金程教育
GOLDEN FUTURE
可信赖的财经培训专家

CFA一级培训项目

Fixed Income

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Topic Weightings in CFA Level I

Study Session 1	Ethics & Professional Standards	15
Study Session 2-3	Quantitative Methods	12
Study Session 4-6	Economic Analysis	10
Study Session 7-10	Financial Statement Analysis	20
Study Session 11	Corporate Finance	8
Study Session 12	Portfolio Management	5
Study Session 13-14	Equity Analysis	10
Study Session 15-16	Fixed Income Analysis	12
Study Session 17	Derivative Investments	5
Study Session 18	Alternative Investments	3
	Total:	100

Framework of Fixed Income

➢ Study Session 15 — Basic Concepts

- R52 Fixed-Income Securities: Defining Elements
- R53 Fixed-Income Markets: Issuance, Trading, and Funding
- R54 Introduction to Fixed-Income Valuation

➢ Study Session 16 — Analysis of Risk

- R55 Understanding Fixed-Income Risk and Return
- R56 Fundamentals of Credit Analysis

Basic Features of A Bond

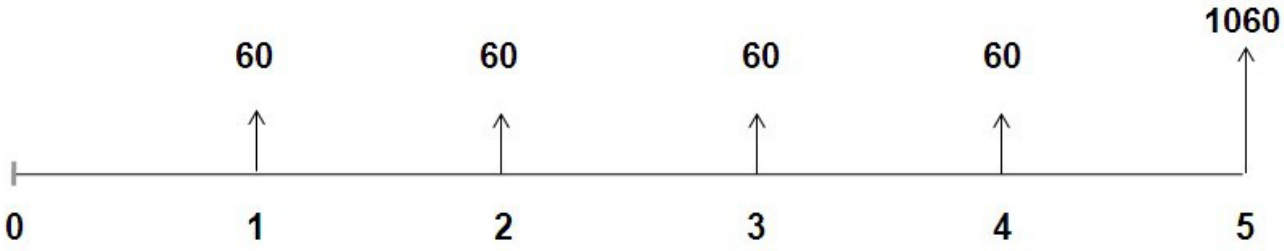
- **Issuer/borrower**: 债券发行人，实际上为资金需求者
  - Supranational organizations e.g. World Bank, IMF
  - Sovereign (national) governments e.g. US Treasury
  - Non-sovereign (local) governments
  - Quasi-government entities e.g. Fannie Mae
  - Companies
- **Bondholder**: 债券持有人，实际上为资金的供给者
- **Maturity**: 期限，决定债券的偿还时间；Tenor: 距离到期的时间
  - Money market securities: one year or less
  - Capital market securities: longer than one year
  - Perpetual bonds: No maturity date, make periodic int. payment but no promise to repay the principal

Basic Features of a Bond

- **Par value//face value/ maturity value**: 面值，多数债券面值为1000
- **Coupon rate**:息票率，决定每期支付的利息
  - Plain vanilla bond/conventional bond: a bond with fixed coupon rate
  - Zero-coupon bond/pure discount bond: a bond pays no interest prior to maturity
- **Payments currency**
  - Dual-currency bond: makes coupon interest payments in one currency and principal repayment maturity in another currency.
  - Currency option bond: gives bondholders a choice of which of two currencies they would like to receive their payments in.

An example:

- 6% coupon rate, 5 years matures from today, 1000 face value, annual payments (how about semi-annual payments?)



Example

- A bond has a par value of $5,000 and a coupon rate of 8.5 percent payable semi-annually. The bond is currently trading at $ 4,112.16. What is the dollar amount of the semi-annual coupon payment?

  A. $238.33.

  B. $425.00.

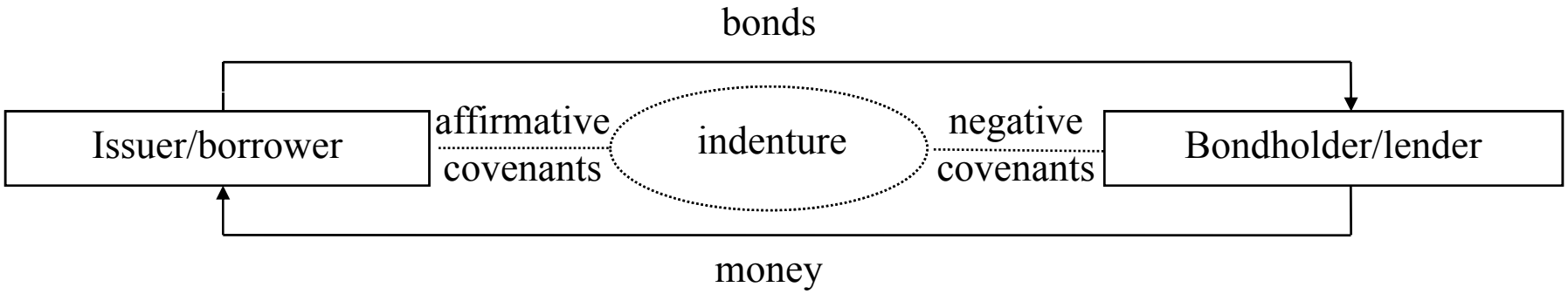
  C. $212.50.

- Correct answer: C
- **Solution**
  - The dollar amount of the coupon payment is computed as follows:
  - Coupon in $ = $5,000*0.085/2 = $212.50

Trust deed

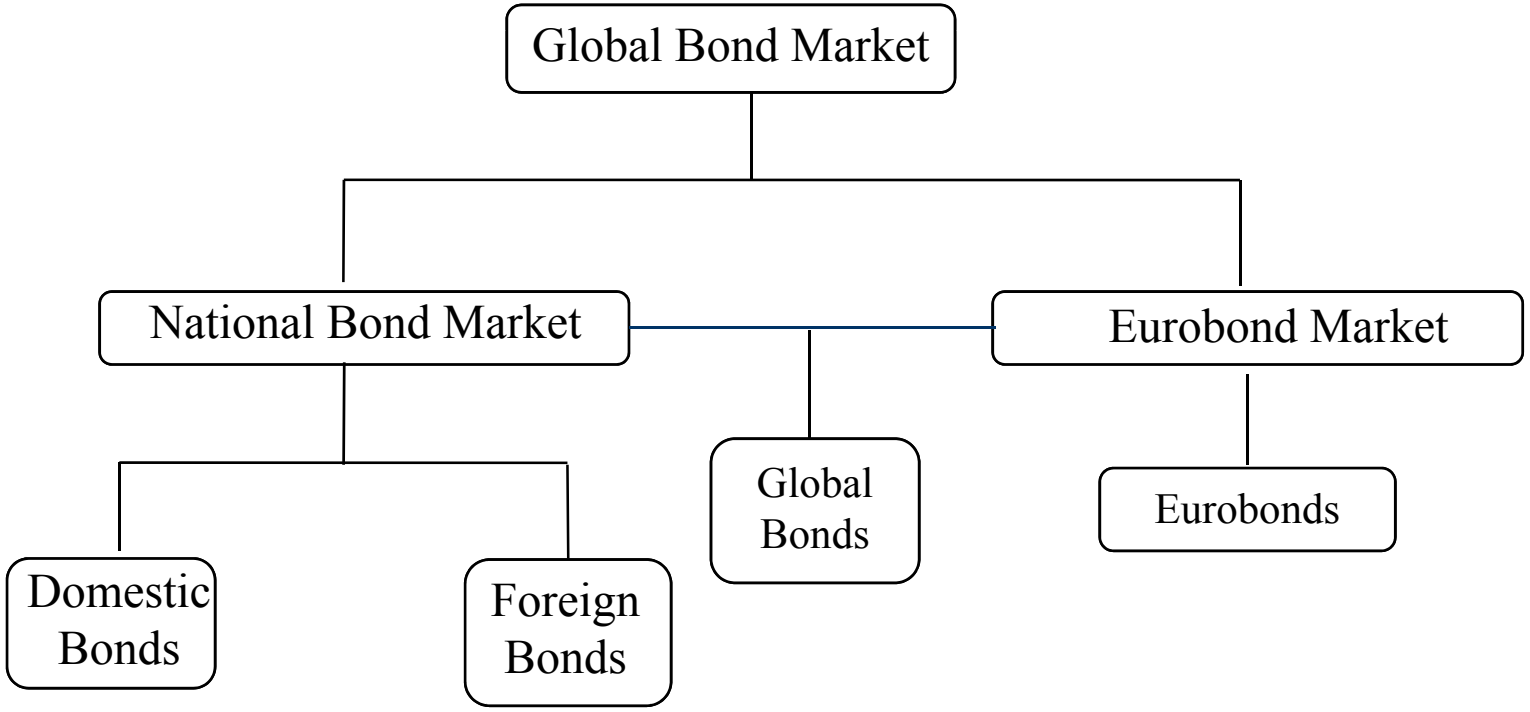
What is fixed income security?

- **Trust deed:** The legal contract that specifies all the rights and obligations of the issuer and the owners of a fixed income security.
  - In the United states and Canada, it is called **bond indenture**.
- **Affirmative VS. negative covenants**



Bond Market

➢ Sectors of the bond market



Bond Market

- **Domestic bonds**: issued by a firm *domiciled in a country* and also traded in that country's currency.
- **Foreign bonds**: issued by a incorporated in *a foreign country* that trade on the national bond market of another country in that country's currency.
- **Eurobonds**: issued *outside the jurisdiction* of any one country and denominated in a currency different from the currency of the countries in which they are sold.
  - **Registered bonds**: the ownership is recorded by either name or serial number.
  - **Bearer bonds (**majority of form of Eurobonds**)**: trustee does not keep records of the ownership of the bonds so that the ownership is evidenced by possessing the bonds.
    - ✓ More attractive to those seeking to avoid taxes.
- **Global bonds**: *Eurobonds* that trade in the *national bond market* of a country other than the country that issues the currency the bond is denominated in , and in the Eurobond market.

Legal and Regulatory Issues Addressed in A Trust Deed

- Other legal and regulatory issue addressed in a trust deed include:

1. ***Legal information*** about the entities issuing the bond
2. Any assets(***collateral***) pledged to support repayment of the bond.
3. Any additional features that increase the probability of repayment (***credit enhancements***)
4. ***Covenants***

Legal and Regulatory Issues Addressed in A Trust Deed

- **Legal information about issuing entities**
  - **Sovereign bonds**: issued by the *treasury of the issuing country.*
  - **Corporate bonds**: issued by well-known corporation, by a subsidiary, or by a holding company.
  - **Securitized bonds**: issued by *a separate legal entity* created for the purpose of owning specific assets which is called *special purpose entities(SPEs)* in U.S, and *special purpose vehicles(SPVs)* in Europe.
    - ✓ SPVs is *bankruptcy remote* because the assets can provide cash flows to support the payment of the bond even if the company defaults.

Legal and Regulatory Issues Addressed in A Trust Deed

➢ **Source of repayment proceeds**:

Types of bond	Source of repayment
Sovereign bonds	• Tax revenues • Print money
Non-sovereign debt	• General taxing authority of issuer • Cash flows of the financed project • Special taxes or fees
Corporate bonds	• Operations
Securitizations	• Cash flows of underlying financial assets

Legal and Regulatory Issues Addressed in a Trust Deed

- **Asset or collateral backing**: a way to *reduce credit risk*.
  - Unsecured bonds: represent a claim to the *overall assets and cash flows* of issuer.
  - Secured bonds: backed by a claim to a *specific assets* of a corporation.
    - ✓ Assets pledged to support a bond issue are referred to *collateral*
- 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"

Legal and Regulatory Issues Addressed in a Trust Deed

- **Credit enhancement**: a variety of provisions used to reduce the credit risk of a bond issue.
  - **Internal credit enhancement**:
    - ✓ **Overcollateralization**: the collateral pledged has a value *greater than* the par value of the debt issued
    - ✓ **Excess spread**: the yield on the financial assets supporting the debt is *greater than* the yield promised on the bonds issued.
    - ✓ Divide a bond into **tranches** with different seniority of claims: any losses of assets supporting a securitized bond are firs absorbed by the bonds with the lowest seniority, then the bonds with the next-lowest priority of claims.——*waterfall structure*

Legal and Regulatory Issues Addressed in a Trust Deed

- **External credit enhancement**:
  - ✓ Surety bond: issued by *insurance companies* and are 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 *a bank*.
  - ✓ 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, *deterioration of credit quality* of the guarantor will also *reduce the credit quality* of the covered issue.

Legal and Regulatory Issues Addressed in a Trust Deed

- **Covenants**
  - **Affirmative covenants**: the borrower promises to do
    - ✓To pay interest and principal on timely basis.
    - ✓To pay all taxes and other claims when due.
    - ✓To maintain all properties used and useful in the borrower's business in good condition and working order.
    - ✓Submit periodic reports.
  - **Negative covenants**: prohibitions on the borrower
    - ✓The company can't sell assets that have been pledged as collateral;
    - ✓The company can't claim that the same assets back several debt issues simultaneously;
    - ✓The company can't borrow additional money unless certain financial conditions are met.

Taxation of Bond Income

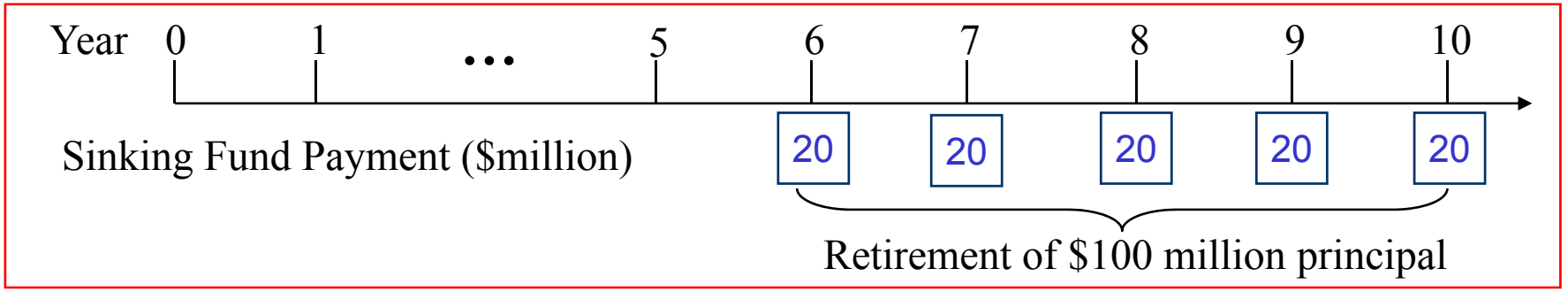
- **Tax consideration**:
  - Income portion (interest):
    - ✓ Taxed at income tax rate (except tax-exempt securities e.g. municipal bonds)
    - ✓ Depend on the issued and traded places
  - Capital gain or loss: due to sell a coupon bond prior to maturity
    - ✓ Capital gains are taxed at a lower rate than ordinary income.
    - ✓ Long-term capital gains: capital gains on the sale of an asset that has been owned for more than the minimum amount of time, which is taxed at an even lower rate.
  - Pure-discount bonds: a portion of the discount from par at issuance is treated as *taxable interest income*.
  - Premium bonds: part of the premium can be used to *reduced the taxable portion of interest payments*.

Cash Flow Structure

- **Plain vanilla bond/bullet bonds**: periodic interest payments *and principal is paid at maturity*.
  - Balloon payment: the final payment includes a lump sum in addition to the final period's interest.
- **Amortizing loan**: periodic payments include *both interest and some repayment of principal*.
  - **Fully amortizing**: principal is *fully paid off* when the last periodic payment is made. (利息占比下降，本金占比上升)
  - **Partially amortizing**: the final payment includes just the *remaining unamortized principal* amount at bond maturity.

Cash Flow Structure

- **Sinking fund provision**: requires the issuer to retire a portion of a bond issue at specific times during the bonds' life.
  - There may be a period during which no sinking fund redemptions are made.
  - The amount of redemptions could decline/increase each year.
  - Doubling option/accelerated sinking fund: allow company to redeem twice the amount required by the sinking fund provision.
- **Example:** ABC Inc. issue a 10-year bond with a par value of $100 million. The bond has a sinking fund provision, which requires that ABC Inc. retire $20 million of the principal every year beginning in the sixth year.



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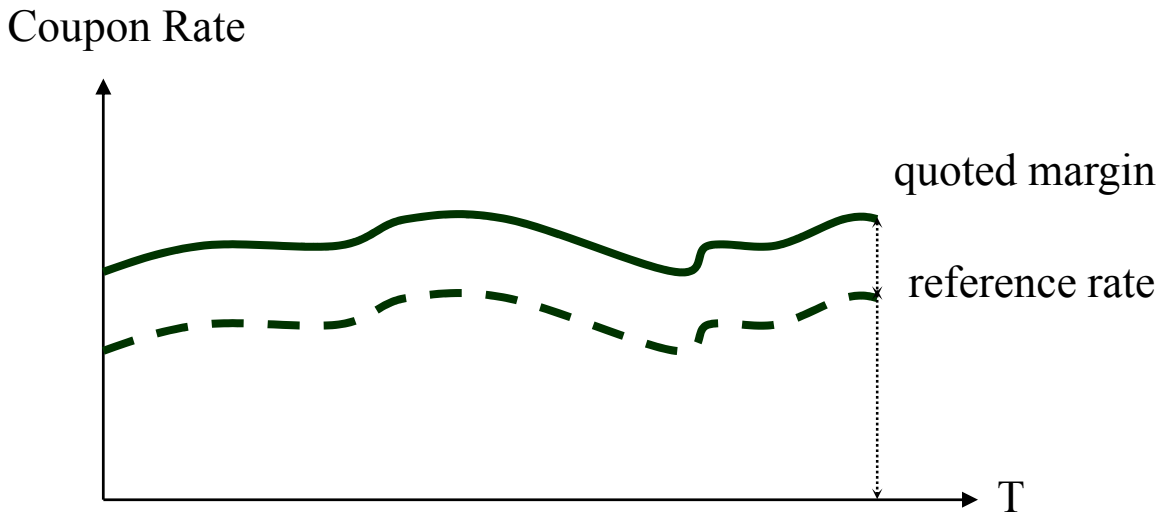
Cash flow Structure

- If the interest rates *had risen since issuance*, the market price of sinking fund provision is *less than* the redemption price.
  - The issuer can redeem the sinking fund provision by buying the bond in the open market.
- 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.
    - ✓ The bond trustee will select outstanding bonds for redemption randomly. The bondholder whose bonds are selected to be redeemed have to reinvest the funds at the lower yield.

Cash Flow Structure

➢Floating-rate Securities



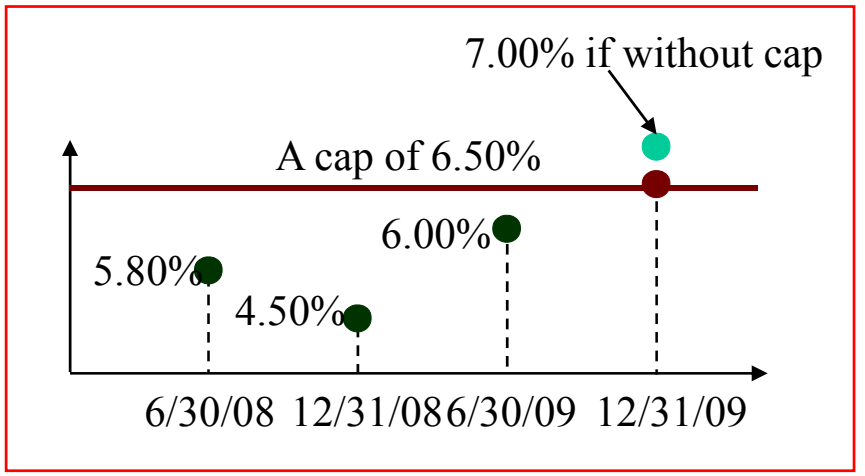
Coupon rate = reference rate ± quoted margin

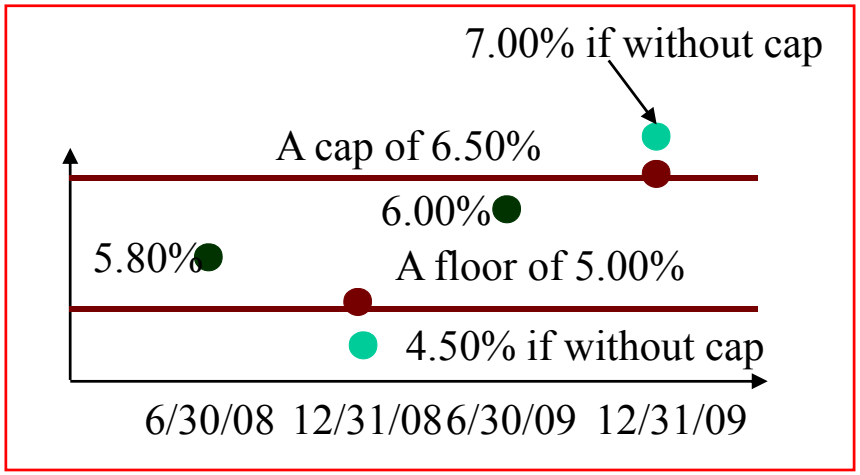
- ➢Such as:
  - LIBOR;
  - U.S. Treasury yield
- ➢It is a constant value.
- ➢It is often quoted in basis point.

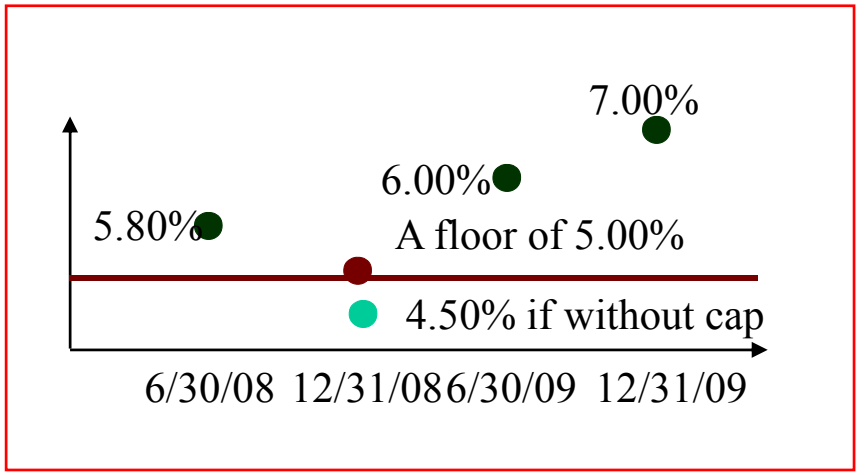
➢ The coupon rate determined at the *coupon reset date* is the rate that the issuer promises to pay at the ***next*** coupon date.

Cash Flow Structure

- The upper limit is called the cap.
- The lower limit is called the floor.
- When a floating-rate security has both a upper limit and a lower limit, the feature is called a collar.







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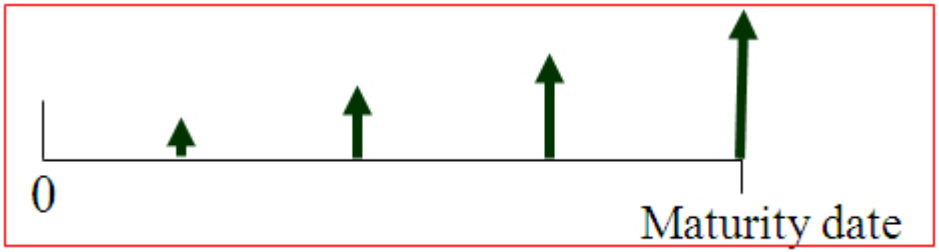
Cash Flow Structure

- **Variable-rate note:** the quoted margin above the reference rate is not fixed.
- **Inverse floaters** (also called ***reverse floaters***) have coupon rates that move in the opposite direction from the change in the reference rate.
  - When the reference rate increases, the coupon rate decreases and vice versa.
- **Example:** An inverse floater's coupon rate = 15% -2 × (3-month LIBOR)**.**

  Suppose the 3-month LIBOR is 3%, then the coupon rate for the next interest payment period is: Coupon rate = 15% - 2 ×3%=9%

Cash Flow Structure

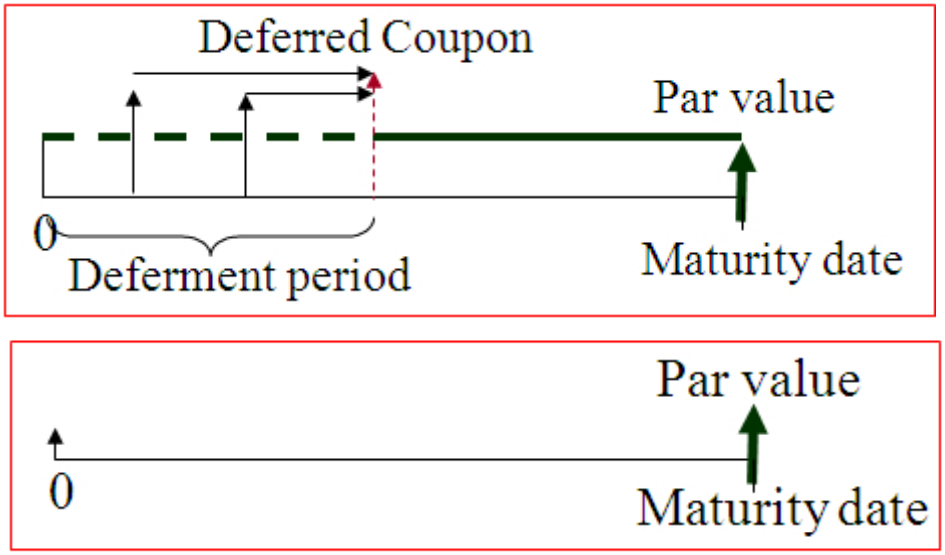
➢ **Step-up coupon bonds**: have a coupon rate that increases over time.



- Have a call option that allows the firm to redeem the bond issue at a set price at each step-up date.
- new higher coupon rate > market yield of the call price → call the bonds
- An increase in bond coupon rates can be viewed as a *protection against the increase in market interest rates* which is due to the decrease in issuer's credit rating.

Cash Flow Structure

- **Deferred coupon bonds/split coupon bond**: interest payments are deferred for a specified number of years.
  - financing for a firm financing a large project that will *not be completed* and generating revenue *for some period of time* after bond issuance.
  - Have tax advantages in some jurisdictions
- **Zero-coupon bonds:** no periodic coupon payments; always be traded at a discount—— one type of deferred coupon bond



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Cash Flow Structure

- **Credit-linked coupon bond:** coupon rate will *go up (down)* by a certain amount if the credit rating of the issuer *falls (improves)*.
- **Pay-in-kind (PIK) bond:** allows the issuer to make the coupon payment by increasing the principal amount of the outstanding bonds, essentially *paying bond interest with more bonds*.
  - These bonds have higher yields because of a lower perceived credit quality from cash flow shortfalls or high leverage of the issuing firm.
- **Equity-linked notes (ETN):** *no periodic interest payments*, and the payment at maturity is *based on an equity index*.
- **Index-linked bond:** coupon payments and/or a principal value that is based on a commodity index.
  - Inflation linked bonds/ linkers: payments are based on the change in an inflation index, e.g. CPI
  - It will not pay less than their original par value at maturity, even when the index has decreases, which is called **principal protected bonds**

Cash Flow Structure

- Different structure of inflation-index bonds:
  - **Index-annuity bonds**: fully amortizing with the periodic payments directly adjusted for inflation or deflation
  - **Indexed zero-coupon bonds**: the payment at maturity is adjusted for inflation.
  - **Interest-indexed bonds**: coupon rate is adjusted for inflation while the principal value remains unchanged.
  - **Capital-indexed bonds**: coupon rate remains constant, and principal value is increased by the rate of inflation. E.g. Treasury inflation Protected Securities (TIPS)
- TIPS: pay semiannual coupons, at maturity:
  - If adjusted par value (per bond) is *greater than* $1,000 at maturity, the holder receives the *adjusted par value* as the maturity payment.
  - If the adjusted par value is *less than* $1,000 (due to deflation), holders receive $1,000 at maturity as this is the minimum repayment amount.

$$\text{TIPS coupon payment} = \text{inflation-adjusted par value} \times \frac{\text{stated coupon rate}}{2}$$

Example

- Consider a $1,000 par value TIPS with a 10% coupon rate. The CPI for the first half year is 3%, and the CPI for the second half year is 4% (both 3% and 4% are annual rates).

$$Coupon_1 = \$1000? (1 \quad 1.5\%)锤10\% \quad 2 = \$50.75$$

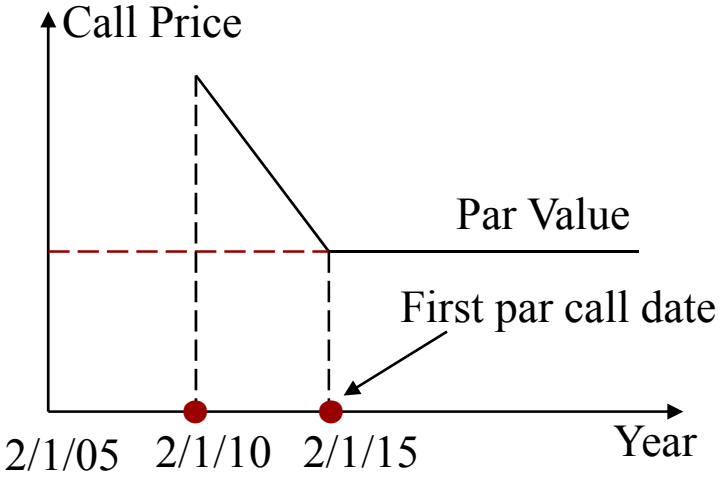
$$Coupon_2 = \$1000? (1 \quad 1.5\%)? (1 \quad 2\%)锤10\% \quad 2 = \$51.77$$

Bonds with Embedded Options

- **Call provisions** are *beneficial to the issuer*.
  - **Deferred call**: call provisions have *a deferment period*; that is, the issuer may not call the bond for a number of years until a specified first call date is reached.
- **Call price:** the price at which the issuer may retire the bond .
- **Call premium:** the amount by which the call price is above par.
- **First par call date:** the date at which the issue is first callable at par value

Example:

- A 20-year bond was issued on 2/1/2005.
- The first call date is 2/1/2010, and the call price is $105.
- Then, the call price declines by $1 a year till it reaches $100 on 2/1/2015 (the first par call date).



Bonds with Embedded Options

- **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.
  - Callable bond offers a higher yield (lower price) than identical noncallable bond
    - ✓ Value callable bond = value of identical noncallable bond- call option value
- **Three styles of exercise for callable bonds**:
  - American style: can be called *anytime* after the first call date.
  - European style: can only be called *on the call date specified*.
  - Bermuda style: can be called on specified dates after the first call date, often *on coupon payment dates*.

Bonds with Embedded Options

- **Make-whole call provision**: the call price is not fixed but includes a lump-sum payment based on the *present value of the future coupons* the bondholder will not receive if the bond is called early, which is unlikely to be *lower than* the market value of the bond
  - To avoid the higher interest rates required on a callable bonds but still preserve the option to redeem bond early.
  - Make-whole provision does not put an upper limit on the bond value when interest rates fall.

Bonds with Embedded Options

- **Putable bonds** are *beneficial to the bondholders.*
  - 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.
  - Putable bonds have a lower yield and higher price than similar non-putable bonds.
    - ✓ Value of putable bonds= value of an identical nonputable bonds+ put option value.

Bonds with Embedded Options

- **Convertible bonds** are *beneficial to the bondholders.*
  - If share prices increase
    - ✓ Bondholders can exchange the bond for a specific number of shares of issue company.
  - If share prices decrease
    - ✓ Bondholders can still receive coupon and principal payment of the straight bond.
    - ✓ The value of straight bond is the lowest price of the convertible bond.
- Two main advantages of issuer :
  - Reduce interest expense
  - Reduce debt of conversion option is exercised

Bonds with Embedded Options

- **Key terms of conversion provision**:
  - Conversion price: share price when the convertible bond can be converted into shares.
  - Conversion ratio: the number of common shares each bond can be converted into.
    - ✓ Conversion ratio = par value / conversion price
  - Conversion value: value of conversion bond if converted right now.
    - ✓ Conversion value = current share * conversion ratio
  - Conversion premium: difference between the convertible bond's price and conversion value
  - Conversion parity:
    - ✓ Conversion value = convertible bond's price
    - ✓ Above parity: conversion value > convertible bond's price
    - ✓ Below parity: conversion value < convertible bond's price

Bonds with Embedded Options

- **Warrants** are *beneficial to the bondholders*
  - Entitles the bondholder to buy the underlying stock of the issuing company at a fixed exercise price until the expiration date.
  - It is not an embedded option but rather an "attached" option.
  - If Common share value of issuing company is *greater than* the fixed exercise price, the bondholder can buy the share *at the fixed exercise price* and still hold the bond.
  - The bond with warrants can be more attractive.

Bonds with Embedded Options

- **Contingent convertible bonds ("CoCos")**are *beneficial to the bondholders.*
  - Can convert from debt to common equity automatically if a specific event occurs.
- **Example:** CoCos can be used by banks to meet its minimum equity requirement.
  - if a bank's equity falls below the required level, CoCos are automatically converted to common stock. This has the effect of decreasing the bank's debt liabilities and increasing its equity at the same time.

Example

- Do embedded options designed to benefit bond issuers (borrowers) include the:

  Accelerated sinking fund provision? Floor on a floater?

  A. No No

  B. No Yes

  C. Yes No

- Correct answer: C

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Classification of Global Fixed-Income Markets

- **By type of issuer:**
  - Government and government-related sector
    - ✓ Supranational (international) organizations
    - ✓ Sovereign (national) governments
    - ✓ Non-sovereign (local) governments
    - ✓ Quasi-government entities
  - Corporate sector
    - ✓ Financial company
    - ✓ Non-financial company
  - Securitized sector
    - ✓ securitization

Classification of Global Fixed-Income Markets

- **By credit quality:**
  - Investment grade
    - ✓ Baa3 or above by Moody's Investors Service
    - ✓ BBB- or above by Standard & Poor's (S&P) and Fitch Ratings
  - Non-investment grade/high yield
    - ✓ Below investment grade
- **By original maturity:**
  - Money market securities
  - Capital market securities
- **By coupon structure:**
  - Floating-rate bonds
  - Fixed-rate bonds

Classification of Global Fixed-Income Markets

- **By currency**
  - Domestic bonds
  - Foreign bonds
  - Eurobonds
  - Global bonds
- **By geography**
  - Developed market
  - Emerging market
    - ✓ Emerging market bonds have higher yields than developed market
- **By other classification**
  - Indexing
  - Taxable statue

Classification of Global Fixed-Income Markets

Global Debt and Equity Outstanding by Sector as of Dec. 2010

Sector	Amount (US$ trillions)	Weight
Stock markets	$54	26%
Bonds issued by governments	41	19
Bonds issued by financial companies	42	20
Bonds issued by nonfinancial companies	10	5
Securitized debt instruments	15	7
Bank loans	49	23

Bonds Outstanding by Currency Denomination as of Dec. 2011

Currency	Amount (US$ billions)	Weight
Euro (EUR)	$9,665.9	46.0%
U.S. Dollar (USD)	6,900.8	32.9
British Pound Sterling (GBP)	2,052.3	9.8
Japanese Yen (JPY)	762.0	3.6
Swiss Franc (CHF)	393.4	1.9
Australian Dollar (AUD)	317.2	1.5
Canadian Dollar (CAD)	313.1	1.5
Swedish Krona (SEK)	103.0	0.5
Norwegian Krone (NOK)	86.4	0.4
Hong Kong Dollar (HKD)	63.5	0.3
Yuan Renminbi (CNY)	38.9	0.2
Other Currencies	305.0	1.5
Total	**21,001.5**	**100.0%**

Fixed-Income Indices

- **Fixed-income indices**: a multi-purpose tool used by investors and managers to *describe a given bond market or sector*, as well as to *evaluate the performance* of investments and investment managers.
  - Index construction: security selection and index weighting
- Major types of fixed-income indices
  - **Barclays Capital Global Aggregate Bond Index**: represents a broad-based measure of the global investment-grade fixed-rate bond market.
  - **J.P Morgan Emerging Market Bond Index**: used to describe the emerging market
  - **FTSE Bond Index Series**: set up to provide coverage of different classes of securities related to the government and corporate bond markets.

Investor in Fixed-Income Securities

- Major categories of bond investors
  - **Central banks**: use open market operations(purchase or sale of bonds)to implement monetary policy.
  - **Institutional investors**: represent the largest groups of investors in fixed income securities
  - **Retail investors**: invest heavily due to the attractiveness of relatively stable prices and steady income production
- Central banks and retail investors typically invest *directly*, while institutional investors invest often *indirectly* through fixed-income mutual funds or exchange-traded funds
- Fixed-income securities are more diverse and more difficult to understand and access than equity securities

Interbank offered rates

- **London Interbank Offer Rate(LIBOR):** published daily for several currencies and for maturities of one day to one year. (E.g. 30-day U.S dollar LIBOR, 90-day Swiss franc LIBOR)
  - It is the most widely used reference rate for floating-rate bonds.
    - ✓ The reference rate must match the frequency with the reset of bond coupon rate.
  - the rates are based on the expected rates for unsecured loans from one bank to another in the **interbank money market**.

Primary Market

- **Primary market**: sales of *newly issued* bonds
  - **Public offering**: bonds can be resisted with securities regulators for sale to the public and is typically don with the help of an investment bank.
    - ✓ **Underwritten offering**: with the *investment bank* or *syndicate* purchasing the entire issue and selling the bonds to dealers.
      - ◆ **Grey market** ("when issued" market): a forward market for bonds about to be issued
    - ✓ **Best efforts offering**: investment bank sells the bonds on a *commission basis* and *do not commit to purchase the whole issue*.
    - ✓ **Auction**: commonly used by issuing *government debts*.
    - ✓ **Shelf registration**: a bond issue is *registered with securities regulators* in its aggregate value with a master prospectus and can be *issued over time* when issuer needs to raise funds
  - **Private placement**: sale of an entire issue to a *qualified investor* or a group of investors, which are typically *large institutions*.

Secondary Markets

- **Secondary markets**: trade of previously issued bonds.
  - **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
- **Trade settlement**:
  - Corporate bonds: third trading day after trade date (T+3).
  - Government bonds: the nest trading day after the trade date(T+1).
  - Money market securities: on the day of trade date.

Characteristics of Different Kinds of Bonds

- **Sovereign bonds**: issued by *national governments* and backed by their tax power.
  - High credit ratings and essentially *free of default risk*.
  - Denominated in the local currency or a foreign currency.
    - ✓ Credit ratings are higher for a sovereign's local currency bonds
  - On-the-run bonds(benchmark bonds): most recently issued government securities.
  - U.S Treasuries: T-Bills(pure discount, less than 1 year); T- Notes(2.3.5.10maturity); T-Bonds (20.30maturity)
- **Nonsovereign government bonds**: issued by governments *below the national level*.
  - *High credit quality*, but lower than sovereign bonds.
- **Agency/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) that *operate across national.*
  - *high credit quality* and can be *very liquid*, especially large issues of well-known entities.
  - E.g.World bank, the IMF, the Asian Development Bank.

Types of Corporation Debts

- **Bank debt**: bilateral loan & syndicated loan
  - Bilateral loan: involves only one bank
  - Syndicated loan: funded by several banks
- **Commercial paper**: *short term, unsecured, low rate* (issued by corporations of high credit quality) debt.
  - Exempt from registration, *directly placed* (sold directly by issuer) or *dealer placed* (sold to investor through agents/brokers).
  - There is very *little secondary trading* of commercial paper.
  - *Reissued or rolled over* when it matures.
  - **Rollover risk**: the risk that a company will not be able to sell new commercial paper to replace maturing paper.
  - **Backup lines of credit/ liquidity enhancement/backup liquidity lines**: a type of credit enhancement provided by a bank to a issuer of commercial paper to ensure that the issuer will have *access to sufficient liquidity* to repay maturing commercial paper if rolled over is not available.

Types of Corporation Debts

- 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

Types of Corporation Debts

- **Corporate bonds**
  - Serial bond issue: with *several maturity dates* (known at issuance) and can be redeemed periodically.
  - Term maturity structure: all the bonds *maturing on the same date*.
- **Medium-term notes (MTNs):**
  - Various maturities(9 months to 100 years)
  - Can be structured to meet an *institution's specifications*.
    - ✓ E.g. structured security: combination of the derivative and notes

Short-Term Funding Alternatives Available to Banks

- **Customer deposits**
  - **Checking accounts**: provide transaction services and *immediate availability of funds*, but *pay no interest*.
  - **Saving accounts**: *pay interest* and allow depositors to accumulate wealth in a very liquid form.
  - **Money market mutual funds**: *an intermediate* between checking and saving accounts, *pay interest*.
- **Negotiable CDs**: typically have maturities of one, traded in the domestic market as well as Eurobond market.
- **Central bank funds market**: banks may buy or sell excess reserves deposited at central bank funds rates with their *central banks*.
  - Central bank funds rates are strongly influenced by the effect of central bank's open market operations on the money supply and availability of short-term funds.
- **Interbank funds**: are *unsecured loaned between banks* for periods of one day to a year.

Repurchase Agreement

- **Repurchase (repo) Agreement**: an institution sells a security with a commitment to buy it back at a later date at a specified price.
  - **Repurchase price**: is greater than the selling price and accounts for the interest charged by the buyer.
  - **Repo rate**: is 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 higher
  - **Repo margin/haircut**: the difference between the market value of the security used as collateral and the value of the loan. The rope 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.

Repurchase Agreement

- **Repurchase (repo) Agreement**
  - Repurchase agreements are *not regulated* by the Federal Reserve.
  - Collateral position of the lender in a repo is better in the event of bankruptcy of the dealer. (*liquidity*)
  - **Overnight repo**: a repurchase agreement for one day.
  - **Term repo**: an agreement covering a longer period.
- **Reverse repo agreement:** taking the opposite side of a repurchase transaction, lending funds by buying the collateral security.

- **Example**
- Consider a firm that enters into a repo agreement to sell a 4%, 12-year bond with a par value of $1 million and a market value of $970,000 for $940,000and to repurchase it 90 days later for $947,050
- Repo rate = 947,050/940,000-1=0.75%
- Repo margin=940,000/970,000-1= -3.1%

Framework of Fixed Income

➢ Study Session 15 — Basic Concepts

- R52 Fixed-Income Securities: Defining Elements
- R53 Fixed-Income Markets: Issuance, Trading, and Funding
- R54 Introduction to Fixed-Income Valuation

➢ Study Session 16 — Analysis of Risk

- R55 Understanding Fixed-Income Risk and Return
- R56 Fundamentals of Credit Analysis

Bond Valuation Process

- The general procedure for valuing fixed-income securities is to take the *present values* of all the expected cash flows and *add them up* to get the value of the security.
  - Estimate the cash flows
  - Determinate the appropriate discount rate
  - Calculate the present value of the estimated cash flows

$$P = \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} + \frac{B}{(1+r)^n}$$

Example

- An investor buys a 25-year, 10 percent annual pay bond for $900 planning to sell the bond in 5 years when he estimates yields will be 9 percent. What is the estimate of the future price of this bond?
  - A. $964.
  - B. $1,091.
  - C. $1,000.
- Correct answer: B

Solution

- This is a Present Value problem 5 years in the future. Input into your calculator:
  N = 20, PMT = 100, FV = 1000, I/Y = 9
  CPT PV = 1,091.28
  The $900 purchase price is a distracter for this problem.

Bond Valuation Process

- **Value of a zero-coupon bond**

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

Example:

- To find the value of a 8-year, $1000 face value zero-coupon bond with a yield to maturity of 8 percent.

Answer:

N=8×2=16; FV=1000; I/Y=8/2=4; PMT=0; CPT→PV=533.9038

Example

- A 12-year, $1,000 face value zero-coupon bond is priced to yield a return of 7.00 percent on a semi-annual basis. What is the price of the bond, and how much interest will the bond pay over its life? (Select the choice that is *closest* to the correct answer.)

	Price	Interest
A.	$438	$562
B.	$444	$556
C.	$438	$556

- Correct answer: A
  - Interest = Face Value – Price = 1000 – 438 = **562**.

Yield to Maturity (YTM)

- Internal rate of return, implied market discount rate
- Critical assumptions:

  1. hold the bond until maturity

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

  3. coupons are reinvested at original YTM
- Calculation: iteration, back out

Calculate Bond Price Using Yield to Maturity

- **Annual -coupon bond**

$$bond\ price = \frac{CPN_1}{(1+YTM)} + \frac{CPN_2}{(1+YTM)^2} + \ldots + \frac{CPN_N + Par}{(1+YTM)^N}$$

- **Semiannual-coupon bond:**

$$bond\ price = \frac{CPN_1}{(1+YTM/2)} + \frac{CPN_2}{(1+YTM/2)^2} + \ldots + \frac{CPN_{2N} + Par}{(1+YTM/2)^{2N}}$$

Example

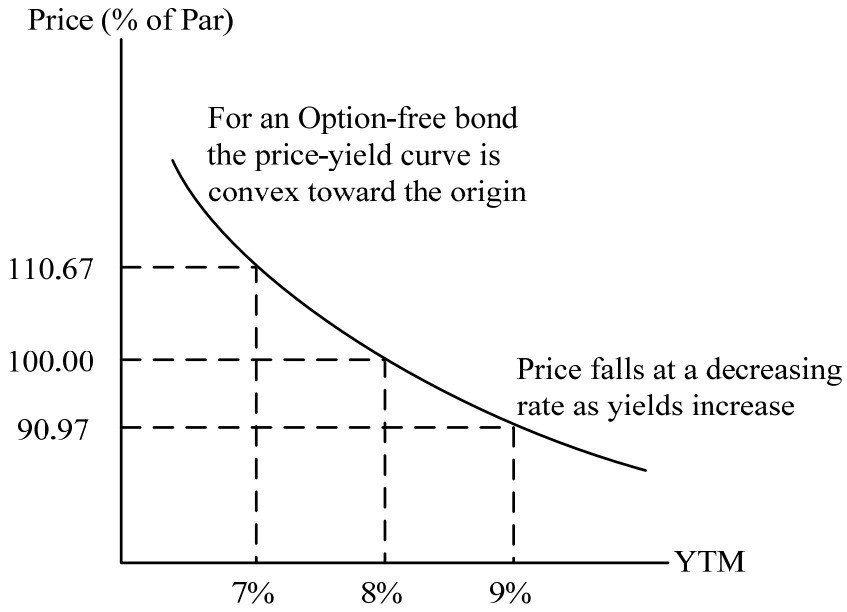
- Consider the purchase of an existing bond selling for $1,020.78. This bond has 5 years to maturity, pays a 7% semiannual coupon. What is the bond's yield to maturity (YTM)?
  - A. 9.26%.
  - B. 10.05%.
  - C. 10.34%.
- Correct answer: C

Solution:

- N = 10, PMT = 35, PV = -1,020.78, FV = 1,000, CPT → I/Y=3.253%
- YTM=3.253%*2=6.506%

Relationships Between Price and Yield:

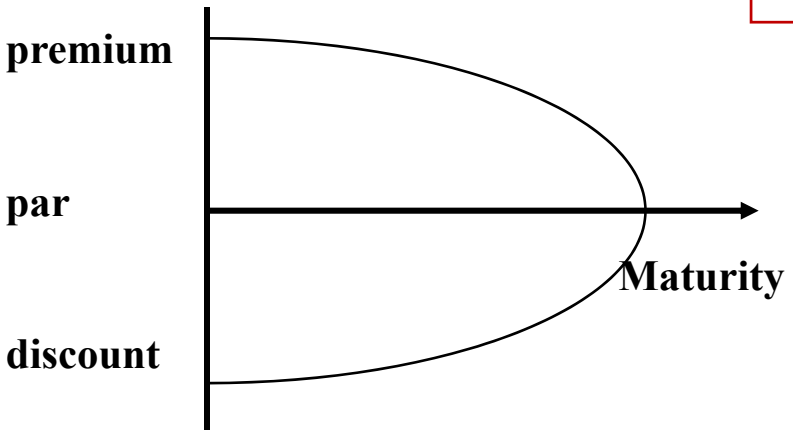
- A bond's price and YTM are *inversely related*.
- A bond will be priced at a *discount (premium)* to par value if coupon rate is *less (more)* than its YTM.
- For a given change in yield, the percentage price increase is *greater* than the percentage price decrease.
- Prices are more sensitive to changes in YTM for bonds with bonds with *lower coupon rates and longer maturities*.



100% Contribution Breeds Professionalism

Relationships Between Price and Yield:

Par value = $1000, Maturity = 3 years, coupon rate =6%, semi-annual payment.

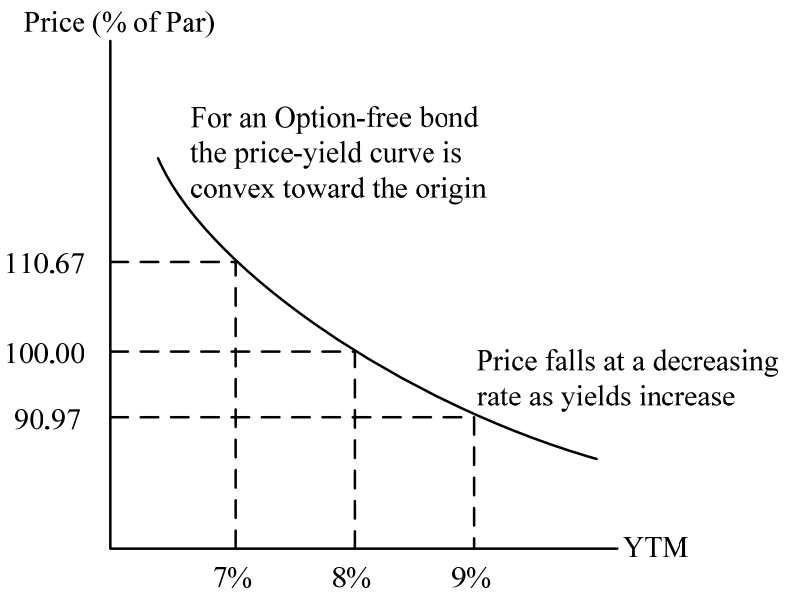


Time of Maturity	YTM=3%	YTM=6%	YTM=12%
3.0 years	$1,085.40	$1,000.00	$852.48
2.5	1,071.74	1,000.00	873.63
1.5	1,057.82	1,000.00	896.05
1.0	1,029.34	1,000.00	945.00
0.5	1,014.78	1,000.00	971.69
0	1,000.00	1,000.00	1,000.00

Example: 3-year bond, coupon rate 10%, semi-annual, par 1000, buy at 8% today, after one-year, the rate change to 7%, the value change attributable to the passage of time?

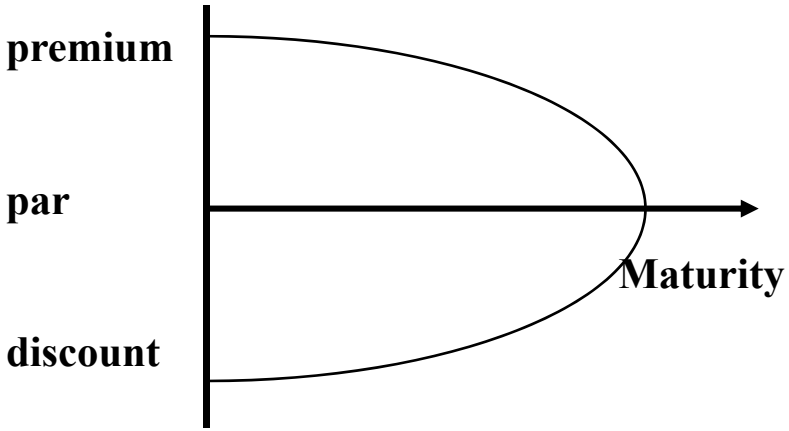
$$P_1(7\%) - P_0(8\%) = P_1(8\%) - P_0(8\%) + P_1(7\%) - P_1(8\%)$$

Price-yield Curve & Constant-yield Price Trajectory



Assumption: Time-to-maturity doesn't change, instantaneous change in yield

But bond price changes as time passes even if yield stays the same



Constant-yield price trajectory – YTM remains constant, how the price changes as time passes

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Example

- An analyst gathered the following information about two option-free bonds that each have a par value of $1,000:

	Bond 1	Bond 2
Time to maturity	5 years	10 years
Annual coupon rate	5.0%	7.0%
Discount rate today	6,0%	6.5%

- If the discount rate does not change for either bond, one year from today, which of the following most likely describes the change in price for each bond?

A. Both Bond 1 and Bond 2 will decrease.

B. Both Bond 1 and Bond 2 will increase.

C. Bond 1 will increase and Bond 2 will decrease.

- Correct answer: C

Example

- An 8% coupon bond with a par value of $100 matures in 6 years and is selling at $95.51 with a yield of 9%. Exactly one year ago this bond sold at a price of $90.26 with a yield of 10%. The bond pays annual interest. The change in price attributable to the change in maturity is closest to:
  - A. $0.54.
  - B. $1.03.
  - C. $4.22.
- Correct answer: B
  - The change in price attributable to moving to maturity = $91.29 - $90.26 = $1.03

Valuation with Spot Rates

- **Spot rates:** are market discount rates for single payments to be made in the future.
- **The no-arbitrage price** of a bond is calculated using spot rates:

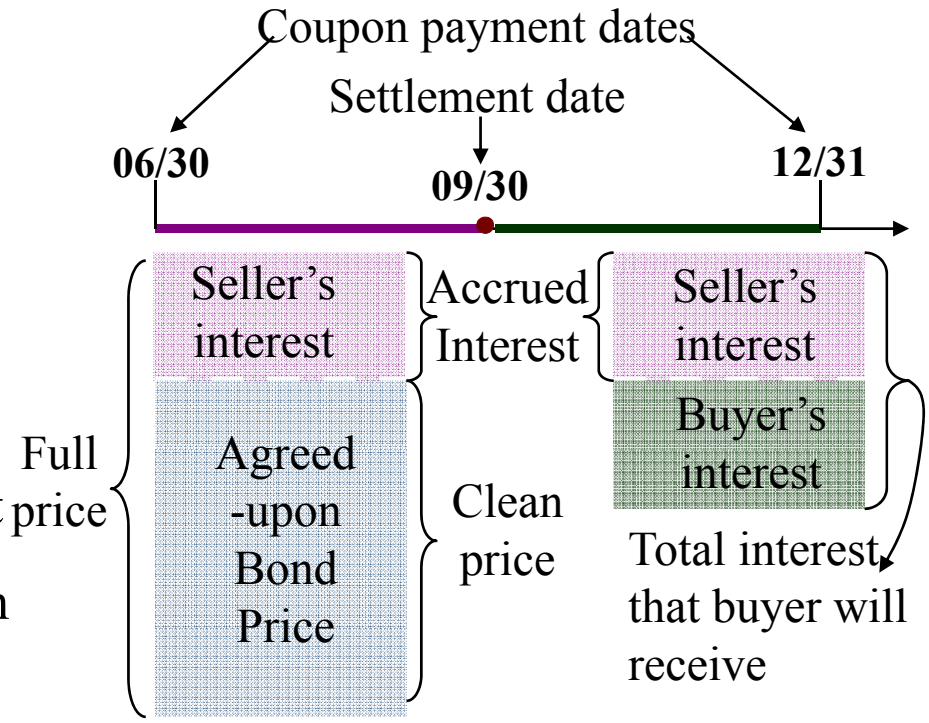
$$\text{no-arbitrage price} = \frac{CPN_1}{(1+S_1)} + \frac{CPN_2}{(1+S_2)^2} + \cdots\cdots + \frac{CPN_N + Par}{(1+S_N)^N}$$

Example

- Treasury spot rates (expressed as semiannual-pay) are as follows: 6 months = 4%, 1year = 5%, 1.5 year = 6%. A 1.5-year, 4% Treasury note is trading at $965. the arbitrage trade and arbitrage profit are: (continue)
  - A. Buy the bond, sell the pieces, earn $7.09 per bond
  - B. Sell the bond, buy the pieces, earn $7.09 per bond
  - C. Sell the bond, buy the pieces, earn $7. 91 per bond
- Correct answer: A

Accrued Interest

- **Accrued Interest:** the interest received by the seller when a bond trades between coupon dates.
- **Clean(flat) Price**: the agreed upon price of the bond.
- **Full Price** (or dirty 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



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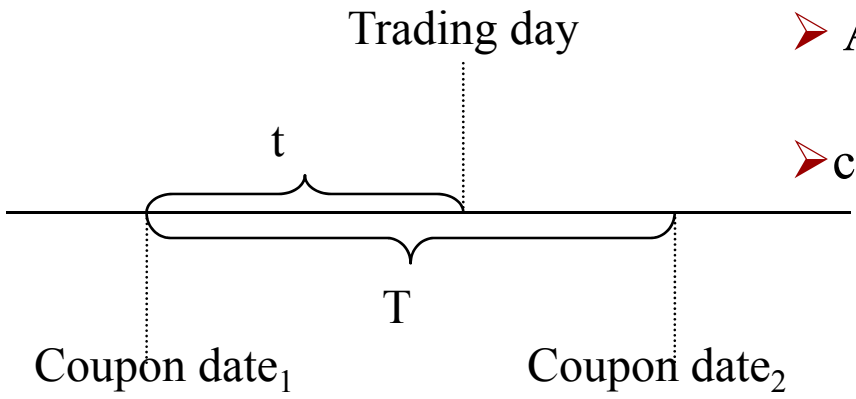
Accrued Interest



- Accrued interest = $Coupon' \frac{t}{T}$
- clean price = dirty price − accrued interest

Example:

- 3-year bond, coupon rate 10%, par 1000,（semiannual）buy at 8%, the period between the settlement date and the next coupon period is 58 days， there are 183 days in the coupon period, what is accrued interest?

- AI=（1000*0.1/2）*（1-58/183）=50*（1-0.3169）=34.155

Bond Price Between Coupon dates

- Flat price is the quoted price, is "pulled to par" along the constant-yield trajectory.
- Reason for quoting flat price: full price rises with accrued interest even if YTM doesn't change, which is misrepresentation of bond price.

$$PV^{Full} = PV^{Flat} + AI$$

$$PV^{Full} = \frac{PMT}{(1+r)^{1-t/T}} + \frac{PMT}{(1+r)^{2-t/T}} + \cdots + \frac{PMT+FV}{(1+r)^{N-t/T}}$$

$$PV^{Full} = [\frac{PMT}{(1+r)^{1}} + \frac{PMT}{(1+r)^{2}} + \cdots + \frac{PMT+FV}{(1+r)^{N}}] \times (1+r)^{t/T} = PV \times (1+r)^{t/T}$$

Matrix Pricing

- **Matrix pricing**: a method of estimating the required YTM of bonds that are *currently not traded or infrequently traded* bonds according to the yields of traded bonds with the same credit quality.
- **Linear interpolation** can be used when the maturities between the valued bond and the traded bond are different.

Example:

- Estimate the YTM of a non-traded 4%, 5-year annual-pay bond
  - 4-year annual-pay, 5% coupon bond: YTM=4.738%
  - 6-year annual-pay, 4% coupon bond: YTM=5232%
  - 6-year annual-pay, 6% coupon bond: YTM=5.284%

Answer:

- Average YTM of 6-year bonds=(5.232+5 .284)/2=5.258%
- Using linear interpolation:

YTM of the non-traded bond=4.738+[(5-4)/(6-4)x(5.258-4.738)=4.998%

Yield Measures for Fixed-Rate Bonds

- **Effective yield**: depends on its *periodicity*, or annual frequency of coupon payments.

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

  - For annual-pay bond: effective yield of an = YTM
  - For bonds with *greater periodicity*, the effective yields is *greater than YTM*

- **Bond Equivalent Yield**
  - A Semiannual YTM or Semiannual-Pay YTM
  - 2 * Semiannual Discounted Rate
  - BEY of an annual-pay bond = $[(1 + \text{annual YTM})^{1/2} - 1] \times 2$
  - Convert semiannual to annual EAR : $(1+\text{BEY}/2)^{2}-1$

Example

- A N-year bond, coupon paid annually, yield to maturity is 5.5%, The bond equivalent yield is:
  - A. 2.8%
  - B. 5.4%
  - C. 5.6%
- Correct answer: B
- **Solution**
  - $(1+BEY/2)^2 = 1+YTM$, BEY = 5.4%

Yield Measures for Fixed-Rate Bonds

- **Street convention yield**: yields calculated using the stated coupon payment dates
- **True yield**: the yield calculated using actual coupon payment dates
  - Due to holidays and weekends, some coupon payments will be made later, hence, true yield will be slightly lower than street convention yield.
- **Current yield:** not consider capital gains/loss or reinvestment income

$$\text{current yield} = \text{annual cash coupon payment} / \text{bond price}$$

- **Simple yield:** the sum of annul coupon payment plus(minus) straight-line amortization of a dismount (premium) is divided by the flat price.

Yield Measures for Fixed-Rate Bonds

- **Yield to call (put)** is calculated as a YTM but with the number of periods until the call (put) price substituted for the number of periods to maturity and the maturity value.
- **Yield to Worst**: the *worst* yield outcome of any that are possible given the call provisions of the bond.
- **Option-adjusted yield**: the required market discount rate whereby the price is *adjusted for the value of the embedded option*.
  - For a callable bond: option-adjusted yield<YTM
  - For a putable bond: option-adjusted yield >YTM

Example

- Tony Ly is a Treasury Manager with Deeter Holdings, a large consumer products holding company. The Assistant Treasurer has asked Ly to calculate the current yield (CY) and the Yield-to-first Call (YTC) on a bond the company holds that has the following characteristics:
  - 7 years to maturity
  - $1,000 face value
  - 7.0% semi-annual coupon
  - Priced to yield 9.0 percent
  - Callable at $1,060 in two years

  If Ly calculates correctly, the CY and YTC are approximately:

	CY	YTC
A.	7.80%	15.72%
B.	7.80%	15.82%
C.	7.78%	15.72%

- Correct answer: B

Yields for FRNs

Coupon rate = reference rate $\pm$ quoted margin

- **Required/discount margin**: margin required to return the FRN to its par value at each reset date.
  - Credit quality is unchanged: required margin=quoted margin
  - Credit quality decreases: required margin>quoted margin
  - Credit quality increases: required margin<quoted margin

Example

- A floating-rate note has a quoted margin of +50 basis points and a required margin of +75 basis points. On its nest reset date, the price of note will:
  A. Equal to par value
  B. Less than par value
  C. Greater than par value
- Correct answer: B

Yields for Money Market Instruments

- Discount yield: U.S. Treasury bills

$$PV = FV / \left(1 - \frac{Days}{Year} \times DR\right) \longrightarrow DR = \left(\frac{Year}{Days}\right) \square \left(\frac{FV - PV}{FV}\right)$$

- Add-on yield: LIBOR, bank CD rates

$$PV = FV / \left(1 + \frac{Days}{Year} \times AOR\right) \longrightarrow AOR = \left(\frac{Year}{Days}\right) \square \left(\frac{FV - PV}{PV}\right)$$

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

Example

1. A $1,000 90-day T-bill is priced with an annualized discount of 1.2%. Calculate its market price and its annualized add-on yield based on a 365-day year

- The discount from face value=1.2%*90/360*1,000=$3
- The current price=1,000-3=$997
- The equivalent add-on yield for 90 days= 3/997=0.3009%
- The annualized add-on yield based on a 365-day year = 365/90*0.3009-1.2203%
  - It is a bond equivalent yield for money market security

2. A $1 million negotiable CD with 120 days to maturity is quoted with an add-on yield of 1.4% based on a 365-day year. calculate the payment at maturity for this Cd and its bond equivalent yield.

- Add-on rate for 120-day=120/365*1.4%=0.4603%——bond equivalent yield
- At maturity, CD pay $1 million * (1+0.4603%)=$1,004,603

Yield Curve

- **Yield curve** shows the *term structure* of interest rates by displaying yields *across different maturities*.
- **Spot curve**: a yield curve for single payments in the future, such as zero-coupon bonds or stripped Treasury bonds.
  - Spot curve for U.S. Treasury bonds is called the zero-curve or strip curve.
- **Yield curve for coupon bonds** shows the YTM for coupon bonds at various maturities, which can be calculated by linear interpolation
- **Par bond yield curve**: shows the *coupon rates* for bonds of various maturities that would result in *bond prices equal to their par values*.

Example:

- Consider a 3-year annual-pay bond with spot rates of 1%, 2%，3% , the coupon payment satisfies:

$$\frac{\text{PMT}}{1.01}+\frac{\text{PMT}}{(1.02)^2}+\frac{\text{PMT+100}}{(1.03)^3}=100$$

Solution: PMT=2.96, par bond coupon rate=2.96%

Forward Rates vs. Spot Rates

➢**Forward Rates:** borrowing/lending rate for a loan to be made at some future date.

Marginal return for extending the time-to-maturity for an additional period

- E.g. The int. of a 1-year loan that would be made 2 years from now
- Notation: 2y1y rate of a 1-year loan to be made 2 years from now

➢**Relationship Between Forward Rates and Spot Rates**

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

➢ **Valuation Using Forward Rates**

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

Example

- Given the following spot and forward rates, how much should an investor pay for a 3-year, annual zero-coupon bond with a face value of $1,000?
  - One-year spot rate at 3.5%
  - The 1-year forward rate 1 year from today is 11.5%
  - The 1-year forward rate 2 years from today is 19.75%

  The investor should pay approximately:

  A. $724.

  B. $720.

  C. $884.

- Correct answer: A

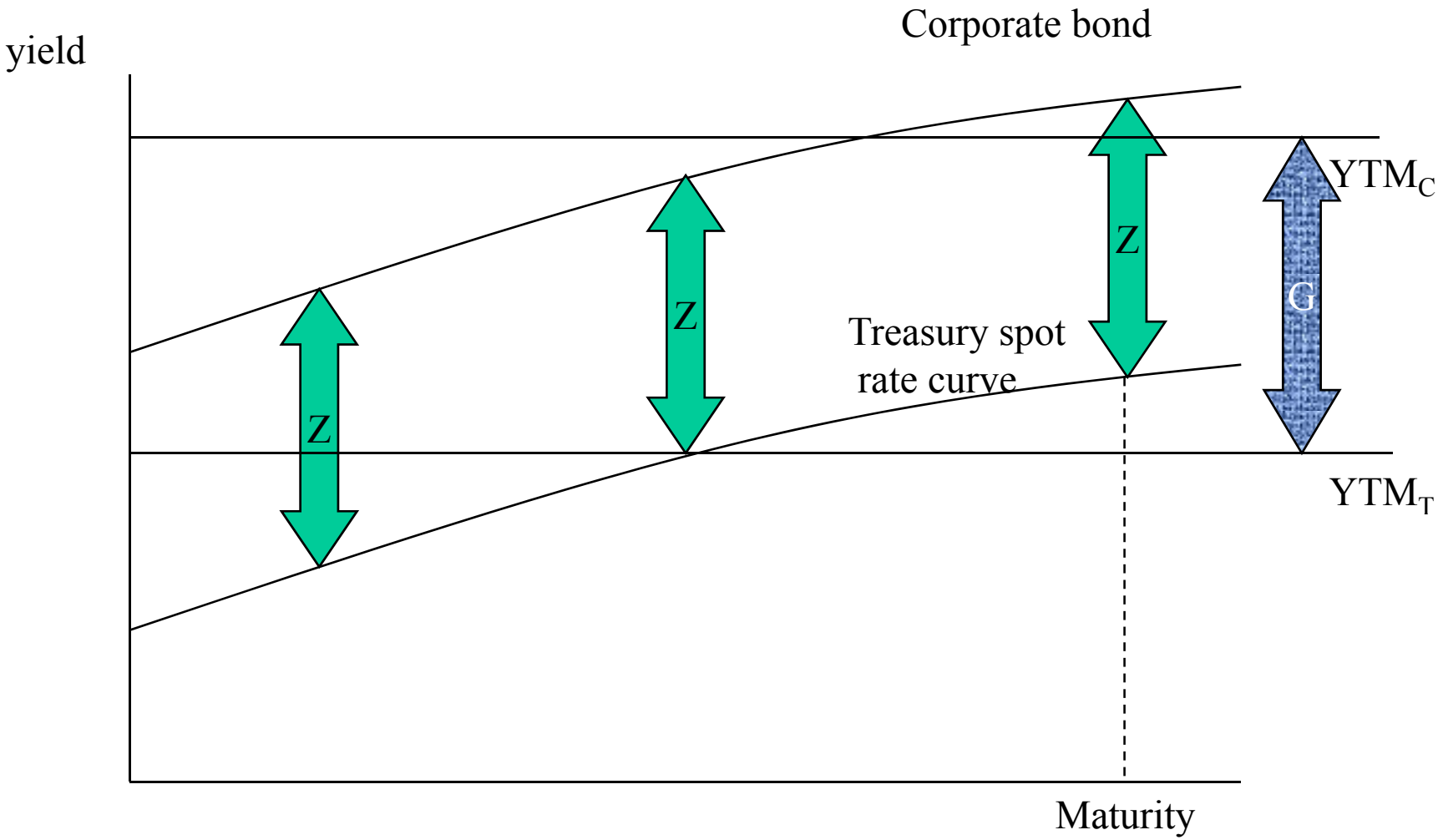
Yield Spread

- **Benchmark spread**: a yield spread relative to a benchmark bond.
  - G-spread: the benchmark is government bond yield
  - Interpolated spread/I-spread: the benchmark is swap rate
- **Z-spread**: the spread that must be added to each rate on the benchmark yield curve to make the present value of a bond equal to its price.
- **The difference between the GS and the ZS**
  - There is *no difference* between two spreads when the *spot yield curve is flat*.
  - If the spot yield curve is *upward sloping*, the *ZS is larger than the GS*.
  - The *steeper* the benchmark spot rate curve, the *greater the difference* between the two spread measures.
- **OAS**: used for bonds with embedded options.
  - Callable bond: ZS>OAS
  - Putable bond: ZS<OAS

Yield Spread

	Description	Character
G- spread	GS= Bond yield to maturity – yield on a comparable-maturity government treasury security $P_{market} = \frac{CF_1}{(1+R+G)^1} + \frac{CF_2}{(1+R+G)^2} + \ldots$	Use a single interest rate to discount each cash flow.
Z-spread	$P_{market} = \frac{CF_1}{(1+R_1+Z)^1} + \frac{CF_2}{(1+R_2+Z)^2} + \ldots$	Assume the interest rate volatility is zero.
OAS	OAS=Z-spread – Option cost $P_{market} = \frac{CF_1}{(1+R_1+OAS)^1} + \frac{CF_2}{(1+R_2+OAS)^2} + \ldots$	

Yield Spread



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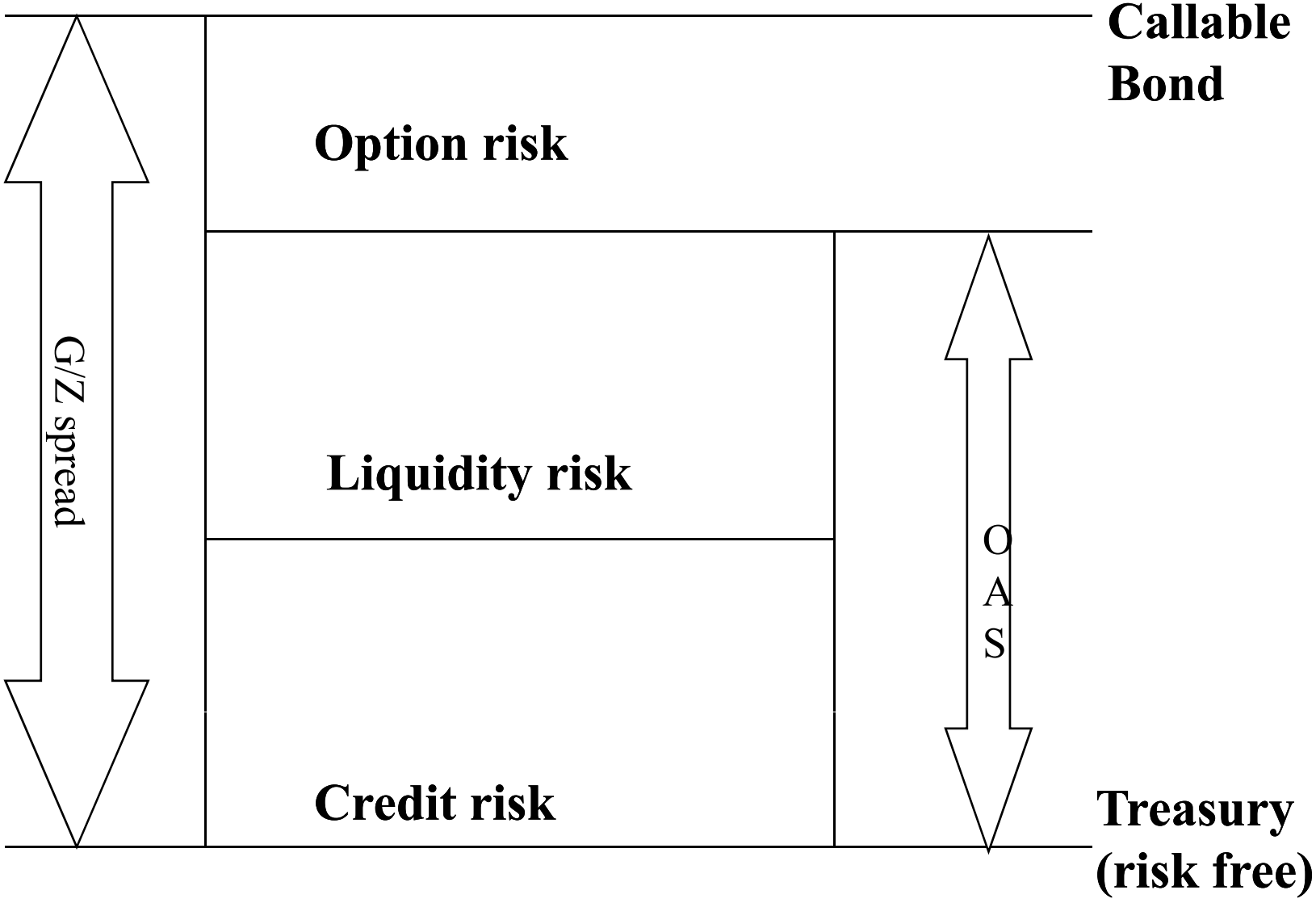
Yield Spread



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Example

1. The difference between benchmark spread and Z-spread, which one is greater?
   A. zero-coupon & flat yield curve
   B. zero-coupon & increase yield curve
   C. amortization & increase yield curve

➢ Correct answer: C

2. With respect to callable bonds, the zero-volatility spread will most likely be:
   A. less that the option-adjusted spread
   B. greater than the option-adjusted spread
   C. equal to the option-adjusted spread but substantially less than the nominal spread

➢ Correct answer: B

Framework of Fixed Income

➢ Study Session 15 — Basic Concepts

- R52 Fixed-Income Securities: Defining Elements
- R53 Fixed-Income Markets: Issuance, Trading, and Funding
- R54 Introduction to Fixed-Income Valuation

➢ Study Session 16 — Analysis of Risk

- R55 Understanding Fixed-Income Risk and Return
- R56 Fundamentals of Credit Analysis

Source of Return

- **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)
- **Annualized holding period return**: calculated as the compound annual return earned from the holding period .

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

Interest Rate Risk

- We will assume that a bond makes *all of its promised coupon and principal payments on time* (i.e., we are not addressing credit risk). Additionally, we assume that the interest rate earned on reinvested coupon payments is the same as the YTM on the bond. There are *five* results to gain from the analysis presented here.

1. 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.

Interest Rate Risk

- We will illustrate this calculation (and the first result listed earlier) with a 6% annual-pay three-year bond purchased at a YTM of 7% and held to maturity.
- With an annual YTM of 7% the bond's purchase price is $973.76.
  - N = 3; 1/Y = 7; PMT = 60; FV = 1,000; CPT PV = -973.76
- At maturity, the investor will have received coupon income and reinvestment income equal to the future value of an annuity of three $60 coupon payments calculated with an interest rate equal to the bond's YTM. This amount is
  - 60(1.07)^2 + 60(1.07) + 60 = $192.89 or
  - N= 3; I/Y = 7; PV= 0; PMT= 60; CPT: FV = -192.89
- The amount earned from reinvestment of the coupons as 192.89-3(60) = $12.89
- the investor's rate of return over the three-year holding period is:

annualized holding period return $= ((1,000+192.89)/973.76)^{1/3} - 1 = 7\%$

Interest Rate Risk

- Calculate an investor's rate of return on the same bond purchased at a YTM of 5%. Price at purchase:
  - N = 3; I/Y = 5; FV = 1,000; PMT = 60; CPT: PV = –1027.23
- Coupons and reinvestment income:
  - 60(1.05)^2+ 60(1.05) + 60 = $189.15 or
  - N = 3; I/Y= 5; PV =0; PMT = 60; CPT: FV = –189.15

$$\text{annualzed holding period return} = \left((1{,}000+189.15) / 1{,}027.23 \right)^{1/3} - 1 = 5\%$$

- **Investment horizon**: the time bond will be held by the investors
- At dates between the purchase and the sale, the value of the bond ate the same YTM as when it was purchase is its **carrying value** and reflects the amortization of the discount or premium since the bond was purchased

Interest Rate Risk

2. 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.

- Using the 6% three-year bond from our earlier examples, we can demonstrate this for an investor with a two-year holding period (investment horizon).
- When the bond is purchased at a YTM of 7% (for $973.76), we have:

  Price at sale: (at end of year 2, YTM = 7%):

  - 1,060 / 1.07 = 990.65 or
  - N = 1; I/Y = 7; FV = 1,000; PMT = 60; CPT: PV = -990.65
- Coupon interest and reinvestment income For two years:
  - 60(1.07) + 60 = $124.20 or
  - N = 2; I/Y = 7; PV 0; PMT = 60; CPT FV = -124.20
- Investor's annual compound rate of return over the two-year holding period is:

$$\left(\frac{124.20+990.65}{973.76}\right)^{1/2} - 1 = 7\%$$

Interest Rate Risk

- This result can be demonstrated for the case where the bond is purchased at a YTM of 5% ($1,027.23) as well:
- Price at sale (at end of year 2, YTM = 5%):
  - 1,060 / 1.05 = 1,009.52 or
  - N = 1; I/Y = 5; FV = 1,000; PMT = 60; CPT: PV = -1,009.52
- Coupon interest and reinvestment income for two years:
  - 60(1.05) + 60 = 123.00 or
  - N=2; I/Y =5; PV =0; PMT 60; CPT: FV=123.00
- Investor's annual compound rate of return over the two-year holding period is:

$$\left(\frac{123.00+1009.52}{1027.23}\right)^{1/2} - 1 = 5\%$$

Interest Rate Risk

3. 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.

- For a three-year 6% bond purchased at par (YTM of 6%), first assume that the YTM and reinvestment rate increases to 7% after purchase but before the first coupon payment date. The bond's annualized holding period return is calculated as:
- Coupons and reinvestment interest:
  - 60(1.07)2+ 60(1.07) + 60 = $192.89
  - N= 3; I/Y = 7; PV = 0; PMT = 60; CPT: FV = -192.89

$$\left(\frac{1192.89}{1000}\right)^{1/3} - 1 = 6.06\%$$

- Investor's annual compound holding period return:

which is greater than the 6% YTM at purchase.

R55 Understanding Fixed-Income Risk and Return

- If the YTM decreases to 5% after purchase but before the first coupon date, we have the following.
- Coupons and reinvestment interest:
  - 60(1.05)2 + 60(1.05) + 60 = $189. I 5
  - N = 3; I/Y = 5; PV=0; PMT = 60; CPT: FV =-189.15
- Investor's annual compound holding period return:

$$(\frac{1189.15}{1000})^{1/3} - 1 = 5.94\%$$

which is less than the 6% YTM at purchase.

- Note that in both cases, the investor's rate of return is between the YTM at purchase and the assumed reinvestment rate (the new YTM).

Interest Rate Risk

4. 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.

5. 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.

Interest Rate Risk

- Consider a three-year 6% bond purchased at par by an investor with a one-year investment horizon. If the YTM *increases from 6% to 7%* after purchase and the bond is sold after one year, the rate of return can be calculated as follows.
- Bond price just after first coupon has been paid with YTM = 7%:
  - N = 2; I/Y = 7; FV = 1,000; PMT = 60; CPT: PV = -981.92
- There is no reinvestment income and only one coupon of $60 received so the holding period rate of return is simply:

$$\left(\frac{981.92+60}{1000}\right)-1=4.19\%$$

, which is *less than* the YTM at purchase.

- If the YTM *decreases to 5%* after purchase and the bond is sold at the end of one year, the investor's rate of return can be calculated as follows.
- Bond price just after first coupon has been paid with YTM = 5%:
  - N = 2; I/Y = 5; FV = 1,000; PMT = 60; CPT: PV = -1,018.59

$$\left(\frac{1018.59+60}{1000}\right)-1=7.86\%$$

,which is *greater than* the YTM at purchase.

Interest Rate Risk

- Two types of interest rate risk
  - **Coupon reinvestment risk**: uncertainty about income from reinvesting coupon payments.
    - ✓ Increases with a higher coupon rate and a longer investment horizon.
  - **Market price risk**: uncertainty about a bond price
- These risks *offset each other*: an increase (decrease) in YTM decreases (increases) a bond's price but increases (decreases) its reinvestment income.
  - 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

Interest Rate Risk

Interest risk

- 利率风险：即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
- 通常用久期duration来衡量利率风险，久期越高，利率风险越高

$$\text{duration} = -\frac{\text{percentage change in bond price}}{\text{yield change in percent}}$$

- Exercise: A bond has a duration of 7.2, if the yield decreases from 8.3% to 7.9%, calculate the approximate percentage change in the bond price

Percentage price change= - duration × yield change in %

Duration

- **Duration:** a measure of a bond's interest rate risk or sensitivity of a bond's full price to a change in its yields (yield duration& convexity), or to changes in benchmark interest rates(curve duration & convexity).
- Duration represents the approximate amount of time a bond needs be held to realize the YTM at purchase, if there's a single change in int. rate.
- Assumptions:
  1. all other variables other than YTM or benchmark int. are held constant.
  2. time-to-maturity is unchanged.
- Important conclusions:
  1. duration measures the instantaneous change in bond price.
  2. it is the flat price that changes when full price changes (accrued int. unchanged).
- Yield duration: Macaulay duration, modified duration, money duration, PVBP
- Curve duration: effective duration

Duration

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

- **Macaulay duration**

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

- **Modified duration**

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

$$\Delta P / P \approx -ModDur \times \Delta YTM$$

- **Approximate modified duration**

$$Approximate\ \text{mod}ified\ duration = \frac{V_- + V_+}{2 \times V_0 \times \Delta YTM}$$

- **Effective duration** (used for bonds with embedded option)

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

Duration

- **Interpreting duration:**
  - Duration is the **slope** of the price-yield curve at the bond's current YTM. (the first derivative of the price-yield curve with respect to yield, but it's not absolutely right for such description ?)
  - Duration is a *weighted average of time (in years)* until cash flow will be received. The weights are the proportions of the total bond value that each cash flow represents.
  - Duration is the *approximate percentage change* in price of 1% change in yield. (price sensitivity)
- **Effects of bond characteristics on duration:**
  - Lower coupon means higher duration.
  - Longer maturity means higher duration.
  - Lower market yield means higher duration

Example

1. A portfolio manager anticipates a major increase in market interest rates. Which trading strategy should generate above-average returns? Purchasing:
   A. long-maturity bonds with low coupon rates
   B. junk bonds with high coupon rates
   C. short-maturity bonds with high coupon rates

➢ Correct answer: C

2. The table below summarizes the yields and corresponding prices for a hypothetical 15-year option-free bond that is initially priced to sell at 7% yield:

Yield(%)	Price(s)
6.90%	100.9254
7.00%	100 .0000
7.10%	99 .0861

➢ Using a 10 basis point rate shock, the effective duration for this bond is closest to: 9.2 years.

Portfolio Duration

- **Two methods**:
  - Calculate the weighted average number of periods until cash flows will be received using the portfolio's IRR.
    - ✓This method is better *theoretically* but cannot be used for bonds with options.
  - Calculate the weighted average of durations of bonds in the portfolio.

$$\text{Portfolio duration} = w_1D_1 + w_2D_2 + \ldots\ldots + w_nD_n$$

    - ✓Limitations: the yields may not change equally on all the bond in the portfolio.

Money Duration and PVBP

- **Money duration/dollar duration**

  Money duration=annual modified duration * full price of bond

- Money duration expressed as money duration per 100 of bond par value

  Money duration per 100 units of par value

  =annual modified duration * full price of bond per 100 of par value

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

$$PVBP = [(V_- - V_+) / 2]$$

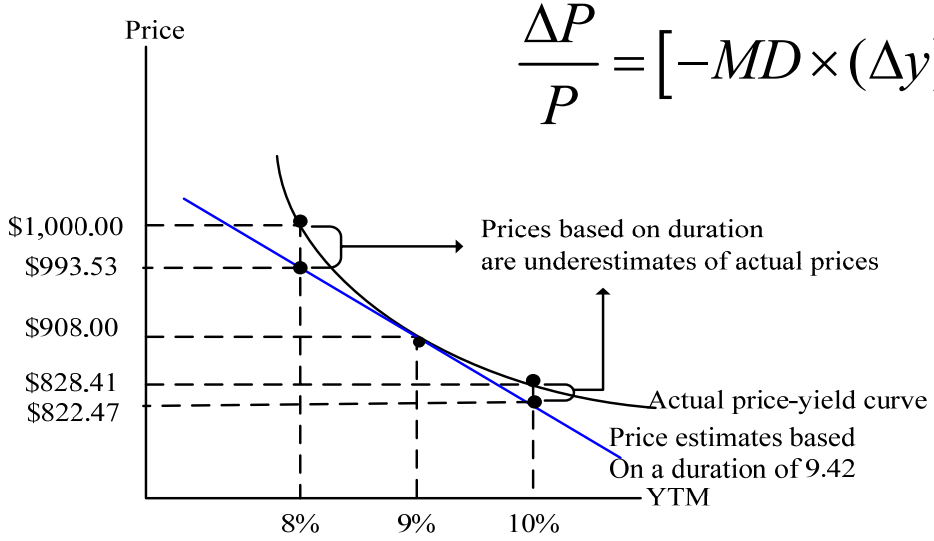
Convexity

- **Convexity** is a measure of the *curvature* of the price-yield curve.

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

  - The more curved the price-yield relation is, the worse our duration-based estimates of bond price changes in response to changes in yield are
  - The convexity adjustment is always positive when convexity is positive

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



Effective Convexity

- **Effective Convexity**: takes into account changes in cash flows due to embedded options, while modified convexity does not.

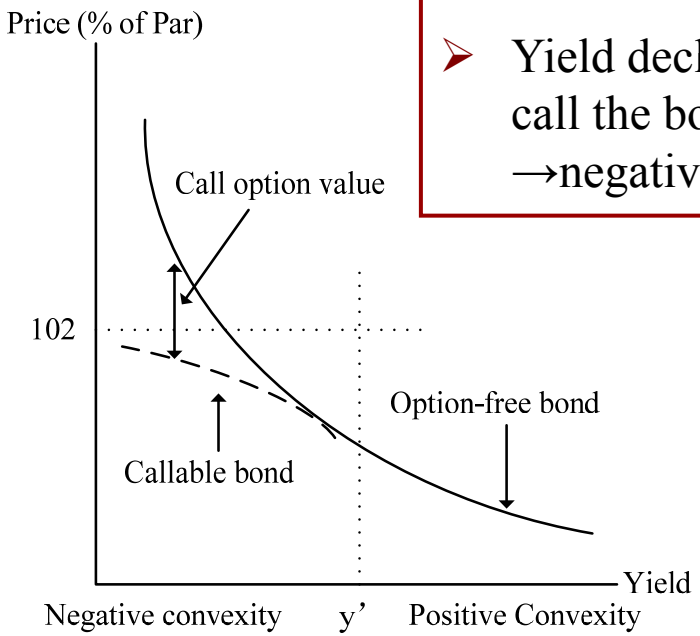
$$\text{effective convexity} = \frac{V_- + V_+ - 2V_0}{(\Delta \text{curve})^2 V_0}$$

  - 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.

Effective Convexity

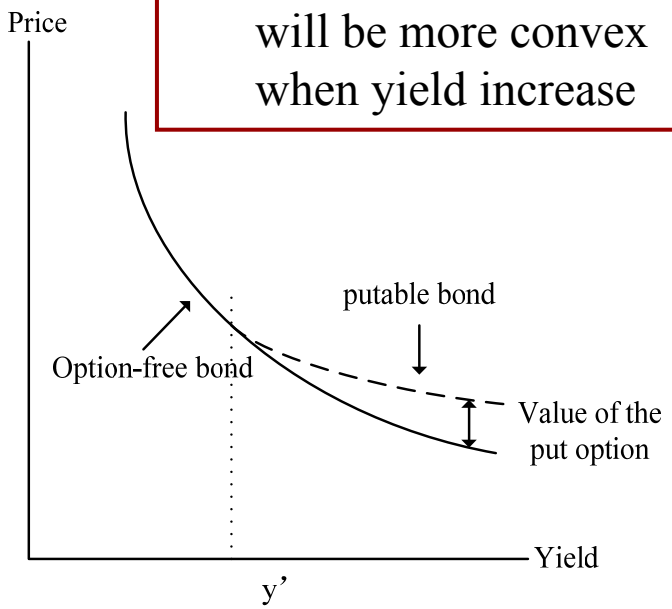
Callable

- High yield →unlikely call, → positive convexity
- Yield decline → may call the bond →negative convexity



Putable

- price/yield relationship will be more convex when yield increase



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Example

- An analyst accurately calculates that the price of an option-free bond with percent coupon would experience a 12 percent change if market yields increase 100 basis points. If market yields decrease 100 basis points, the bond's price would likely:

  A. Increase by 12%

  B. Increase by less than 12%

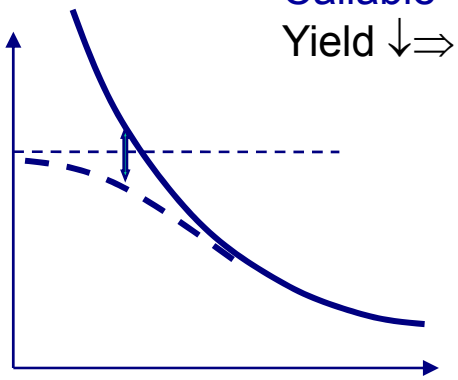
  C. Increase by more than 12%

- Correct answer: C

Measurement of Interest Rate Risk

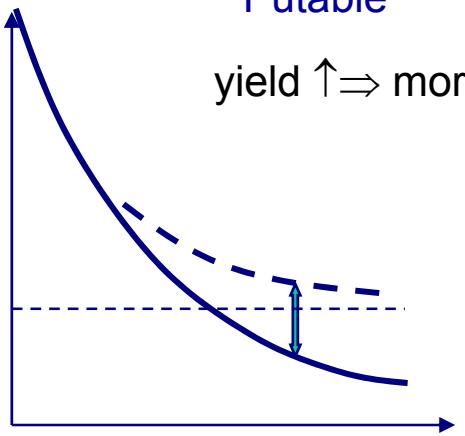
Callable

Yield ↓⇒ negative convexity



Putable

yield ↑⇒ more convex



$$ED = \frac{P_- - P_+}{2P_0 \cdot \Delta y} \qquad \frac{\Delta P}{P} = -ED \times \Delta y$$

Duration

$$MD = \frac{\text{Macaulay D}}{1 + \text{periodic y}}$$

$$\text{portfolio duration} = w_1 D_1 + w_2 D_2 + \ldots + w_N D_N$$

$$\Delta P/P = -MD \times \Delta y + 0.5 \times C \times (\Delta y)^2$$

$$\text{PVBP} = \text{duration} \times 0.0001 \times \text{bond(portfolio) value}$$

$$*\,MacD = \sum_{t=1}^{n} \frac{t \cdot c}{P} + \frac{n \cdot M}{P}$$

- 计算时注意:
  - Price与 Int Rate的反向关系
  - 衡量相对变化
  - Yield变化的单位：是百分比还是小数

Term structure of yield volatility

- **Term structure of yield volatility**: the relationship between maturity and yield volatility.
  - In calculation of duration and convexity, the yield curve is assumed to be *parallel shift*.
  - Shorter-term bond may be have more price volatility than a longer bond with a greater duration because of the greater yield volatility of the shorter-term yield

Holding period return, Duration, and Investment Horizon

- **Macaulay duration** may be interpreted as the investment horizon for which a coupon reinvestment risk and market price risk *just offset each other*, assuming there's a one-time parallel shift in the yield curve that occurs before the next coupon payment date.
- Relationships among interest rate risk, Macaulay duration, and investment horizon:

  1. if investment horizon > Macaulay duration, then reinvestment risk dominates price risk, investor's risk is to lower interest rates.

  2. if investment horizon = Macaulay duration, then reinvestment risk offsets price risk

  3. if investment horizon = Macaulay duration, then price risk dominates reinvestment risk, investor's risk is to higher interest rates.

- Duration gap:

  Duration gap = Macaulay duration – investment horizon

  - **Positive gap** exposes the investor to market price risk from increasing interest rates
  - **Negative gap** exposes the investor to reinvestment risk from decreasing interest rates

Credit and liquidity Spread

- YTM on a corporate bond includes a government benchmark yield and a spread.
- For an option-free bond, the same duration and convexity measures apply for both a change in benchmark yield and a change in spread. (source of change includes change in inflation, real int. rate, credit risk, liquidity)
- Bond's spread has two components:
  - Premium for credit risk
  - Premium for lack of liquidity
- The impact on a bond's value of a change in spread:

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

Example:

- Consider a bond with a duration of 8 and a convexity of 22. the bond's spread to the benchmark curve increases by 25 basis points due to a credit downside. What is the approximate change in the bond's market value?

Solution: Change in bond value= -8(0.0025)+0.5(22)(0.0025^2)=-1.99%

Framework of Fixed Income

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Fundamentals of Credit Analysis

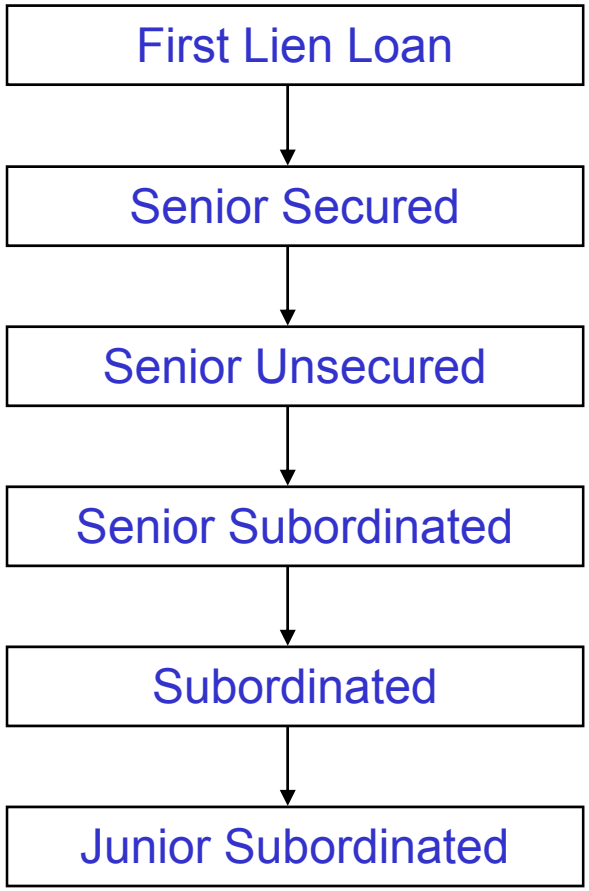
- ***Credit risk*** is the risk of loss resulting form the borrower (issuer of debt) failing to make full and timely payments of interest and/or principal. It has two components.
  - ***Default risk***, or default probability, is the probability that a borrower defaults – that is, fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security.
  - ***Loss severity***, or loss given default, in the event of default, is the portion of a bond's value (including unpaid interest) an investor loses.
- Expected loss = Default probability * Loss severity given default
  - Loss severity given default = 1 – Recovery rate
  - ***Recovery rate*** is the percentage of the principal amount recovered in the event of default.

Fundamentals of Credit Analysis

- ***Spread risk***: Corporate bonds and other "credit-risky" debt instruments typically trade at a yield premium, or spread, to bonds that have been considered "default-risk free".
  - Yield spreads, expressed in basis points, widen based on two primary factors:
    - ✓ A decline in an issuer's creditworthiness, sometimes referred to as credit migration or downgrade risk
    - ✓ An increase in market liquidity risk.
- Spread risk is the possibility that a bond's spread will widen due to one or both of these factors.
  - ***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.
    - ✓ Two main issuer-specific factors that affect market liquidity risk:
      - ◆ The size of the issuer.
      - ◆ The credit quality of the issuer.

Fundamentals of Credit Analysis

- **Capital Structure**: the composition and distribution across operating units of a company's debt and equity, including bank debt, bonds of all seniority rankings, preferred stock, and common equity.
- **Seniority Ranking**



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Fundamentals of Credit Analysis

- ***Secured debt***: the debtholder has a direct claim – a pledge from the issuer – on certain assets and their associated cash flows.
  - ***First mortgage debt*** refers to the pledge of a specific property (e.g., a power plant for a utility or a specific casino for a gaming company).
  - ***First lien debt*** refers to a pledge of certain assets that could include buildings but might also include property and equipment, licenses, patents, brands, and so on.
- ***Unsecured debt*** is often referred to as debentures. Unsecured bondholders have only a general claim on an issuer's assets and cash flow.
- ***Priority of claims***: in the event of default, unsecured debtholders claim rank below (i.e., get paid after) those of secured creditors.

Fundamentals of Credit Analysis

- To avoid unnecessary delays, bankruptcy negotiation and compromise among various claimholders may result in a reorganization plan that does not strictly conform to the original priority of claims.
- **Exercise:（原版书例题）**

1. Under which circumstance is a subordinated bondholder most likely to recover some value in a bankruptcy without a senior creditor getting paid in full? When:

   A. absolute priority rules are enforced.

   B. the various classes of claimants agree to it

   C. the company is liquidated rather than reorganized

2. 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

Fundamentals of Credit Analysis

- For recovery rates, there are a few things worth noting:
  - Recovery rates can vary widely by industry.
  - Recovery rates can also vary depending on when they occur in a credit cycle.
  - These recovery rates are averages.
  - Priority of claims is not always absolute.
    - ✓ The priority of claims in bankruptcy:
      - secured creditors > unsecured creditors
      - senior creditors > junior creditors
    - ✓ In practice, however, more junior creditors and even shareholders may receive some consideration without more senior creditors being paid in full.
    - ✓ In the U.S., the bias is toward reorganization and recovery of companies in bankruptcy. In the UK, the bias is toward liquidation of companies in bankruptcy and maximizing value to the banks and other senior creditors.
    - ✓ Bankruptcy and bankruptcy laws are vary complex and can vary greatly by country.

Fundamentals of Credit Analysis

- Credit ratings

Moody's	S&P	Fitch	Summary Definition
Investment Grade—High Credit-Worthiness			
Aaa	AAA	AAA	Gilt edge, prime, maximum safety
Aa1 Aa2 Aa3	AA+ AA AA-	AA+ AA AA-	High grade, high-credit quality Upper medium grade Lower medium grade
A1 A2 A3	A+ A A-	A+ A A-	
Baa1 Baa2 Baa3	BBB+ BBB BBB-	BBB+ BBB BBB-	

Fundamentals of Credit Analysis

- Credit ratings

Moody's	S&P	Fitch	Summary Definition
Speculative-Lower Credit-Worthiness			
Ba1	BB+	BB+	Low grade speculative
Ba2	BB	BB	
Ba3	BB-	BB-	
B1	B	B+	Highly speculative
B2	B	B	
B3	B	B-	

Fundamentals of Credit Analysis

- Credit ratings

Moody's	S&P	Fitch	Summary Definition
Predominantly Speculative, Substantial Risk, or in Default			
Caa	CCC+ CCC	CCC+ CCC	Substantial risk, in poor standing
Ca	CC	CC	May be in default, very speculative
C	C	C	Extremely speculative
	CI		Income bonds-no interest being paid
		DDD	
	D	DD	Default

Fundamentals of Credit Analysis

- **Triple-A (Aaa or AAA):** highest quality, minimal credit risk, extremely low probabilities of default.
- **Double-A (Aa or AA):** high-quality grade, very low default risk.
- **Single-A:** supper-medium grade.
- Bonds rated Baa3/BBB- or higher are called "**investment grade**".
- Bonds rated ba1 or lower by Moody's and BB- or lower by S&P and Fitch have **speculative credit** characteristics and increasingly higher default risk.
- Bonds **rated D** by S&P and Fitch are already in default.
- For Moody's, bonds **rated C** are likely, but not necessarily, in default.

Fundamentals of Credit Analysis

- ***Issuer credit rating***: address an obligor's overall creditworthiness – its ability and willingness to make timely payments of interest and principal on its debt.
  - Issuer credit rating usually applies to its senior unsecured debt.
- ***Issue ratings*** refer to specific financial obligations of an issuer and take into consideration such factors as ranking in the capital structure (e.g., secured or subordinated).
- Bonds in default are rated D by S&P and Fitch and are included in Moody's lowest rating category, C. When a company defaults on one of its several outstanding bonds, provisions in bond indentures may trigger default on the remaining issues as well. Such a provision is called a ***cross default provision***.

Fundamentals of Credit Analysis

- ***Notching*** is the practice by rating agencies of assigning different ratings to bonds of the same issuer.
  - 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.
- ***Structural subordination***
  - Subsidiary's debt covenant may restrict the transfer of cash or assets upstream to the parent company before the subsidiary's debt is serviced. Thus the parent company's bonds are effectively subordinated to the subsidiary's bonds.

Fundamentals of Credit Analysis

- **Risks in relying on agency ratings:**
  - **Credit ratings can be very dynamic.**
    - ✓ Crditworthiness can and does change – up or down – and that bond investors should not assume an issuer's credit rating will remain the same from time of purchase through the entire holding period.
  - **Rating agencies are not infallible.**
  - **Other types of so-called idiosyncratic or event risk are difficult to capture in ratings.**
  - **Ratings tend to lag market pricing of credit.**
    - ✓ Bond prices and credit spreads frequently move more quickly because of changes in perceived creditworthiness than rating agencies change their ratings (or even outlooks) up or down.
    - ✓ For certain speculative-grade credits, two bonds with similar ratings may trade at very different valuations.

Fundamentals of Credit Analysis

- The four Cs of credit analysis
  - ***Capacity*** refers to the ability of the borrower to make its debt payments on time.
  - ***Collateral*** refers to the quality and value of the assets supporting the issuer's indebtedness.
  - ***Covenants*** are the terms and conditions of lending agreements that the issuer must comply with.
  - ***Character*** refers to the quality of management.

Fundamentals of Credit Analysis

(1) *Capacity:*

- Industry analysis
  - Industry structure - Porter's five forces model
    - ✓ ***Power of suppliers***: fewer supplier, greater credit risk
    - ✓ ***Power of buyers/customers***: fewer buyers, greater credit risk
    - ✓ ***Barriers to entry***: higher entry barriers, lower credit risk
    - ✓ ***Substitution risk***: fewer substitutions, lower credit risk
    - ✓ ***Level of competition***: heavier competition, greater credit risk
  - Industry fundamentals
    - ✓ ***Industry cyclicality***
      - ◆ Cyclical industries tend to have more volatile earnings, revenues, and cash flows, which make them more risky than noncyclical industries.
    - ✓ ***Industry growth prospects***
      - ◆ Creditworthiness is poorer for the weaker companies in a slow-growing or declining industry.
    - ✓ ***Published industry statistics***
      - ◆ Published industry statistics can be a source for industry fundamentals and outlook.

Fundamentals of Credit Analysis

(1) *Capacity:*

- **Company fundamentals**
  - **Competitive position**
    - ✓ Market share changes over time and cost structure relative to peers are some of the factors to analyze.
  - **Track record/operating history**
    - ✓ The performance of the company over different phases of business cycle, trends in margins and revenues, and current management's tenure.
  - **Management's strategy and execution**
    - ✓ This includes the soundness of the strategy, the ability to execute the strategy, and the effects of management's decisions on bondholders.
  - **Ratios and ratio analysis**

Fundamentals of Credit Analysis

- Ratios and ratio analysis
  - ✓ ***Profitability and cash flow measures***
    - ◆ **EBITDA**

      EBITDA = operating income + dep. & amor.
      - Drawbacks: it does not adjust for capital expenditures and changes in working capital, which are necessary uses of funds for a going concern. Cash needed for these uses is not available to debt holders.
    - ◆ **Funds from operations (FFO)**

      FFO = NI from continuing operations + dep. & amor. + deferred income taxes + other non-cash items
      - FFO is similar to cash flow from operations (CFO) except that FFO excludes changes in working capital.
    - ◆ **Free cash flow before dividends**

      FCF before div. = NI + dep. & amor. – capital expenditure – increase (plus decrease) in non-cash working capital – non-recurring items
      - Free cash flow before dividends excludes non-recurring items.
    - ◆ **Free cash flow after dividend**

      FCF after div. = FCF before div. – div.
      - If free cash flow after dividends is greater than zero, it represents cash that could be used to pay down debt or allowed to accumulate on the balance sheet. Either outcome is a form of deleveraging, a positive indicator for creditworthiness.

Fundamentals of Credit Analysis

- Ratios and ratio analysis
  - ✓ ***Leverage ratios***
    - ◆ **Debt/capital**
      - Capital = total debt + shareholders equity
      - A lower ratio indicates less credit risk.
      - If the financial statements list high values for intangible assets such as goodwill, an analyst should calculate a second debt-to-capital ratio adjusted for a writedown of these assets' after-tax value.
    - ◆ **Debt/EBITDA**
      - A higher ratio indicates higher leverage and higher credit risk.
      - This ratio is more volatile for firms in cyclical industries or with high operating leverage because of their high variability of EBITDA.
    - ◆ **FFO/debt**
      - Because this ratio divides a cash flow measure by the value of debt, a higher ratio indicates lower credit risk.

Fundamentals of Credit Analysis

- Ratios and ratio analysis
  - ✓ ***Coverage ratios***
    - ◆ **EBITDA/interest expense**
      - A higher ratio indicates lower credit risk.
      - This ratio is used more often than the EBIT-to-interest expense ratio. Because depreciation and amortization are still included as part of the cash flow measure, this ratio will be higher than the EBIT version.
    - ◆ **EBIT/interest expense**
      - A higher ratio indicates lower credit risk.
      - This ratio is the more conservative measure because depreciation and amortization are subtracted from earnings.

Fundamentals of Credit Analysis

(1) *Capacity:*

- Comments on issuer's liquidity
  - **Cash on the balance sheet**
    - ✓ Cash holdings provide the greatest assurance of having sufficient liquidity to make promised payments.
  - **Net working capital**
    - ✓ Working capital consumed billions of dollars in cash as accounts payable came due, when the companies most needed liquidity.
  - **Operating cash flow**
    - ✓ Analysts will project this figure out a few years and consider the risk that it may be lower than expected.
  - **Committed bank lines**
    - ✓ Committed but untapped lines of credit provide contingent liquidity in the event that the company is unable to tap other, potentially cheaper, financing in the public debt markets.
  - **Debt coming due and committed capital expenditures in the next one to two years**
    - ✓ Analysts will compare the sources of liquidity with the amount of debt coming due as well as with committed capital expenditures to ensure that companies can repay their debt and still invest in the business if the capital markets are somehow not available.

Fundamentals of Credit Analysis

(2) *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**
  - Low depreciation expense relative to capital expenditures may signal that management is not investing sufficiently in the company.
  - The quality of the company's assets may be poor, which may lead to reduced operating cash flow and potentially high loss severity.
- **Equity market capitalization**
  - A stock that trades below book value may indicate that company assets are of low quality.
- **Human and intellectual capital**
  - These are difficult to value, but a company may have intellectual property that can serve as collateral.

Fundamentals of Credit Analysis

(3) *Covenants:*

- **Affirmative:** obligated to do
  - Include such duties as making interest and principal payments and filing audited financial statements on a timely basis.
  - Require a company to redeem debt in the event of the company being acquired or to keep the ratio of debt to EBITDA below some prescribed amount.
- **Negative:** limited in doing
  - Include a cap on the amount of cash that can be paid out to shareholders relative to earnings
  - or perhaps a cap on the amount of additional secured debt that can be issued.

Fundamentals of Credit Analysis

(4) *character:*

- Credit analysis can make judgments about management's character in the following ways:
  - **Soundness of strategy**
    - ✓ Management's ability to develop a sound strategy.
  - **Track record**
    - ✓ Management's past performance in executing its strategy and operating the company without bankruptcies, restructurings, or other distress situations that led to additional borrowing.
  - **Accounting policies and tax strategies**
    - ✓ Use of inappropriate accounting policies and tax strategies, such as revenue recognition issues, policies leading to frequent restatements, and frequently changing auditors.
  - **Fraud and malfeasance record**
    - ✓ Any record of fraud or other legal and regulatory problems.
  - **Prior treatment of bondholders**
    - ✓ Benefits to equity holders at the expense of debt holders, through actions such as debt-financed acquisitions and special dividends, especially if they led to credit rating downgrades.

Fundamentals of Credit Analysis

- Credit risk VS. return: yields and spreads
  - The higher the credit risk, the greater the return potential and the higher the volatility of that return.
  - Yield on corporate bond

    = real risk-free interest rate

    + expected inflation rate

    + maturity premium

    + liquidity premium

    + credit spread

      ✓ Yield spread = liquidity premium + credit spread

Fundamentals of Credit Analysis

- Factors affect the spreads on corporate bonds:
  - **Credit cycle**
    - ✓ The bond market perceives low aggregate credit risk and is generally bullish. Spreads narrow as the credit cycle improves
  - **Economic conditions**
    - ✓ Credit spreads narrow as the economy strengthens
  - **Financial market performance**
    - ✓ Credit spreads narrow in strong-performing markets overall, including the equity market.
  - **Broker-dealer capital**
    - ✓ Yield spreads are narrower when broker-dealers provide sufficient capital but can widen when market-making capital becomes scarce.
  - **General market demand and supply**
    - ✓ Credit spreads narrow in times of high demand for bonds.

Fundamentals of Credit Analysis

- Credit risk VS. return: yields and spreads
  - The return impact from spread changes is driven by two main factors:
    - ✓ The modified duration of the bond
    - ✓ The magnitude of the spread change
      - For **small spread changes**, the return impact (percent change in bond price) can be approximated by:
        Return impact ≈ - modified duration × Δ spread
      - For **larger spread changes**, incorporating convexity improves the accuracy of return impact measurement:
        Return impact ≈ - modified duration × Δ spread + 0.5×convexity ×(Δ spread)^2
  - ***Credit curves***: the plot of yield spreads for a given bond issuer across the yield curve.
    - ✓ typically upward sloping, with the exception of high premium-priced bonds and distressed bonds, where credit curves can be inverted because of the fear of default, when all creditors at a given ranking in the capital structure will receive the same recovery rate without regard to debt maturity.

Fundamentals of Credit Analysis

- **High-yield corporate bonds:** rated below Baa3/BBB-
- Reasons for companies rated below investment grade:
  - Highly leveraged capital structure
  - Weak of limited operating history
  - Limited or negative free cash flow
  - Highly cyclical business
  - Poor management
  - Risky financial policies
  - Lack of scale and/or competitive advantages
  - Large off-balance-sheet liabilities
  - Declining industry

Fundamentals of Credit Analysis

- Special considerations of high-yield credit analysis:
  - ***Greater focus on issuer liquidity and cash flow***
    - ✓ Sources of liquidity, from strongest to weakest, are the following:
      - Cash on the balance sheet
      - Working capital
      - Operating cash flow
      - Bank credit facilities
      - Equity issuance
      - Asset sales
  - ***Detailed financial projections***
    - ✓ Projecting future earnings and cash flows are important for revealing potential vulnerabilities to meet debt payments.

Fundamentals of Credit Analysis

- Special considerations of high-yield credit analysis:
  - ***Detailed understanding and analysis of the debt structure***
    - ✓ A high-yield issuer will often have at least some of the following types of obligations in its debt structure:
      - (Secured) bank debt
      - Second lien debt
      - Senior unsecured debt
      - Subordinated debt, which may include convertible bonds
      - Preferred stock
  - ***Understanding of an issuer's corporate structure***
    - ✓ Subsidiaries' dividends are paid out of earnings after they satisfy of all their other obligations.
    - ✓ The parent's reliance on cash flow from its subsidiaries means that parent's debt is structurally subordinated to the subsidiaries' debt and have a lower recovery rating in default.
      - However, a parent company's credit rating may be superior to subsidiaries' ratings because the parent can benefit from having access to multiple cash flows from diverse subsidiaries.
    - ✓ Leverage ratios should be calculated at each of the debt-issuing entities, as well as a consolidated basis

Fundamentals of Credit Analysis

- Special considerations of high-yield credit analysis:
  - ***Covenant analysis***
    - ✓ **Change of control put**
      - This covenant gives debt holders the right to require the issuer to buy back debt (typically for par value or a value slightly above par) in the event of an acquisition.
      - For investment grade bonds, a change of control put typically applies only if an acquisition of the borrower results in a rating downgrade to below investment grade.
    - ✓ **Restricted payments**
      - The covenant protects lenders by limiting the amount of cash that may be paid to equity holders.
    - ✓ **Limitations on liens**
      - The covenant limits the amount of secured debt that a borrower can carry.
      - Unsecured debt holders prefer the issuer to have less secured debt, which increases the recovery amount available to them in the event of default.
    - ✓ **Restricted versus unrestricted subsidiaries**
      - Restricted subsidiaries' cash flows and assets can be used to service the debt of the parent holding company

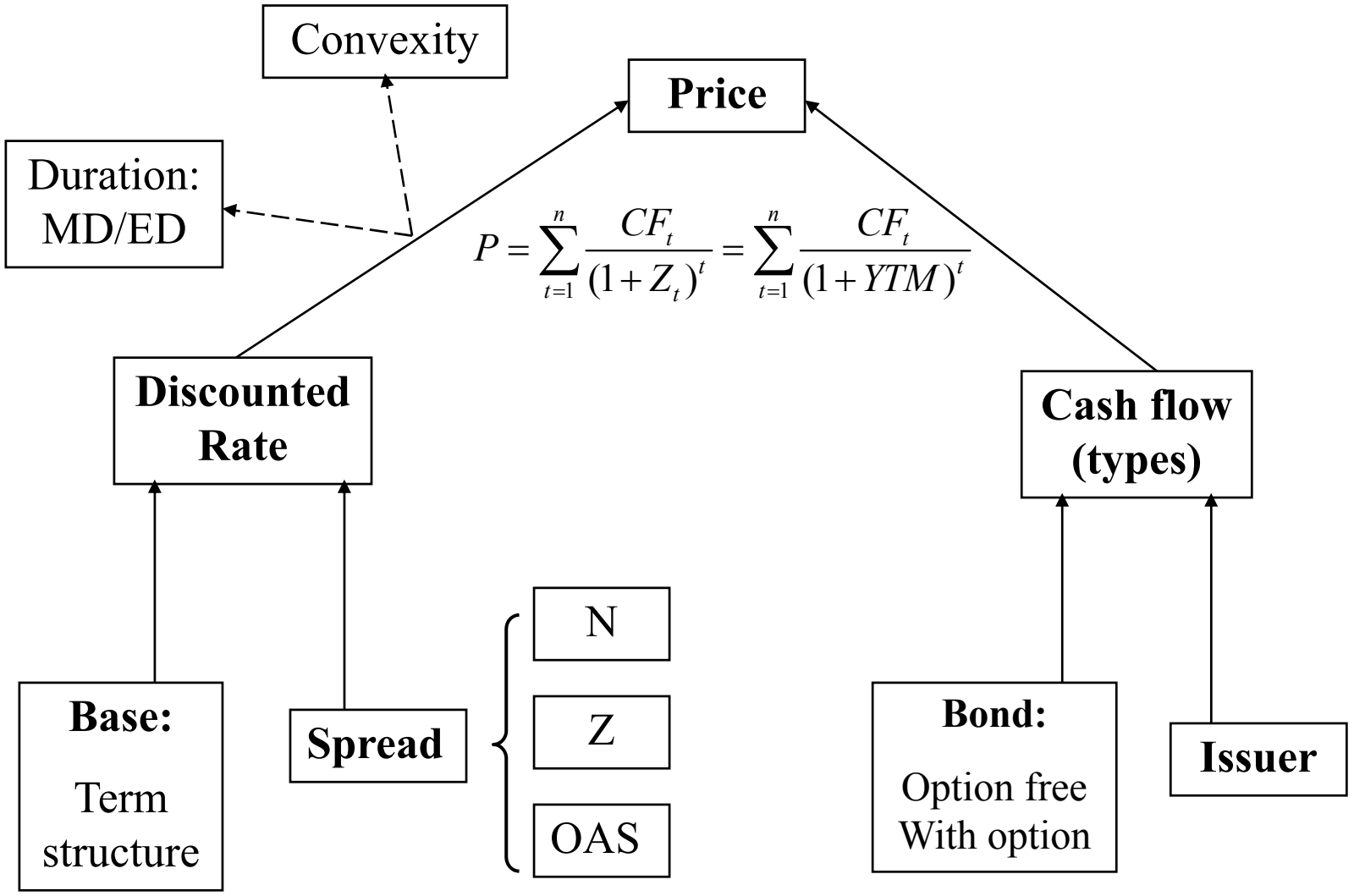
Fundamentals of Credit Analysis

- ***Sovereign debt*** is issued by national governments.
- ***Sovereign credit analysis*** is based on a combination of qualitative and quantitative factors:
  - A government's ability to pay
  - Its willingness to pay
    - ✓ The assessment of willingness is important because bondholders usually have no legal recourse if a national government refuses to pay its debts.

Fundamentals of Credit Analysis

- ***Municipal debt***: general obligation (GO) bonds and revenue-backed bonds
  - ***GO bonds***
    - ✓ backed by the taxing authority of the issuing municipality
    - ✓ The credit analysis has some similarities to sovereign analysis
  - ***Revenue-backed 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.
    - ✓ ***Debt service coverage ratio (DSCR):*** the ratio of the project's net revenue to the required interest and principal payments on the bonds.
      - ◆ Many revenue bonds include a covenant requiring a minimum DSCR to protect the lenders' interests.

Fixed Income Framework



100% Contribution Breeds Professionalism

It’s not an end but just the beginning.

If there is anyone out there who still questions that China is a place where everything is possible, who wonders if the dream of our founders is alive in our time, who doubts what we can achieve, today is the answer.

It’s an answer told by the days and the nights in which we shared our views.

Good luck to everybody!

金程教育
GOLDEN FUTURE
可信赖的财经培训专家

CFA一级培训项目

Portfolio Management

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Topic Weightings in CFA Level I

Session NO.	Content	Weightings
Study Session 1	Ethics & Professional Standards	15
Study Session 2-3	Quantitative Analysis	12
Study Session 4-6	Economics	10
Study Session 7-10	Financial Reporting and Analysis	20
Study Session 11	Corporate Finance	8
Study Session 12	Portfolio Management	5
Study Session 13-14	Equity Investment	10
Study Session 15-16	Fixed Income	12
Study Session 17	Derivatives	5
Study Session 18	Alternative Investments	3

Framework of Portfolio Management

- SS 12 — Portfolio Management
  - R42 Portfolio Management: An Overview
  - R43 Portfolio Risk and Return: Part I
  - R44 Portfolio Risk and Return: Part II
  - R45 Basic of Portfolio Planning and Construction

R42 Portfolio Management: An Overview

- Portfolio perspective
  - Definition: evaluate individual investments by their contribution to the risk and return of an investor's portfolio.
  - Diversification allows an investor to reduce portfolio risk without necessarily reducing the portfolio's expected return.
  - During periods of financial crisis, correlations tend to increase, which reduces the benefits of diversification.

R42 Portfolio Management: An Overview

- The types of investment management clients
  - Individual investors
  - DC pension plan: the individual makes the investment decisions and takes on the investment risk.
  - DB pension plan: be funded by company contributions and have an obligation to provide specific benefits to retirees.
  - Endowment: a fund that is dedicated to providing financial support on an ongoing basis for a specific purpose.
  - Foundation: a fund established for charitable purposes to support specific types of activities or to fund research related to a particular disease.
  - Bank
  - Insurance company
  - Investment companies
  - Mutual funds
  - Sovereign wealth funds: pools of assets owned by a government.

R42 Portfolio Management: An Overview

- Characteristics of different types of investors

Investor	Risk Tolerance	Investment Horizon	Liquidity Needs	Income Needs
Individuals	Depends on individual	Depends on individual	Depends on individual	Depends on individual
DB pensions	Low	Long	Low	Depends on age
Banks	Low	Short	High	Pay interest
Endowments	High	Long	Low	Spending level
Insurance	Low	Long—life Short—P&C	High	Low
Mutual funds	Depends on fund	Depends on fund	High	Depends on fund

R42 Portfolio Management: An Overview

- Defined contribution pension plan: a retirement plan in which the firm contributes a sum each period to the employee's retirement account.
  - The employer makes no promise regarding the future value of the plan assets
  - The employee assumes all of the investment risk.
- Defined benefit pension plan: the firm promises to make periodic payments to employees after retirement.
  - The employer assumes the investment risk.

R42 Portfolio Management: An Overview

- **Planning step:**
  - Analysis of the investor's risk tolerance, return objectives, time horizon, tax exposure, liquidity needs, income needs, unique circumstances;
  - IPS: details the investor's investment objectives and constraints; specify an objective benchmark; updated at least every few years and anytime the investor's objectives or constraints change significantly.
- **Execution step:** asset allocation; top-down analysis & bottom-up
- **Feedback step:**
  - monitor and rebalance the portfolio;
  - Measure portfolio performance.

R42 Portfolio Management: An Overview

- **Mutual funds**: combine funds from many invertors into a single portfolio that is invested in a specified class of securities or to match a specific index
  - Open-ended shares: can be bought or sold at the net asset value
  - Closed-ended funds: have a fixed number of shares that trade at a price determined by the market
- **Exchanged-traded funds**: similar to mutual funds, but investors can buy and sell FTF shares in the same way as shares of stock
- **Separately managed accounts**: is owned by a single investor and managed according to his own needs and preferences
- **Hedge funds**: are limited in the number of investors and exempt from most reporting requirements
- **Buyout funds**: taking a company private by buying all available shares, funded by issuing debt.
- **Venture capital funds**: companies purchased are in the start-up phase.

R43 Portfolio Risk and Return: Part I

- **HPR:** percentage increase in the value of an investment over given time period.
- **Average return**
  - Arithmetic mean return: unbiased estimator of the true mean
  - Geometric mean return: compound annual rate
  - Money-weighted rate of return: IRR
- **Other return measures**
  - Gross return: total return before management and administration fees
  - Pretax nominal return
  - After-tax nominal return
  - Real return
  - Leveraged return: the gain or loss as a percentage of an investor's cash investment. (real estate)

R43 Portfolio Risk and Return: Part I

- Asset classes with the greatest average returns also have the highest standard deviations of returns.
- Liquidity should be considered when invest, especially in emerging markets and for securities that trade infrequently.

R43 Portfolio Risk and Return: Part I

An individual investment:

- Expected Return $$E(R) = \sum_{i=1}^{n} P_i R_i = P_1 R_1 + P_2 R_2 + \Lambda + P_n R_n$$
- Variance of Return $$\text{Var} = \sigma^2 = \sum_{i=1}^{n} [R_i - E(R)]^2 P_i$$
- Standard Deviation of Return $$\text{SD} = \sigma = \sqrt{\sum_{i=1}^{n} [R_i - E(R)]^2 P_i}$$

Covariance

- Using expectation data $Cov_{1,2} = \sum_{i=1}^{n} P_i[R_{i,1} - E(R_1)][R_{i,2} - E(R_2)]$

- Using historical data $Cov_{1,2} = \frac{1}{n-1}\sum_{t=1}^{n}[R_{t,1} - \overline{R_1}][R_{t,2} - \overline{R_2}]$

➢ **Correlation** $\rho_{1,2} = \frac{Cov_{1,2}}{\sigma_1 \sigma_2}$ $Cov_{1,2} = \rho_{1,2}\sigma_1\sigma_2$

R43 Portfolio Risk and Return: Part I

➢The portfolio standard deviation formula

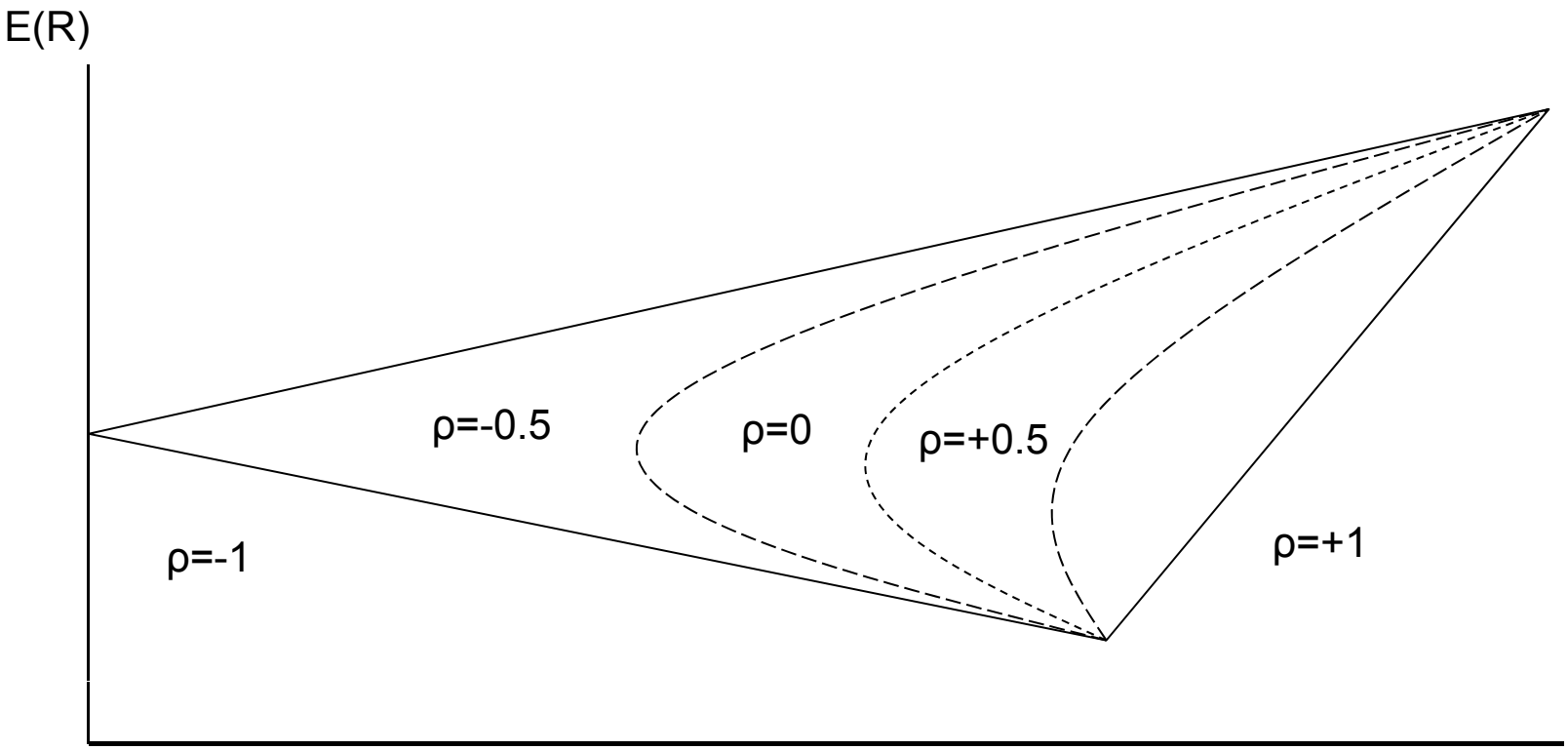
$$\sigma_P = \sqrt{\sigma_P^2} = \sqrt{\sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j Cov_{i,j}}$$

- The risk of a portfolio of risky assets depends on the asset weights and the standard deviations of the assets returns, and crucially on the correlation (covariance) of the asset returns.
- The lower the correlation between the returns of the stocks in the portfolio, all else equal, the greater the diversification benefits.
- Two-asset portfolio:

$$\sigma_p^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2COV_{1,2}$$
$$= w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_1\sigma_2\rho_{1,2}$$

R43 Portfolio Risk and Return: Part I

- Risk and return for different values of correlation



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R43 Example

- If the correlation coefficient is 0.75 , what is the portfolio's standard deviation?

A. 10.6%

B.12.4%

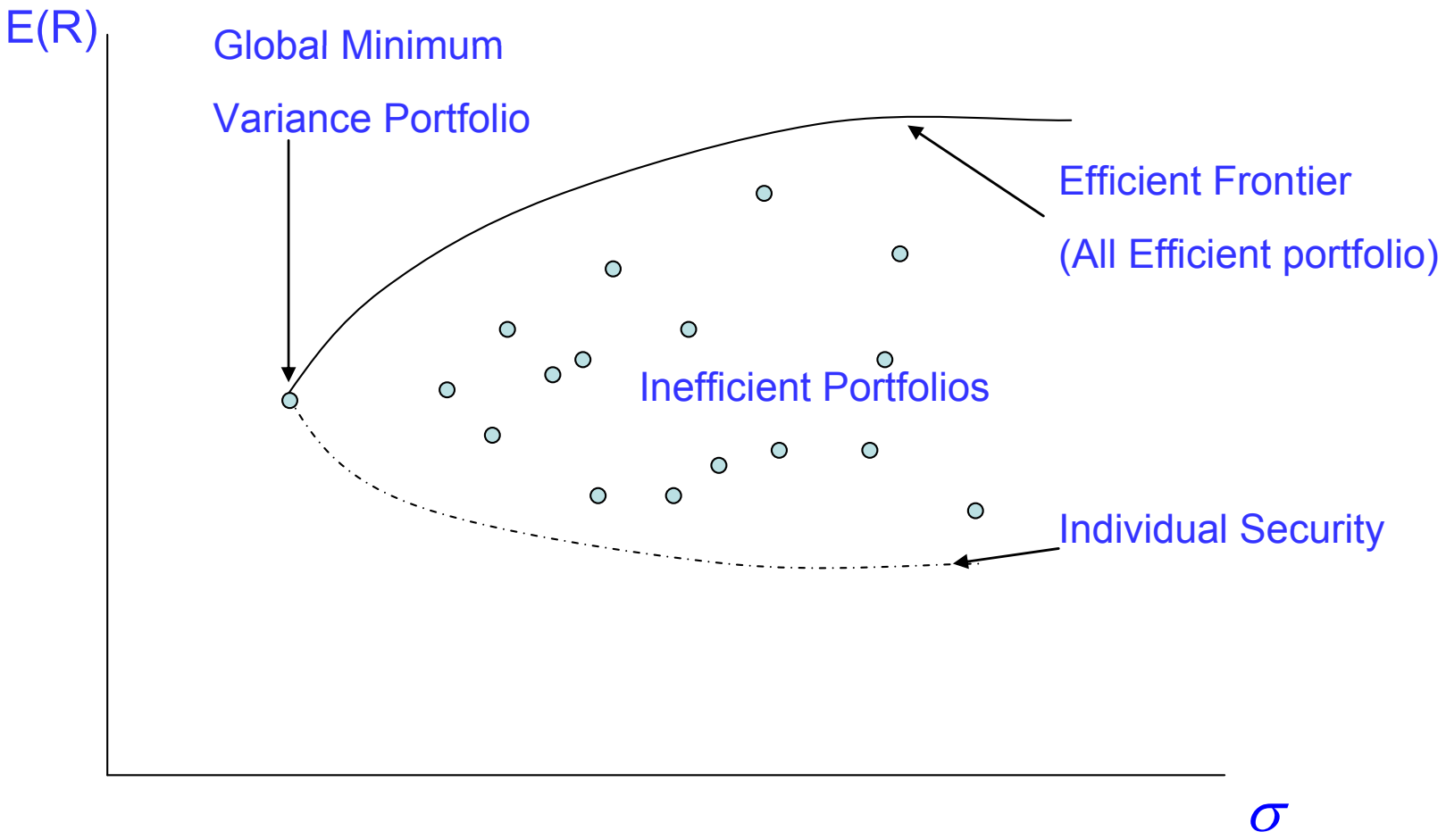
C.15.0%

- The correct answer is: A

$$\sqrt{(0.25)^2(0.15)^2+(0.75)^2(0.10)^2+2(0.25)(0.75)(0.15)(0.10)(0.75)}=$$

$$\sqrt{0.001406+0.005625+0.004219}=\sqrt{0.01125}=0.106=10.6\%$$

R43 Portfolio Risk and Return: Part I



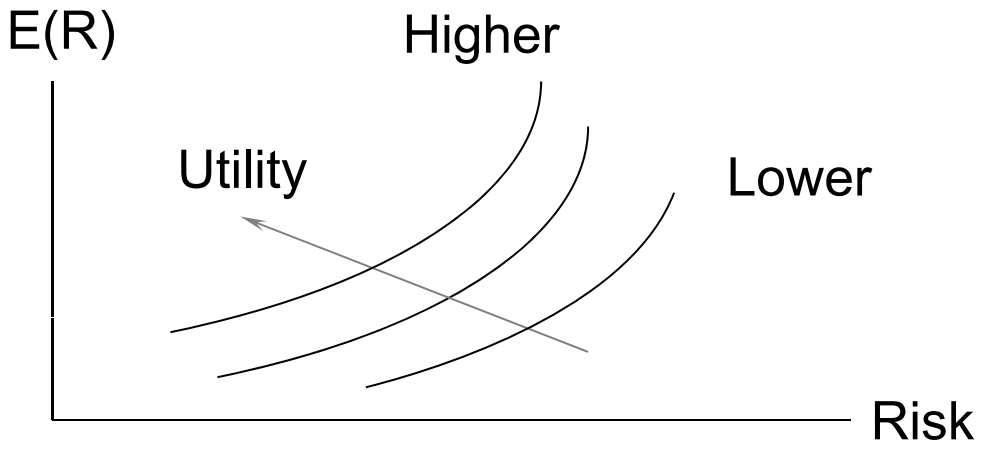
R43 Portfolio Risk and Return: Part I

- Minimum variance frontier
  - Portfolios that have minimum variance for each given level of expected return
  - Global minimum variance portfolio
- Efficient frontier
  - All risky assets are contained
  - Efficient portfolio: well-diversified or fully-diversified

R43 Portfolio Risk and Return: Part I

➢Risk aversion

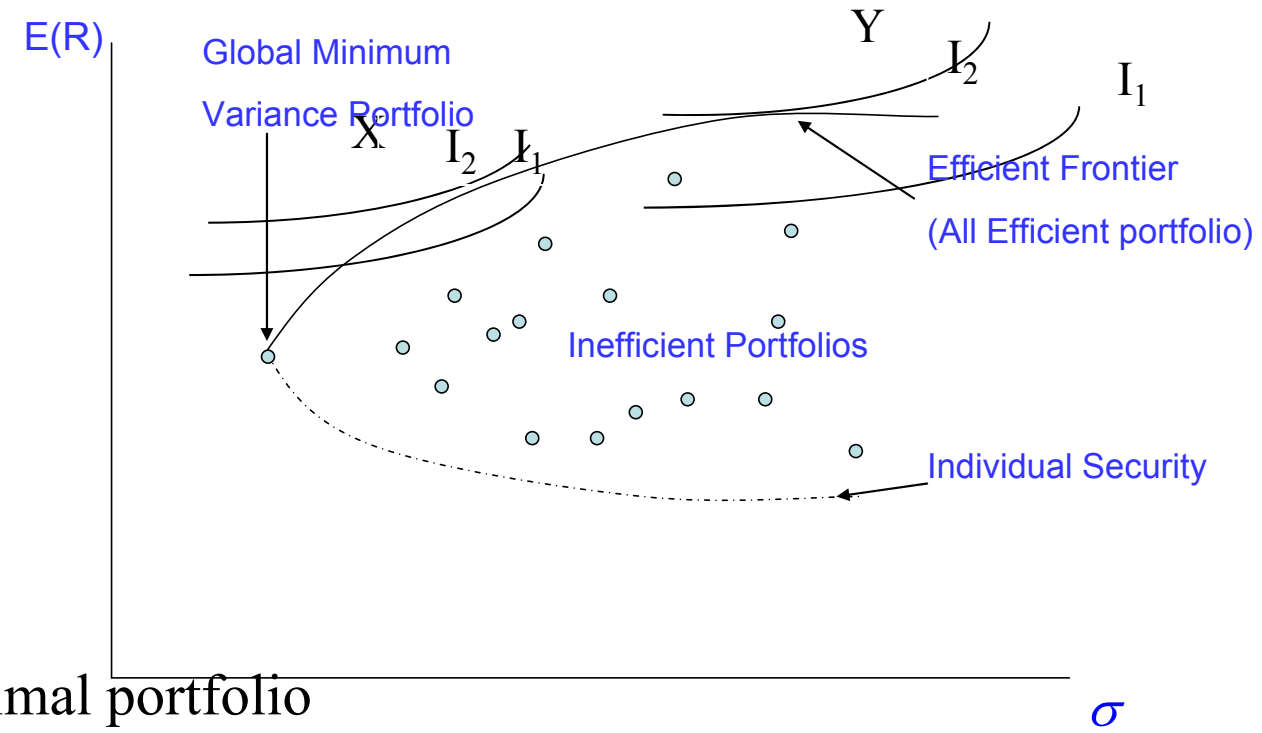
- Refers to the fact that individuals prefer less risk to more risk.
- Risk-averse investors:
  - ✓Prefer lower to higher risk for a given level of expected returns
  - ✓Will only accept a riskier investment if they are compensated in the form of greater expected return



R43 Portfolio Risk and Return: Part I

The optimal portfolio for an investor

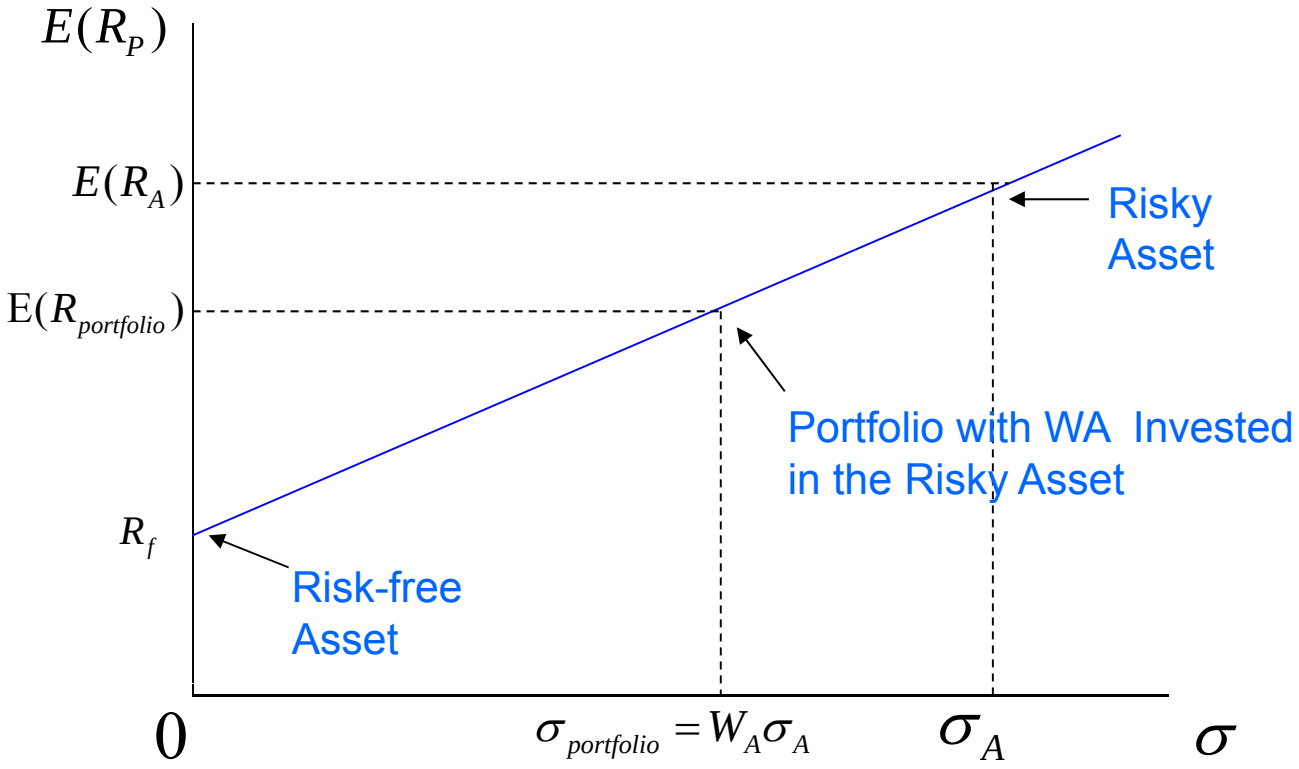
- At the point of where an investor's (highest) risk-return indifference curve is tangent to the efficient frontier.



➢Optimal portfolio

- The highest indifference curve that is tangent to the efficient frontier
- Different investors may have different optimal portfolios

R44 Portfolio Risk and Return: Part II



$$E(R_P) = W_A E(R_A) + W_B E(R_B)$$

$$\sigma_P = \sqrt{W_A^2\sigma_A^2 + W_B^2\sigma_B^2 + 2W_A W_B \rho_{AB}\sigma_A\sigma_B}$$

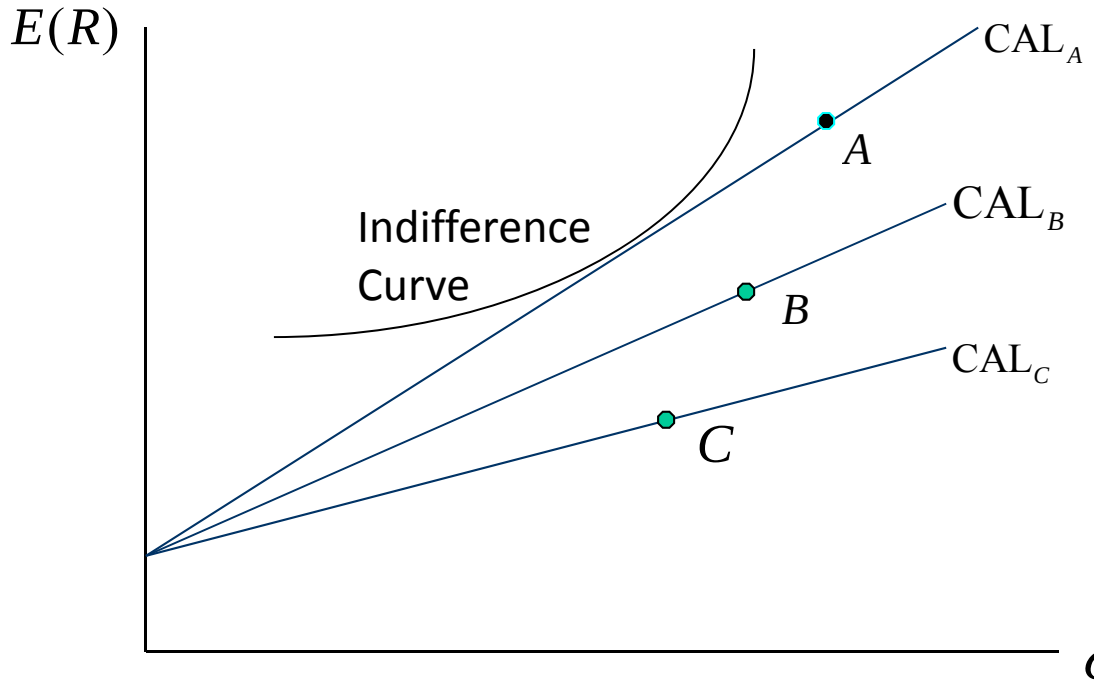
$$\sigma_P = \sqrt{W_A^2\sigma_A^2} = W_A\sigma_A$$

R44 Portfolio Risk and Return: Part II

- Two-fund separation theorem:
  - Combining a risky portfolio with a risk-free asset
  - All investors' optimum portfolios will be made up of some combination of an optimal portfolio of risky assets and the risk-free asset.
- CAL
  - The line representing these possible combinations of risk-free assets and the optimal risky asset portfolio.

R44 Portfolio Risk and Return: Part II

- Risky Portfolios and Their Associated Capital Allocation Lines for Different investors



- If each investor has different expectations about the expected returns of, standard deviations of, or correlations between risky asset returns, each investor will have a different optimal risky asset portfolio and a different CAL

R44 Portfolio Risk and Return: Part II

- **The Market Portfolio:**
  - Is the tangent point where the CML touches the Markowitz efficient frontier.
  - Consists of every risky assets
  - The weights on each asset are equal to the percentage of the market value of the asset to the market value of the entire market portfolio.

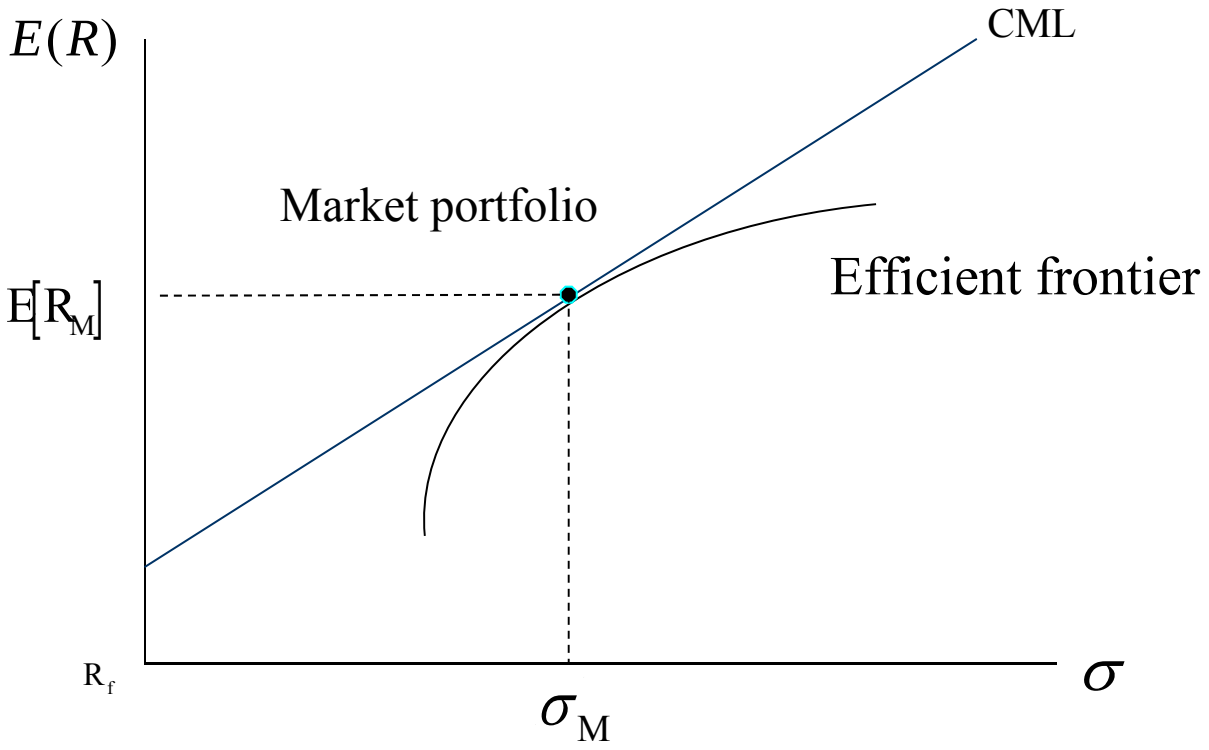
R44 Portfolio Risk and Return: Part II

- Capital market line
  - When investors share identical expectations about the mean returns, variance of returns, and correlations of risky assets, the CAL for all investors is the same and is known as the capital market line (CML):

$$E(R_P) = R_F + \frac{E(R_M) - R_F}{\sigma_M}\sigma_P$$

  - The market portfolio
  - Explanation of the CML
- Investment using CML follow a passive investment strategy (i.e., invest in an index of risky assets that serves as a proxy for the market portfolio and allocate a portion of their investable assets to a risk-free asset.)
- Difference between the CML and the CAL

R44 Portfolio Risk and Return: Part II



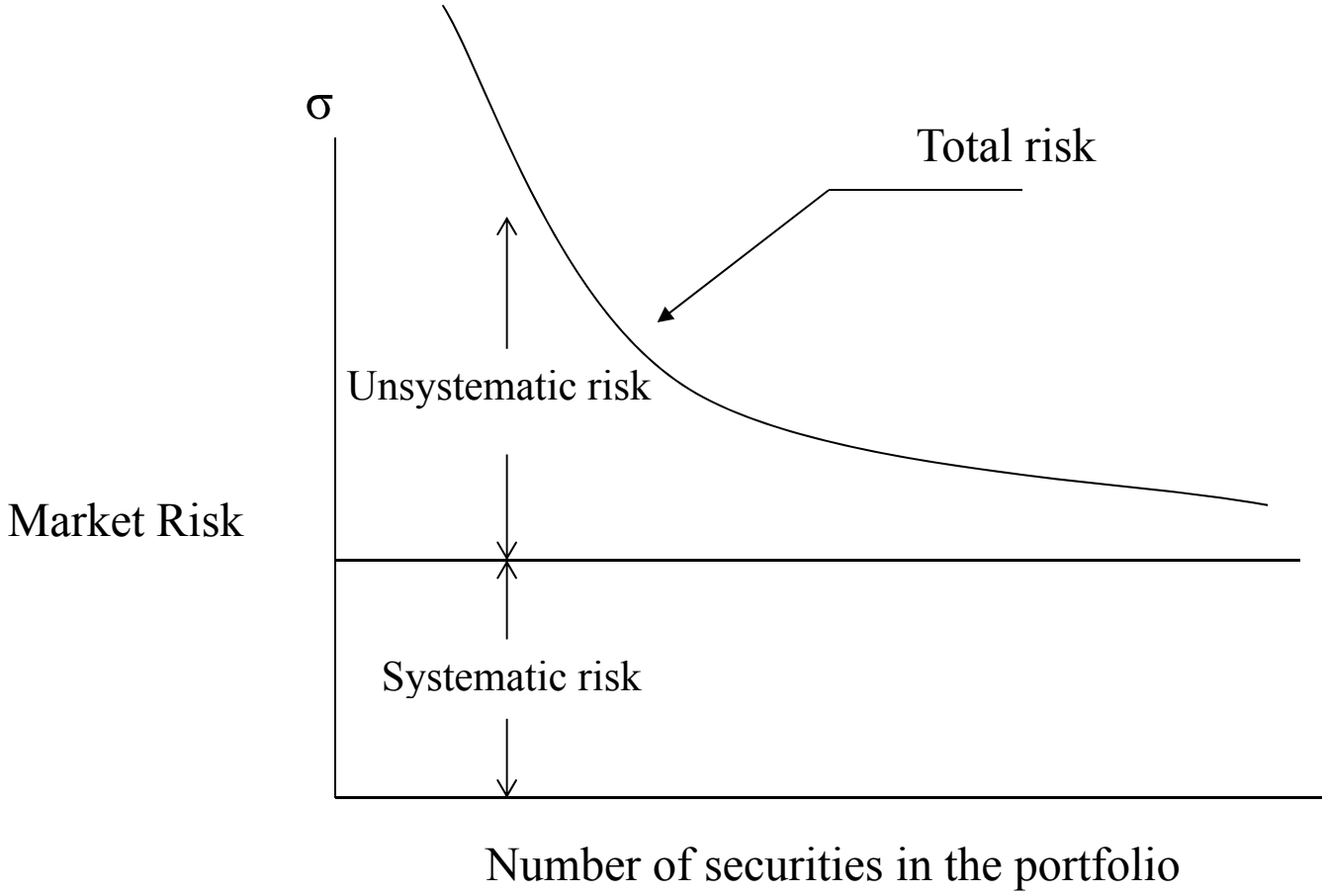
$$E(R_P) = R_F + \frac{E(R_M) - R_F}{\sigma_M}\sigma_P$$

R44 Portfolio Risk and Return: Part II

- **Unsystematic risk (or unique, diversifiable, firm-specific risk):**
  - The risk that disappears in the portfolio construction process
- **Systematic risk (or market risk):**
  - The risk that is left cannot be diversified away.
  - Total risk = systematic risk + unsystematic risk

R44 Portfolio Risk and Return: Part II

- **Risk vs. Number of portfolio Assets**



R44 Portfolio Risk and Return: Part II

➢ Systematic Risk is Relevant in Portfolios

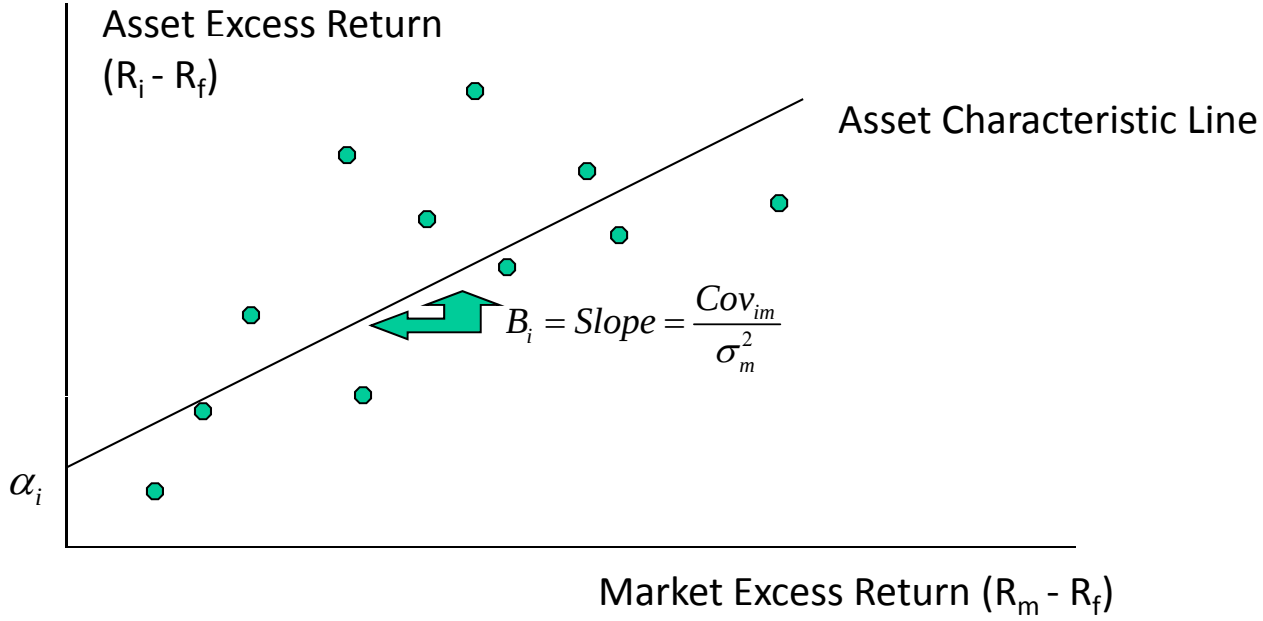
- One important conclusion of capital market theory:
  - ✓Equilibrium security returns depend on a stock's or a portfolio's systematic risk, not its total risk as measured by standard deviation.
- One of the assumptions of the model :
  - ✓Diversification is free, because investors will not be compensated for bearing risk that can be eliminated at no cost.

R44 Portfolio Risk and Return: Part II

- Beta: the sensitivity of an asset's return to the return on the market index in the market model.

$$\beta_i = \frac{Cov_{i,mkt}}{\sigma^2_{mkt}} = (\frac{\sigma_i}{\sigma_{mkt}}) \times \rho_{i,mkt}$$

- Asset characteristic line (regression of asset excess returns against market asset returns)



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R44 Portfolio Risk and Return: Part II

- Return generating models: multifactor models
  - Macroeconomic factors: GDP growth, inflation, or consumer confidence
  - Fundamental factors: earnings, earnings growth, firm size, and research expenditures
  - Statistical factors

$$E(R_i) - R_F = \beta_{i,1} \times E(Factor1) + \beta_{i,2} \times E(Factor2) + \ldots + \beta_{i,k} \times E(Factork)$$

- Market model
  - A single factor model
  - The only factor is the expected excess return on the market portfolio (market index)

$$E(R_i) - R_f = \beta_i (E(R_M) - R_f)$$

R44 Portfolio Risk and Return: Part II

➢The Equation of SML

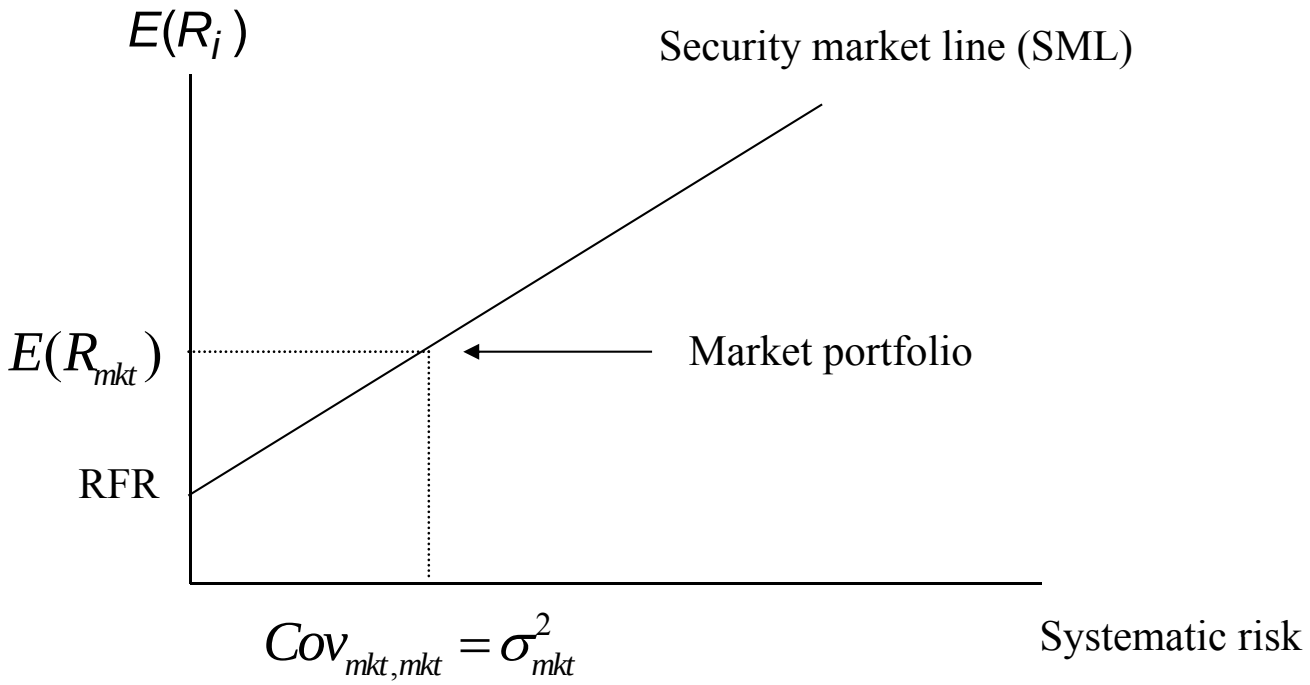
$$E(R_i) = RFR + \beta_i [E(R_{mkt}) - RFR]$$

➢ Beta

- A standardized measure of systematic risk.

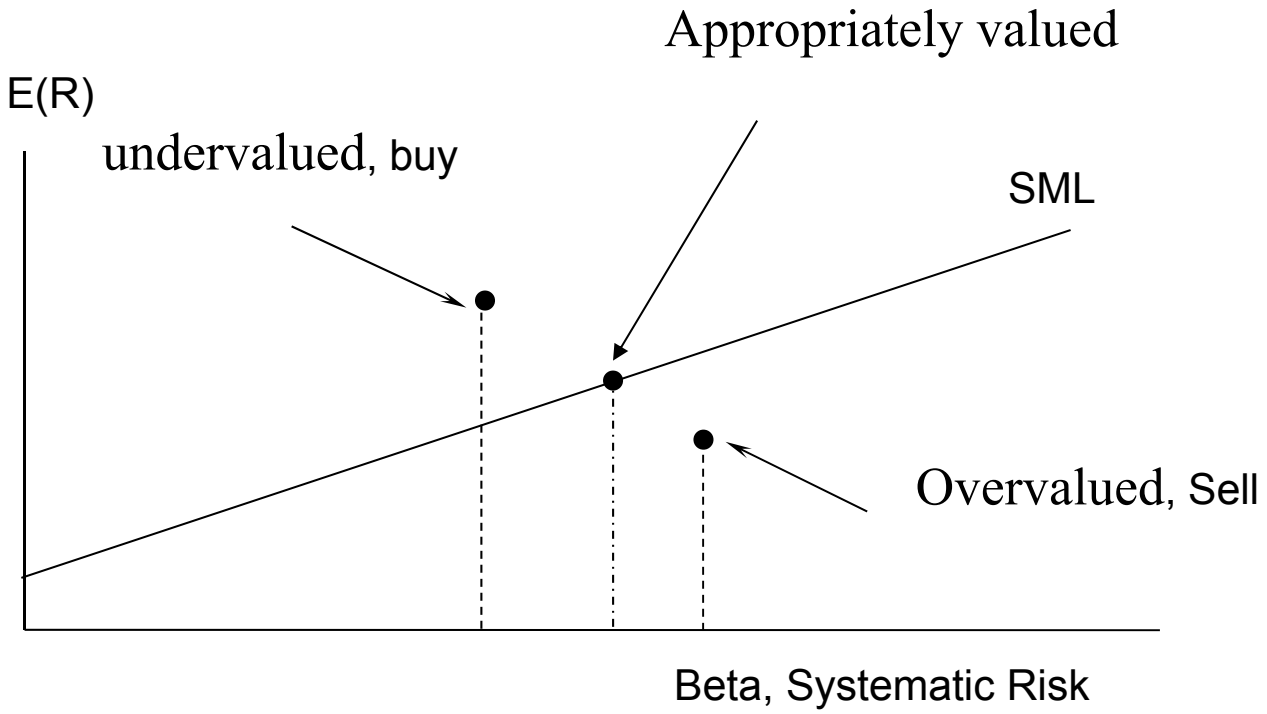
R44 Portfolio Risk and Return: Part II

Capital Asset Pricing Model



R44 Portfolio Risk and Return: Part II

- **How to judge if a stock is properly valued**



Example

- The risk-free rate is 6%, and the expected market return is 15%. A stock with a beta of 1.2 is selling for $25 and will pay a $1 dividend at the end of the year. If the stock is priced at $30 at year-end, it is:

  A. overpriced, so short it.

  B. underpriced, so buy it.

  C. underpriced, so short it.

- The correct answer is : B

  Required rate = 6+ 1.2 (15-6) = 16.8%

  Required on stock = (30-25+1)/25 = 24%

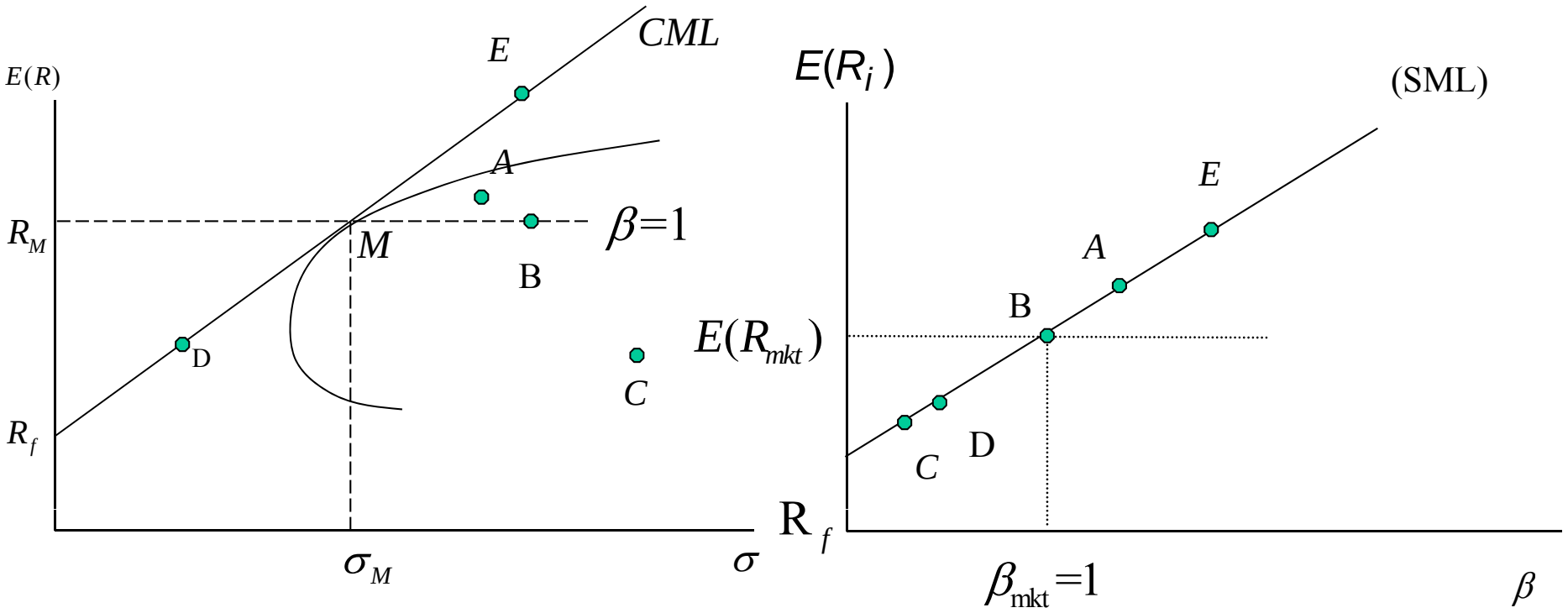
  Based on risk, the stock plots above the SML and is underpriced, so buy it.

R44 Portfolio Risk and Return: Part II

- Differences between the SML and the CML

	SML	CML
Measure of risk	Uses systematic risk (non-diversifiable risk)	Uses standard deviation (total risk)
Application	Tool used to determine the appropriate expected (benchmark) returns for securities	Tool used to determine the appropriate asset allocation (percentages allocated to the risk-free asset and to the market portfolio) for the investor
Definition	Graph of the capital asset pricing model	Graph of the efficient frontier
Slope	Market risk premium	Market portfolio Sharpe ratio

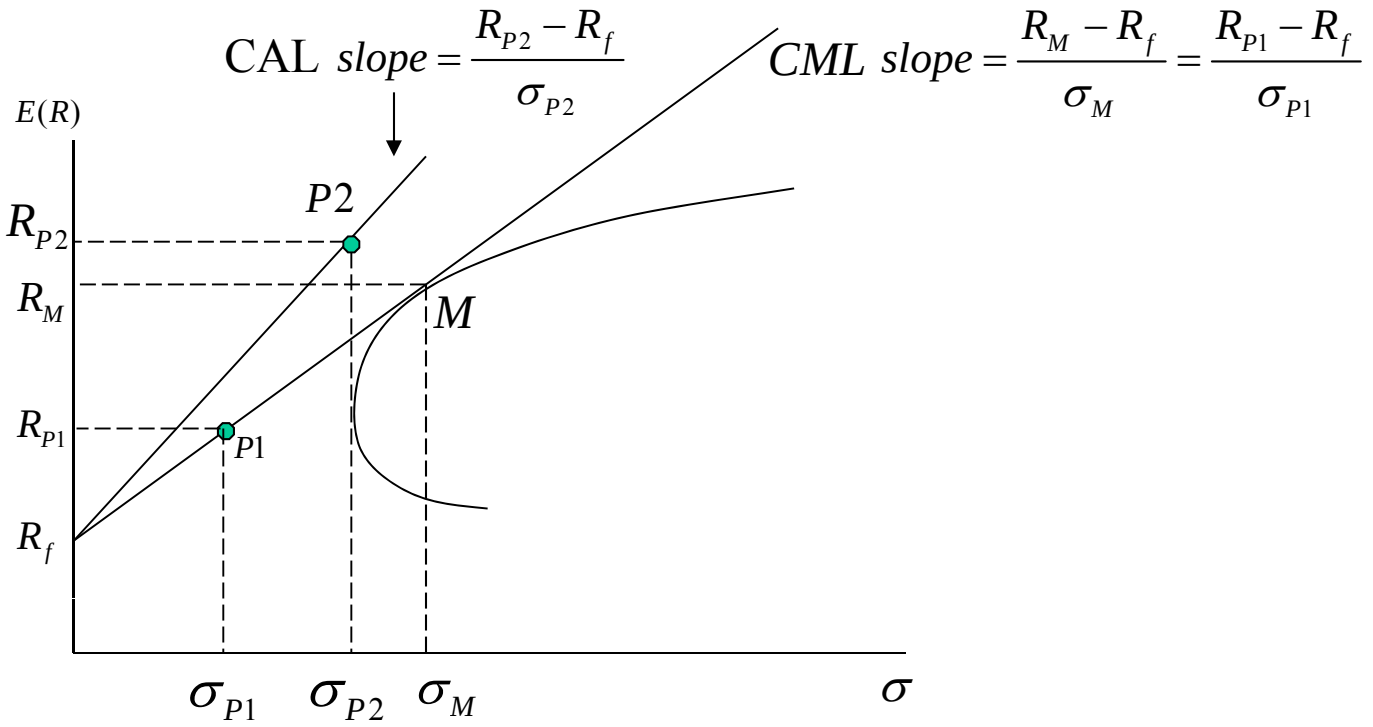
R44 Portfolio Risk and Return: Part II



R44 Portfolio Risk and Return: Part II

Evaluate relative portfolio performance (risk-adjusted returns)

$$\text{Sharpe ratio} = \frac{R_P - R_f}{\sigma_P}$$

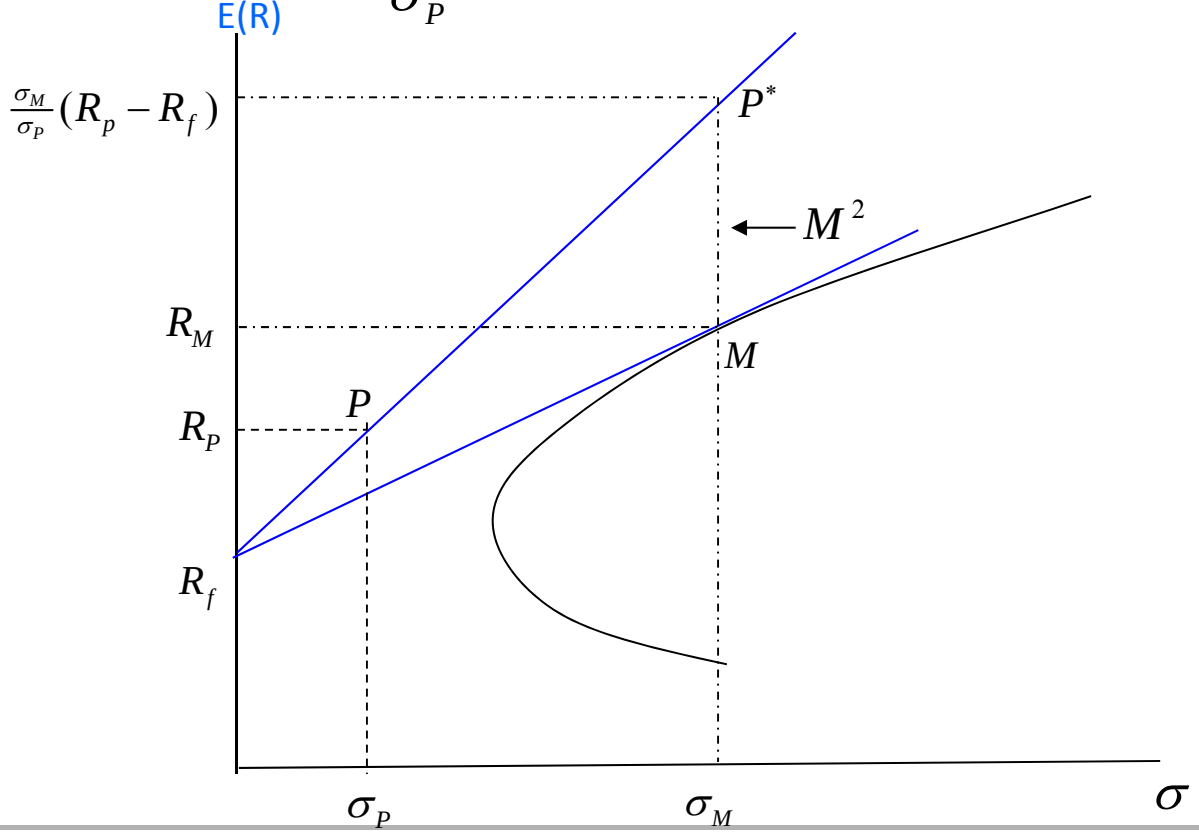


- The Sharpe ratio for any portfolio along the CML is the same.

R44 Portfolio Risk and Return: Part II

- The M-squared (M^2) measure produces the same portfolio rankings as the Sharpe ratio but is stated in percentage terms.

$$M^2 = (R_P - R_f)\frac{\sigma_M}{\sigma_P} - (R_M - R_f)$$



Notes:
- The M-squared (M^2) measure produces the same portfolio rankings as the Sharp ratio but is stated in percentage terms.
- M^2 and SR for not well-diversified

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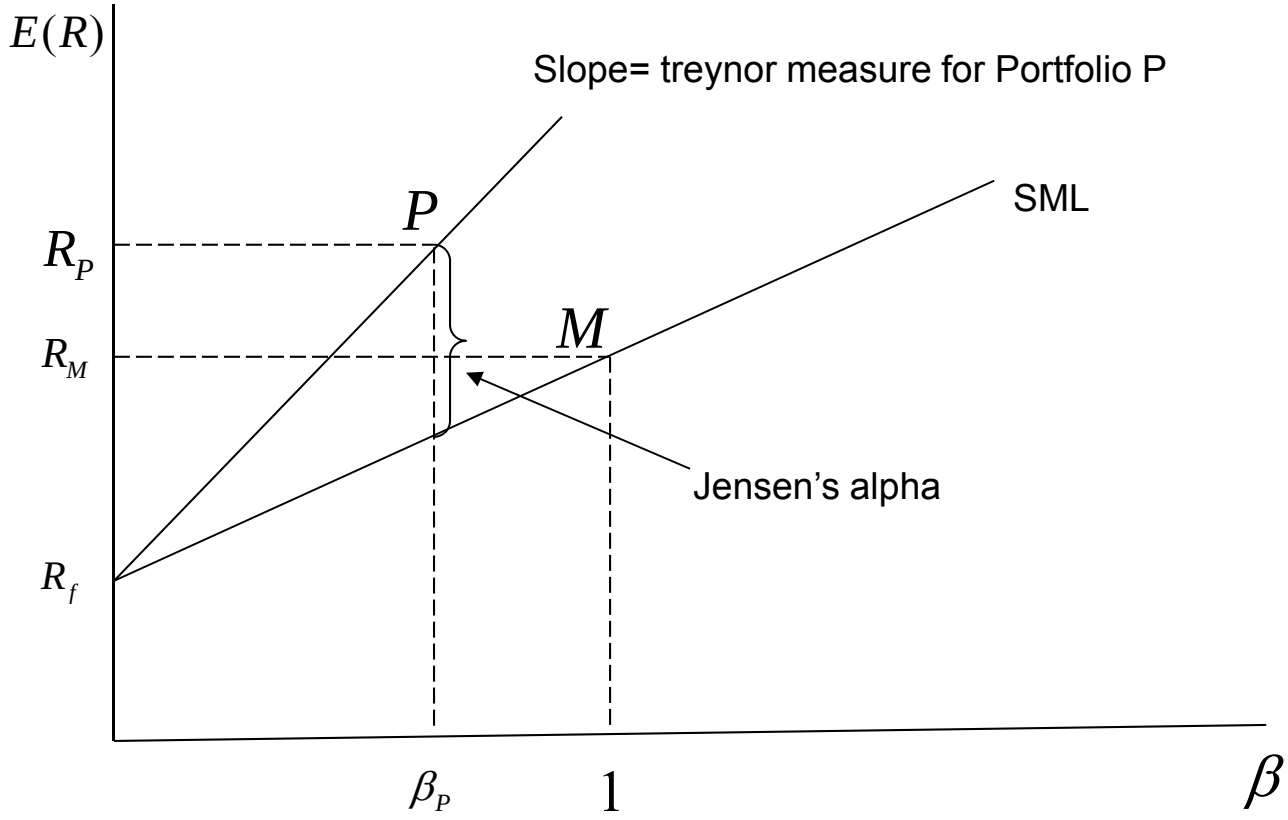
R44 Portfolio Risk and Return: Part II

- Treynor measure & Jensen's alpha (systematic risk)

$$\text{Treynor measure} = \frac{R_P - R_f}{\beta_P} \qquad \alpha_P = (R_P - R_f) - \beta_P (R_M - R_f)$$



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R45 Basic of Portfolio Planning and Construction

➢**The need for a policy statement**

- Understand and articulate realistic investor goals, needs and risk tolerance
- Ensure that goals are realistic
- Provide an objective measure of portfolio performance

➢**Major components of IPS**

- Description of client
- Statement of the purpose
- Statement of duties and responsibilities
- Procedures to update IPS and to respond to various possible situations
- Investment objectives
- Investment constraints
- Investment guidelines
- Evaluation of performance
- Appendices: information on asset allocation

R45 Basic of Portfolio Planning and Construction

- **Investment objectives: risk and return**
- Risk objective
  - The risk objective limits how high the investor can set the return objective
  - Risk measurement: absolute (std dev.), relative (tracking risk), downside risk (VAR)
  - Risk tolerance: willingness and ability

Situation		Risk tolerance
willingness > ability		ability (education)
willingness < ability	return objective = willingness	willingness (reevaluation)
	return objective = ability	ability (education)

R45 Basic of Portfolio Planning and Construction

- Return objectives
  - Return measurement: total return, inflation-adjusted return, after-tax return
  - Total return perspective: balance between capital gains and income
  - Stated return desire vs. Required return
  - Consistent with risk objective

R45 Basic of Portfolio Planning and Construction

- **Investment constraints**
  - **Liquidity—**for cash spending needs (anticipated or unexpected)
  - **Time horizon—**the time between making an investment and needing the funds
  - **Tax concerns—**the tax treatments of various accounts, and the investor's marginal tax bracket
  - **Legal and regulatory factors—**restrictions on investments in retirement, personal, and trust accounts
  - **Unique needs and preferences—**constraints because of investor preferences or other factors not already considered

R45 Basic of Portfolio Planning and Construction

- **Strategic asset allocation:**
  - combine the IPS and capital market expectations to formulate weightings on acceptable asset classes
  - Specify the percentage allocations to the included asset classes
  - Correlations within the class & correlations between asset classes

Asset Class	Target
Cash	0%
U.S. large-cap equity	12%
U.S. small-/mid-cap equity	6%
International (developed) equity	12%
Emerging market equity	6%
U.S. bonds	18%
Global bonds	8%
High –yield bonds	5%
Emerging market debt	3%
Inflation-protected bonds	3%
Real estate	5%
Hedge funds	5%
Private equity	2%
Commodities	0%
Tactical asset allocation and other	15%
TOTAL	*100%*

Active portfolio management

- **Tactical asset allocation:** a manager who varies from strategic asset allocation weights in order to take advantage of perceived short-term opportunities. Depend on:
  - The manager's ability to identify shot-term opportunities in specific asset classes;
  - The existence of such short-term opportunities.
- **Security selection:** deviation from index weights on individual securities within an asset class. Depend on:
  - The manager's skill
  - The opportunities with in a particular asset class.

It’s not the end but just the beginning.

If you have people you love, allow them to be free beings. Give and don't expect. Advise, but don't order. Ask, but never demand. It might sound simple, but it is a lesson that may take a lifetime to truly practice. It is the secret to true Love. To truly practice it, you must sincerely feel no expectations from those who you love, and yet an unconditional caring.

如果你有爱的人，允许他们自由随意的存在。给予而不指望；建议而不命令；请求而不要求；可能听起来简单，但这需要一辈子去实践。这就是真爱的秘诀。真正去实践它，你必须对那些你爱的人没有期望，并给予无条件的关爱。