increases by 6%, the coupon rate remains unchanged at 8%, but the principal amount increases by 6%/2=3% and the coupon payment is based on the inflation-adjusted principal amount. On the first coupon

payment date, the inflation-adjusted principal amount is 1,000 × (1 + 0.03) = 1,030 and the semi-annual coupon payment is equal to (0.08 × 1,030) / 2 = 41.20.

Q-17.   Solution: A.

A step-up coupon bond has contractually mandated changes in its coupon rate over time.

B is incorrect because a deferred coupon bond initially has no coupon payments.

C is incorrect because a floating rate bond's coupon rate will change in ways that are not known in advance, depending on future changes in the reference rate.

Q-18.   Solution: A.

Both statements are incorrect. An issuer is more likely to call a bond when rates have declined; thereby the reinvestment risk increases relative to an option-free bond. Because of the call provision, the callable bond has less potential price appreciation than an identical option-free bond (termed price compression).

Q-19.   Solution: A.

The conversion value of the bond is 50,000 × 40 = $2,000,000. The price of the convertible bond is $1,800,000. Thus, the conversion value of the bond is more than the bond's price, and this condition is referred to as above parity.

Q-20.   Solution: B.

When interest rates fall, the price of the embedded call option increases. The price of a callable bond equals the price of an option-free bond minus the price of the embedded call option. So, the price of the callable bond will not increase as much as an option-free bond because the price of the call option increases. As interest rates fall, the bond is more likely to be called, limiting the upside potential of price.

Q-21.   Solution: C.

The right to call the issue is beneficial to the issuer when interest rates fall.

A is incorrect because the conversion provision grants the bondholder the right to convert the bond for a specified number of shares of common stock. Such a feature allows the bondholder to take advantage of favorable movements in the price of the issuer's common stock.

B is incorrect because the right to put the issue is an option granted to the bond-holder to sell the bond back to the issuer at a predetermined price on specified dates before maturity.

Q-22.   Solution: A.

An American-style callable bond is a bond in which the issuer has the right to call the bonds at any time starting on the first call date.

Q-23.   Solution: A.

Primary bond markets are markets in which bonds are issued for the first time to raise capital. B is incorrect because having a specific location where the trading of bonds takes place is not a requirement for a primary bond market. C is incorrect because a market in which existing bonds are traded among individuals and institutions is the definition of a secondary, not primary, market.

Q-24.   Solution: A.

In major developed bond markets, newly issued sovereign bonds are sold to the public via an auction. B and C are incorrect because sovereign bonds are rarely issued via private placements or best effort offerings.

Q-25.   Solution: C.

Non-sovereign bonds usually trade at a higher yield and lower price than sovereign bonds with similar characteristics. The higher yield is because of the higher credit risk associated with non-sovereign issuers relative to sovereign issuers, although default rates of local governments are historically low and their credit quality is usually high. The higher yield may also be a consequence of non-sovereign bonds being less liquid than sovereign bonds with similar characteristics.

Q-26.   Solution: B.

The IMF is a multilateral agency that issues supranational bonds. A and C are incorrect because sovereign bonds and quasi-government bonds are issued by national governments and by entities that perform various functions for national governments, respectively.

Q-27.   Solution: A.

A sinking fund arrangement is a way to reduce credit risk by making the issuer set aside funds over time to retire the bond issue. B and C are incorrect because a sinking fund arrangement has no effect on inflation risk or interest rate risk.

Q-28.   Solution: B.

A loan from a group of lenders to a single borrower is a syndicated loan. A is incorrect because a bilateral loan is a loan from a single lender to a single borrower. C is incorrect because a private placement involves placing the debt issued by a borrower directly with a lender or a group of lenders. The fact that the borrower is a private company is irrelevant.

Q-29.   Solution: A.
The higher the quality of the collateral, the lower the difference between the market value of the security used as collateral and the value of the loan—that is, the repo margin.

Q-30.   Solution: B
A syndicated loan is a loan from a group of lenders, called the "syndicate," to a single borrower. Syndicated loans are primarily originated by banks, and the loans are extended to companies but also to governments and government-related entities.

Q-31.   Solution: B.
A repurchase agreement (repo) can be viewed as a collateralized loan where the security sold and subsequently repurchased represents the collateral posted. A and C are incorrect because interbank deposits and negotiable certificates of deposit are unsecured deposits-that is, there is no collateral backing the deposit.

Q-32.   Solution: A.
If the credit event does not occur, the issuer must make all promised cash flows as scheduled-that is, the regular coupon payments and the par value at maturity.

Q-33.   Solution: C.
A structured financial instrument whose coupon rate moves in the opposite direction of the reference rate is called an inverse floater. Because the coupon leverage (0.5) is greater than zero but lower than one, the structured financial instrument is a deleveraged inverse floater. In this example, if the reference rate increases by 100 bps, the coupon rate decreases by 50 bps. A is incorrect because the coupon leverage would have to be higher than one for the structured financial instrument to be a leveraged inverse floater. B is incorrect because a yield enhancement instrument is designed to increase risk exposure in the hope of realizing a higher expected return, such as credit linked note (CLN).

Q-34.   Solution: A.

The bond price is closest to 95.00. The bond has six semiannual periods. Half of the annual coupon is paid in each period with the required rate of return also being halved. The price is determined in the following manner:

N=6, I/Y=5.5, PMT=4.5, FV=100

CPT (PV)=95

Q-35.   Solution: C.

The lower the coupon rate, the more sensitive the bond's price is to changes in interest rates.

A is incorrect because the maturity would have to be longer for Bond A relative to Bond B.

B is incorrect because when interest rates rise, the price of a callable bond will not fall as much as an otherwise option-free bond.

Q-36.   Solution: C.

A security with a present value of 97.12, 9 interest payments of 10, and a 10th payment of principal plus interest (110) has a yield to maturity of 10.48%.

Q-37.   Solution: B.

The value of the bond is

$$\frac{10}{1.06} + \frac{10}{1.06^2} + \frac{110}{1.06^3} = 9.43 + 8.90 + 92.36 = 110.69$$

if market interest rates increase, the discount rate will increase, and the value will be

$$\frac{10}{1.08} + \frac{10}{1.08^2} + \frac{110}{1.08^3} = 9.26 + 8.57 + 87.32 = 105.15$$

a change of 105.15-110.69=-5.54.

Q-38.   Solution: B.

The bond price is computed as

$P_0 = 10/(1.075)^4 + 10/(1.070)^5 + 10/(1.065)^6 + (10 + 100)/(1.060)^7 = 94.63$.

Q-39.   Solution: C.

A spot rate is defined as the yield to maturity on a zero-coupon bond maturing at the date of that cash flow.

Q-40.   Solution: C.

If the discount rate increases to 12% from 8%, the price of a bond decreases. At a discount rate of 12%, the bond sells at a discount to face value. As a discount bond approaches maturity, it will increase in price over time until it reaches par at maturity.

Q-41.   Solution: B.

With 4 years remaining to maturity and a discount rate that is unchanged at 6.0 percent, the value of the bond would be $103.47 or N=4, I/Y=6, PMT=7, FV=100, CPT(PV)=103.47, the part of this change in value attributing to the passage of time is 104.21-103.47=0.74.

Q-42.   Solution: C.

The agreed on bond price without accrued interest is referred to as the flat price.

Q-43.   Solution: C.

$$PV = \frac{4}{(1+0.03)^1} + \frac{4}{(1+0.03)^2} + \frac{4}{(1+0.03)^3} + \frac{4}{(1+0.03)^4} + \frac{104}{(1+0.03)^5} = 104.58$$
$$PV^{full} = 104.58 \times 1.03^{76/180} = 105.89$$

Q-44.   Solution: A.

The first step is to determine the yields-to-maturity on the observed bonds. The required yield on the two-year, 6.0% bond priced at 106.500 is 2.622%. The required yield on the four-year, 5.0% bond priced at 106.250 is 3.306%.

Applying the method of linear interpolation, the YTM of a bond with three-year maturity and same credit ranking is (2.622%+3.306%)/2=2.964%, then calculate the price, which is 105.763.

Some fixed-rate bonds are not actively traded. Therefore, there is no market price available to calculate the rate of return required by investors. The same problem occurs for bonds that are not yet issued. In these situations, it is common to estimate the market discount rate and price based on the quoted or flat prices of more frequently traded comparable bonds. These comparable bonds have similar times-to-maturity, coupon rates, and credit quality. This estimation process is called matrix pricing.

Q-45.   Solution: B.

Current yield is calculated as ($6/$92.50) = 6.49%.

Q-46.   Solution: C.

$$PV = 100 \times \left(1 - \frac{180}{360} \times 0.0650\right) = 96.75$$

$$\mathrm{BEY} = \frac{365}{180} \times \frac{100 - 96.75}{96.75} = 6.81\%$$

Q-47.   Solution: C.

FRN Z will be priced at a discount on the next reset date because the quoted margin of 0.80% is less than the discount or required margin of 0.85%. The discount amount is the present value of the extra or "excess" interest payments of 0.05% (0.85% - 0.80%). FRN Y will be priced at par value on the next reset date since there is no difference between the quoted and discount margins. FRN X will be priced at a premium since the quoted margin is greater than the required margin.

Q-48.   Solution: C.

C is correct. The yield-to-call is 4.68%, the formula for calculating this bond's yield-to -call is:

N=6, PV=-990, PMT=20, FV=1010

CPT (I/Y)=2.338（%）

YTC=I/Y*2=4.68（%）

Q-49.   Solution: B.

The spot curve, also known as the strip or zero curve, is the yield curve constructed from a sequence of yields-to-maturities on zero-coupon bonds. The par curve is a sequence of yields-to-maturity such that each bond is priced at par value. The forward curve is constructed using a series of forward rates, each having the same time frame.

Q-50.   Solution: A.

To obtain the spot yield curve a bond analyst would prefer to use the most recently issued and actively traded government bonds. Such bonds will have similar liquidity as well as fewer tax effects because they will be priced closer to par value.

Q-51.   Solution: B.

The forward and spot curves are interconnected to each other. The spot curve can be calculated from the forward curve, and the forward curve can be calculated from the spot curve. Either curve can be used to value fixed-rate bonds.

Q-52.   Solution: B.

The value of the bond is

$$\frac{3}{(1+0.015/2)} + \frac{3}{(1+0.015/2)*(1+0.025/2)}$$

$$+\frac{3}{(1+0.015/2)*\left(1+\frac{0.025}{2}\right)*(1+0.033/2)}$$

$$+\frac{3}{(1+0.015/2)*\left(1+\frac{0.025}{2}\right)*\left(1+\frac{0.033}{2}\right)*(1+0.039/2)}$$

$$+\frac{3+100}{(1+0.015/2)*\left(1+\frac{0.025}{2}\right)*\left(1+\frac{0.033}{2}\right)*\left(1+\frac{0.039}{2}\right)*(1+0.043/2)}$$

= \$107.03

Q-53.   Solution: A.

The four-year spot rate can be computed as:
$Z_4 = [(1.005) \times (1.007) \times (1.01) \times (1.015)]^{1/4} - 1 = 0.924\%$

Q-54.   Solution: A.

Solution 1：Yield-to-maturity on the U.K. corporate bond:

$$100.65 = \frac{5}{(1+r)^1} + \frac{5}{(1+r)^2} + \frac{105}{(1+r)^3}, r = 0.04762 \, or \, 476bps$$

Yield-to-maturity on the U.K. government benchmark:

$$100.25 = \frac{2}{(1+r)^1} + \frac{2}{(1+r)^2} + \frac{102}{(1+r)^3}, r = 0.01913 \, or \, 191bps$$

The G-spread is 476-191=285 bps

Solution 2：FV=100, PV=-100.25, N=3, PMT=2%×100=2, CPT, I/Y=1.91, $r_{treasury}$=191bps

FV=100, PV=-100.65, N=3, PMT=5%×100=5, CPT, I/Y=4.76, r_{bond}=476bps

The G-spread is r_{bond} - $r_{treasury}$ =285 bps

Q-55.   Solution: A.

The I-spread, or interpolated spread, is the yield spread of a specific bond over the standard swap rate in that currency of the same tenor. The yield spread in basis points over an actual or interpolated government bond is known as the G-spread. The Z-spread (zero-volatility spread) is the constant spread that is added to each spot rate so that the present value of the cash flows matches the price of the bond.

Q-56.   Solution: C.

A key motivation for a corporation to establish a SPV is to separate it as a legal entity. In the case of bankruptcy for the corporation, the SPV is unaffected because it is not a subsidiary of the corporation. Given this arrangement, the SPV can achieve a rating as high as AAA and borrow at lower rates than the corporation.

A is incorrect because the SPV does not receive a guaranty.

B is incorrect because the corporation does have a lien on those assets.

Q-57.   Solution: B.

There are recourse and non-recourse mortgage loans. In a non-recourse loan, the lender does not have a claim against the borrower and thus can look only to the property to recover the outstanding mortgage balance. In a recourse loan, the lender can seek to recover any shortfall from the sale of the property to cover the mortgage loan. The borrower, therefore, has a strategic default option only in non-recourse loans; for example, if the mortgage is greater than the property value, he may select to default without further personal obligation.

A is incorrect. Recourse and non-recourse do not refer to any pricing terms.

C is incorrect. In a recourse loan, the borrower does not have an incentive to default on an underwater mortgage since the lender can seek to recover any shortfall beyond the sale of the property from the borrower.

Q-58.   Solution: C.

In a mortgage pass-through security the pass-through rate is less than the mortgage rate on the underlying pool of mortgages by an amount equal to the servicing (and other administrative) fees.

Q-59.   Solution: A.

Extension risk (contraction risk) is the risk that when interest rates rise (decline), actual prepayments will be lower (higher) than forecasted. At lower rates, homeowners will refinance at the now-available lower interest rates. Thus, a security backed by mortgages will have a shorter maturity than was anticipated at the time of purchase. At higher rates, homeowners are reluctant to give up the benefits of a contractual interest rate that now looks low, thus slowing the prepayment on the securitization, leading to its longer maturity. SMM is a measure of prepayment and not a risk, and CPR is the corresponding annualized rate.

B is incorrect. SMM is a measure of prepayment and not a risk.

C is incorrect. CPR is the corresponding annualized rate for SMM.

Q-60.   Solution: C.

Seasoned means that the pool is older than 30 months.

SMM=1-(1-0.06)$^{1/12}$=0.005143.

Q-61.   Solution: B.

Many commercial loans backing commercial mortgage-backed securities (CMBS) are balloon loans that require significant repayment of principal at maturity. The risk that the borrower will not be able to make the balloon payment is called balloon risk. The lender may decide to extend the loan over a period of time called the workout period. Because the term of the loan can be extended, balloon risk is a type of extension risk.

A is incorrect because shorter-term tranches in a CMO structure have less extension risk than longer-term tranches.

C is incorrect because planned amortization class tranches in a CMO structure offer investors reduction in both extension and contraction risk.

Q-62.   Solution: B

Credit tranching allows investors to choose between subordinate and senior bond classes as a means of credit enhancement. The purpose of this structure is to redistribute the credit risk associated with the collateral.

Q-63.   Solution: A.

Asset-backed securitizations can be structured with subordinated bond classes. They function as credit protection for the more senior bond classes; that is, losses are realized by the subordinated bond classes before any losses are realized by the senior bond classes. This type of protection is also commonly referred to as a waterfall structure because of the cascading flow of payments between bond classes in the event of default.The creation of bond classes that possess different expected maturities is referred to as time tranching. An SPE is a bankruptcy remote legal entity that holds the collateral and is considered not an enhancement but, rather, a prerequisite for establishing securitizations.

B is incorrect. The creation of bond classes that possess different expected maturities is referred to as time tranching.

C is incorrect. An SPE is a bankruptcy remote legal entity that holds the collateral and is considered not an enhancement but, rather, a prerequisite for establishing securitizations.

Q-64.   Solution: A.

Because commercial mortgage loans are non-recourse loans, the lender can only look to the income-producing property backing the loan for interest and principal repayment. If there is a

default, the lender looks to the income-producing property backing the loan for interest and principal repayment. If there is a default, the lender looks to the proceeds from the sale of the property for repayment and has no recourse against the borrower for any unpaid mortgage loan balance.

Q-65.   Solution: A.

Many commercial loans backing CMBSs are balloon loans that require a substantial principal repayment at maturity of the loan. If the borrower fails to make the balloon payment, the borrower is in default. CMBSs generally do not have amortizing principal as RMBSs do, and they do offer call protection.

B is incorrect. CMBSs generally do not have amortizing principal as RMBSs do.

C is incorrect. CMBSs generally do offer call protection.

Q-66.   Solution: A.

An auto loan ABS involves the use of amortizing collateral, that is, the cash flows for an auto loan ABS include interest payments, scheduled principal repayments, and any prepayments, if allowed.

B is incorrect because overcollateralization is one of the typical features of an auto loan ABS.

C is incorrect because an auto loan ABS typically has some form of credit enhancement, such as a senior/subordinated tranche structure.

Q-67.   Solution: B.

A credit card receivable ABS is an example of an ABS with a non-amortizing collateral.

A is incorrect because a credit card receivable ABS may require early amortization of the principal if certain events occur. Such an early amortization provision would safeguard the credit quality of the issue.

C is incorrect because a credit card receivable ABS would typically have a lockout period during which the cash flow that is paid out to security holders is based only on finance charges collected and fees.

Q-68.   Solution: A.

The benefit of the return on collateral in excess of what is paid out to the bond classes accrues to the equity holders and to the CDO manager.

B is incorrect because when the senior bond class experiences early principal repayment the CDO manager isn't meeting pre-specified tests requiring the prepayment of low cost senior debt,

deleveraging the CDO and making it harder for the subordinated tranche to earn a competitive return.

C is incorrect because if debt funding costs are higher than the CDO return, no return will accrue to the subordinated tranche.

Q-69.   Solution: B.

Covered bonds usually carry lower credit risks and offer lower yields than otherwise similar ABS. The reason is, among other factors, covered bonds provide investors with dual recourse, to the cover pool and also to the issuer. Moreover, covered bonds have a dynamic cover pool, meaning sponsors must replace any prepaid or non-performing assets.

Q-70.   Solution: C.

$$PV = \frac{8}{1.1^1} + \frac{8}{1.1^2} + \frac{8}{1.1^3} + \frac{108}{1.1^4} = 93.66$$

Coupon & coupon reinvestment $= 8 \times 1.1^4 + 8 \times 1.1^3 + 8 \times 1.1^2 + 8 \times 1.1^1 + 8 = 48.84$

$$100 = \frac{93.66 + 48.84}{(1+r)^5}, r = 0.0734$$

Q-71.   Solution: C.

Yield to maturity is based on the assumption that a bond is held to maturity, does not default, and has its coupon payments reinvested at the yield to maturity. The bond selling at a premium has the highest coupon rate and is expected to earn the most reinvestment income from reinvesting those coupon payments at the yield to maturity. If the reinvestment rate falls, this bond will suffer the greatest loss.

Q-72.   Solution: B.

period	Cash flow	Present value	weight	Period×weight
1	60	55.55556	0.058575	0.058575
2	60	51.44033	0.054236	0.108471
3	1060	841.46218	0.887190	2.661570
		948.45806	1.000000	2.828617

Q-73.   Solution: B.

When interest rates are rising, the put option becomes more valuable to the investor. The ability to sell the bond at par value limits the price depreciation as rates rise. So, the presence of an embedded put option reduces the sensitivity of the bond price to changes in interest rates, resulting in a lower effective duration.

Q-74.   Solution: B.

The effective duration is defined as:

$$\frac{(PV_-) - (PV+)}{2 * (\Delta Curve) * (PV_0)}$$

Effective duration = (106.75 − 102.10)/(2 × 0.0035 × 103.25)= 6.43

Q-75.   Solution: B.

To determine the percentage price change of a bond for a given change in yield, first convert Macaulay duration (7.0705) to modified duration by dividing Macaulay duration by 1 plus yield per period.
ModDur =7.0705/1.047 = 6.7531
Next, multiply annual modified duration by the change in yield.
−[6.7531 × (−0.0075)] = 0.0507 or 5.07%

Q-76.   Solution: C.

Option-free bonds have positive convexity. The higher the yield to maturity, the lower the duration (and thus the lower the interest rate risk).

Q-77.   Solution: A.

The presence of an embedded put option reduces the effective duration of the bond, especially when rates are rising. If interest rates are low compared with the coupon rate, the value of the put option is low and the impact of the change in the benchmark yield on the bond's price is very similar to the impact on the price of a non-putable bond. But when benchmark interest rates rise, the put option becomes more valuable to the investor. The ability to sell the bond at par value limits the price depreciation as rates rise. The presence of an embedded put option reduces the sensitivity of the bond price to changes in the benchmark yield, assuming no change in credit risk.

Q-78.   Solution: A.

The portfolio's duration is a weighted average of the durations of the individual holdings, computed as: (12/24) × (3.0) + (6/24) × (7.0) + (6/24) × (6.0) = 4.75.

Q-79.   Solution: A.

A limitation to using the average duration approach in calculating portfolio duration is that it assumes all interest rates across the yield curve change by the same amount and, therefore, each bond's price changes by the same percentage.

B is incorrect because the duration of each bond is calculated using the appropriate discount rate for the bond, not the same discount rate for all bonds.

C is incorrect because the duration of each bond is calculated using the bond's coupon rate payment.

Q-80.   Solution: C.

The bond's PVBP is computed using

$$\text{PVBP} = \frac{(\text{PV}_-) - (\text{PV}_+)}{2}.$$

$$\frac{105.90 - 105.75}{2} = 0.075$$

Q-81.   Solution: C.

Money Duration of Bond A = 7.75 × 95.00 = 736.25

Money Duration of Bond B = 5.75 × 85.00 = 488.75

Money Duration of Bond C = 10.50 × 90.00 = 945

Q-82.   Solution: B.

A bond's yield-to-maturity is inversely related to its Macaulay duration: The higher the yield-to-maturity, the lower its Macaulay duration and the lower the interest rate risk. A higher yield-to-maturity decreases the weighted average of the times to the receipt of cash flow, and thus decreases the Macaulay duration.

A bond's coupon rate is inversely related to its Macaulay duration: The lower the coupon, the greater the weight of the payment of principal at maturity. This results in a higher Macaulay duration. Zero-coupon bonds do not pay periodic coupon payments; therefore, the Macaulay duration of a zero-coupon bond is its time-to-maturity.

Q-83.   Solution: C.

Empirical duration is the best measure—better than analytical duration—of the impact of yield changes on portfolio value, especially under stressed market conditions, for a portfolio consisting of a variety of different bonds from different issuers, such as the portfolio described in Answer C. In this portfolio, credit spread changes on the high-yield bonds may partly or fully offset yield changes on the AAA rated sovereign bonds and spread changes on the AAA rated corporate bonds; this interaction is best captured using empirical duration. The portfolios described in Answers A and B consist of the same types of bonds from similar issuers—sovereign bonds from similar-rated sovereign issuers (A) and covered bonds from similar-rated corporate issuers (B)—so empirical and analytical durations should be roughly similar in each of these portfolios.

Q-84.   Solution: B

The investor is hedged against interest rate risk if the duration gap is zero; that is, the investor's investment horizon is equal to the bond's Macaulay duration. The investor is at risk of lower rates only if the duration gap is negative; that is, the investor's investment horizon is greater than the bond's Macaulay duration. In this case, coupon reinvestment risk dominates market price risk.

Q-85.   Solution: B

The duration gap is the bond's Macaulay duration minus the investment horizon, which is positive in this case. A positive duration gap implies that the investor is currently exposed to the risk of higher interest rates.

A is incorrect because while the duration gap is positive the investor is currently exposed to the risk of higher, not lower, interest rates.

C is incorrect because the duration gap is positive, not negative, implying that the investor is currently exposed to the risk of higher interest rates.

Q-86.   Solution: C.

A fall in interest rates will result in a higher percentage rise in the bond's price compared with the percentage fall in the bond's price when interest rates rise by the same amount.

A is incorrect because the coupon effect relates to the sensitivity of bond price changes to changes in the coupon rate.

B is incorrect because the maturity effect relates to the sensitivity of bond price changes to the time to maturity.

Q-87.   Solution: A.

The expected percentage price change for a bond can be is estimated as follows:

%ΔP^{Full} ≈ (–AnnModDur × ΔYield) + [0.5 × AnnConvexity × (ΔYield)^2]

%ΔPFull ≈ (–8.5 × –0.004) + [0.5 × 72.50 × (–0.004)2] = 3.458%

Q-88.   Solution: B.

$$\text{approximate convexity} =$$
$$[98.782 + 98.669 - (2 * 98.722)]/(0.001^2 * 98.722) = 70.906$$

Q-89.   Solution: B.

A callable bond exhibits negative convexity at low yield levels and positive convexity at high yield levels.

Q-90.   Solution: A.

Credit migration risk or downgrade risk refers to the risk that a bond issuer's creditworthiness may deteriorate or migrate lower. The result is that investors view the risk of default to be higher, causing the spread on the issuer's bonds to widen.

Q-91.   Solution: A.

The price increase was *most likely* caused by a decrease in the bond's credit spread. The ratings upgrade *most likely* reflects a lower expected probability of default and/or a greater level of recovery of assets if default occurs. The decrease in credit risk results in a smaller credit spread. The increase in the bond price reflects a decrease in the yield-to-maturity due to a smaller credit spread. The change in the bond price was not due to a change in liquidity risk or an increase in the benchmark rate.

Q-92.   Solution: A.

All claims at the same level of the capital structure are pari passu (on an equal footing).

Q-93.   Solution: B.

Third lien debt is secured debt. It has a secured interest in the pledged assets and ranks higher than all other unsecured debts.

A is incorrect because a subordinate loan is an unsecured debt. Among the various creditor classes, these obligations have among the lowest priority of claims and frequently have little or no recovery in the event of default.

C is incorrect because senior unsecured bond is also an unsecured debt. It ranks highest among all the unsecured debts, but it ranks below secured debts.

Q-94.   Solution: B.

In response to changes in perceived creditworthiness, bond prices and credit spreads often move more quickly than rating agencies change their ratings up or down. Bond prices and relative valuations can move every day, whereas bond ratings do not change very often. Thus, bond investors who wait for rating agencies to change their ratings before making buy and sell decisions in their portfolios may be at risk of underperforming other investors who make portfolio decisions in advance of rating agency changes.

A is incorrect. With few exceptions, credit ratings have proven to be accurate.

C is incorrect. Credit ratings for speculative, rather than investment-grade, bonds tend to be a poor representation of bond values because as credit quality deteriorates, the market focuses more on expected loss and less on risk of default (which is what credit ratings measure).

Q-95.   Solution: C.

Notching is less common for highly rated issuers than for lower-rated issuers. For lower-rated issuers, higher default risk leads to significant differences between recovery rates of debt with different seniority rankings, leading to more notching.

Q-96.   Solution: C.

The value of assets in relation to the level of debt is important to assess the collateral of the company; that is, the quality and value of the assets that support the debt levels of the company.

Q-97.   Solution: B.

B is correct. The "Four Cs of Credit Analysis" framework includes capacity, collateral, covenants, and character. Competition is not one of the components.

Q-98.   Solution: C.

While the company has a similar return on capital it has significantly higher leverage as well as lower EBITDA interest coverage ratio than its industry peers. It is likely that the company's credit risk will be above its industry peers.

Q-99.   Solution: B.

Any history of fraud or malfeasance is a major warning flag to credit analysis under the category of "character."

Q-100.   Solution: A.

Low demand implies wider yield spreads, while heavy supply will widen spreads even further.

Q-101.   Solution: A.

Building blocks of the yield curve are spread (risk premium) and a benchmark (risk-free rate of return). Expected inflation rate and expected real rate are components of the risk-free rate of return (i.e., the benchmark).

Q-102.   Solution: C.

C is correct. Non-sovereign governments typically must balance their operating budgets and lack the discretion to use monetary policy as many sovereigns can.

6.2. 进阶题

Q-1.   Solution: A.

$$(1+\frac{0.03897}{2})^2 = (1+\frac{YTM_{12}}{12})^{12}$$
$$YTM_{12} = 0.00322*12 = 0.0387$$

Q-2.   Solution: C.

The yield to worst for a callable bond is the lowest of the yields to call for each possible call date and the yield to maturity. The yield to call or yield to maturity solves the following equation:

$$P = \sum_{t=1}^{T} CF_t / (1+i)^t$$, where i is the yield to call, or yield to maturity CF is the cash flow at date t,

and T is the maturity or call date. The yield to call if the bond is called in one year is 8.57%,

because $105 = \frac{10+104}{1.0857^1}$

The yield to call if the bond is called in two years is 8.15%, because $105 = \frac{10}{1.0815^1} + \frac{10+102}{1.0815^2}$. The

yield to maturity of the bond is 8.06%, because $105 = \frac{10}{1.0806^1} + \frac{10}{1.0806^2} + \frac{10+100}{1.0806^3}$. The yield to

worst is the lowest of these and occurs when the bond is held until maturity (i.e., it is the yield to maturity).

Q-3.   Solution: B.

The value of the bond is

$$\frac{30}{(1+0.014/2)} + \frac{30}{(1+0.014/2)(1+0.02/2)} + \frac{30}{(1+0.014/2)(1+0.02/2)(1+0.025/2)}$$
$$+\frac{1030}{(1+0.014/2)(1+0.02/2)(1+0.025/2)(1+0.029/2)}$$
$$= \$1074.33$$

Q-4.   Solution: B.

Instrument C provides a bond equivalent yield of 5.88%, compared with 5.9671% for Instrument A and 5.73% for Instrument B.

For Instrument A: assume FV=100,

$$\frac{100-PV}{100} \times \frac{360}{90} = 0.058, PV=98.55.$$

$$AOR = \frac{100-98.55}{98.55} \times \frac{365}{90} = 0.059671$$

For Instrument B: assume FV=100,

$$\frac{100-PV}{100} \times \frac{365}{90} = 0.0565, \text{PV=98.6068}.$$

$$\text{AOR} = \frac{100 - 98.6068}{98.6068} \times \frac{365}{90} = 0.0573$$

For Instrument C=5.88%

Q-5.   Solution: C.

The option value in basis points per year is subtracted from the Z-spread to calculate the option-adjusted spread (OAS). The Z-spread is the constant yield spread over the benchmark spot curve. The I-spread is the yield spread of a specific bond over the standard swap rate in that currency of the same tenor.

Q-6.   Solution: C.

Because the fixed-rate bond is held to maturity (a "buy-and-hold" investor), interest rate risk arises entirely from changes in coupon reinvestment rates. Higher interest rates increase income from reinvestment of coupon payments, and lower rates decrease income from coupon reinvestment. There will not be a capital gain or loss because the bond is held to maturity. The carrying value at the maturity date is par value, the same as the redemption amount. The redemption of principal does not expose the investor to interest rate risk. The risk to a bond's principal is credit risk.

Q-7.   Solution: A.

lower yield − to − maturity by 5 bps to 2.95%

$$PV_- = \frac{5}{(1+0.0295)^1} + \frac{5}{(1+0.0295)^2} + \frac{105}{(1+0.0295)^3} = 105.804232$$
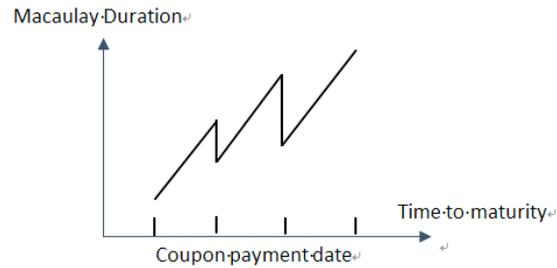
higher yield − to − maturity by 5 bps to 3.05%

$$PV_- = \frac{5}{(1+0.0305)^1} + \frac{5}{(1+0.0305)^2} + \frac{105}{(1+0.0305)^3} = 105.510494$$

approximate modified duration $= \dfrac{105.804232 - 105.510494}{2*0.0005*105.657223} = 2.78$

Q-8.   Solution: A.

As time passes during the coupon period, the Macaulay duration declines smoothly and then jumps upward after the coupon is paid.

Q-9.   Solution: B.

Lowering the yield-to-maturity by one basis point to 4.99% results in a bond price of 85.849134:

$$PV_- = \frac{3}{(1+0.0499)^1} + ... + \frac{103}{(1+0.0499)^9} = 85.849134$$

Increasing the yield-to-maturity by one basis point to 5.01% results in a bond price of 85.719638:

$$PV_+ = \frac{3}{(1+0.0501)^1} + ... + \frac{103}{(1+0.0501)^9} = 85.719638$$

$$PVBP = \frac{85.849134 - 85.719638}{2} = 0.06475$$

Q-10.   Solution: B.

$$approximate\ convexity = \frac{V_- + V_+ - 2V_0}{(\Delta YTM)^2 V_0};$$

$$approximate\ convexity = [98.782 + 98.669 - (2*98.722)] / (0.001^2 *98.722) = 70.906$$

Q-11.   Solution: B.

The price adjustment for duration can be calculated as follows:

8.5 × (0.015) × 100 = 12.75%.

$900(1.1275) = $1,014.75

This adjusts the price for duration only. Because the bond is option-free and the change in yield is large, using duration alone underestimates the actual price of the bond because of the effect of convexity. Once an adjustment is made for convexity, the price would be greater than $1,014.75.

Q-12.   Solution: C.

The duration gap is closest to 4.158. The duration gap is a bond's Macaulay duration minus the investment horizon. The approximate Macaulay duration is the approximate modified duration times one plus the yield-to-maturity. It is 13.478 (= 12.480 × 1.08).

Given an investment horizon of eight years, the duration gap for this bond at purchase is positive: 13.478 - 8 = 5.478. When the investment horizon is less than the Macaulay duration of the bond, the duration gap is positive, and price risk dominates coupon reinvestment risk.

Q-13.   Solution: B.

The company's interest coverage ratio can be computed as: EBITDA/Interest expense. That is:

	20X7	20X8
EBITDA	124.0	168.0
Interest expense	29.0	35.0
EBITDA/Interest expense	4.28	4.8

EBITDA = Operating profit + Depreciation and amortization

The company's EBITDA interest coverage ratio has improved over this period. If EBIT is used to calculate the coverage ratios you reach the same conclusion, for 20X7 the ratio is 3.38 and for 20X8 it is 3.83.

Q-14.   Solution: A.

If the prepayment rate falls, it usually result in a lengthening of the security's life which is called extension risk and is also fund manager's concern.

Q-15.   Solution: A.

In structure 1, we have two sequential pay tranches. If prepayments slow, it will take longer for cash flows to get the Y bonds, so the X bonds have less extension risk. The X bonds have more contraction risk than the Y bonds because they will get cash flows more quickly if prepayments accelerate. The X bonds protect the Y bonds against contraction risk. In the case of Structure 2 where there are two PAC tranches, the F support tranche will absorb the impact of both accelerated and slower than expected prepayments, resulting in the E bonds having both less contraction risk and less extension risk than the F bonds.