- **Market Organization and Structure**
- **Security Market Indexes**
- **Efficient market hypothesis**

Market Organization and Structure

Purpose

- Achievement of purpose
    - Saving, borrowing, issue capital, risk management, exchanging assets, utilizing information
- Discovery rates
- Allocation of capital

Assets and markets

- Financial (securities, derivative, currencies) and real assets
- Financial: Debt (repay) and equity (**ownership**)
- Public (exchange or dealer, regulation) and private (illiquid, no regulation)
- Derivative
    - Financial and physical
- Spot and other (futures, forward, options) market
- Primary (issue) and secondary (trade) market
- Money (debt less than one-year maturity) and capital (long-term debt and equity)
- Traditional (bond, equity) and alternative (hedge, private, real estate, lease, gemstones, commodities)
    - Alternative: illiquid, need DD, sell at discount

Securities

- Fixed income and equity, individual and pooled
    - Individual can be combined to **pooled** investment vehicles
- Fixed income
    - Short-term: <= one or two years
        - Corporate Commercial **paper**
        - bank certificates of **deposits**
        - Government **bills**
        - repo
    - Intermediate
        - notes
    - Long-term: five to ten year
        - Bond
    - Convertible bond: bond -> equity
- Equities
    - Common stock: residual claim
    - Preferred stock: scheduled dividend
    - Warrants: similar to options to buy stocks
- Pooled investment
    - Mutual fund

        - Open-end and close-end
    - Exchange-traded funds (ETF) and ETN (notes)
        - Similar to closed-end but
        - Depositories, share: depository receipts
    - ABS
    - Hedge fund
        - Short sell, Leverage, less regulation

Currencies

- Issued by government's central banks

Contracts

- Forward
- Futures
- Options
- Swaps
    - Interest rate swap: fixed-floating
    - Currency swap
    - Equity swap: debt-equity
    - CDS
- Insurances

Commodities

- Without store or deliver physical commodities

Real assets

- Real estate, equipment, machinery
- Direct
    - Illiquid, need DD
- indirect
    - REIT or MLP
    - Stocks of firms owning real assets

Financial intermediaries

- Brokers
    - Find counterparties in a cost-efficient manner
- Block brokers
    - Placement of large trades
- Prime brokers
    - Securities brokers provide **loan** to investors to purchase securities on **margin**
- Dealers
    - Buying and selling from own inventory
    - Provide liquidity in the market
    - Profit from spread (difference) between bid price and ask price
- Primary dealers

    - Trade with **central banks** when banks buy or sell government securities in order to affect the **money supply**
- Broker-dealers
    - Conflict of interest
- Exchange
    - Venue for traders, regulation
- Alternative trading system (ATS)
    - Also known as electronic communication networks (ECNs) or multilateral trading facilities (MTFs)
    - Dark pools: do not reveal current client orders
- Investment banks
    - Sell common/preferred stock, debt
    - Raise capital, M&A advice
- securitizers
    - Pool assets, structure (tranches), sell
    - Decrease funding cost
    - SPV or SPE (bankruptcy-remote)
- Depository institutions
    - Bank, credit unions, savings & loans
    - Payday lenders
    - Factoring companies
    - Finance by commercial paper
- Insurance companies
    - Moral hazard
    - Adverse selection
    - Fraud
- Arbitrageurs
    - Buy low and selling high the same asset in different markets
    - Provide liquidity
    - Exploit pricing or discrepancies
- Clearinghouses
    - Limit counterparty risk
- custodians
    - improve market integrity

Long and short

- long and short
    - long
        - who benefit from **increase** in **asset price**
    - short
        - who benefit from decrease in asset price
        - borrow asset, sell it, replace it in the future
- hedger
    - long an asset uses a short to hedge
- option
    - long: buyer or caller
    - short: seller or writer

- swap
  - each party is long one asset and short another asset
  - long: the party who benefit from an increase in **quoted** price or **rate**
- currency
  - each party is long one currency and short the other

Short sales and positions

- Process
  - **Borrow** securities through a broker
  - **Sell** securities through the broker
  - **Deposit** a portion of the **proceeds** with the broker
  - **Payment-in-lieu**
    - Pay all **dividends or interest** received to the broker
  - **Short rebate rate**
    - Brokers may pay **interests** on the **collateral**
    - Usually only provided to institutional investors
    - Typically, 0.1% less than overnight interest rates
    - Can be lower or **negative** if the security is difficult to borrow
  - **Repurchase** the asset upon **request** or the **close** of the short sale
    - No time limits
  - **Return** the asset to the broker
- Return
  - $\text{investment} = \text{begin value} \times \text{margin ratio} + \text{borrow commission}$
    - $\text{margin} = \text{begin value} \times \text{margin ratio}$
  - $\text{gross profit} = \text{begin value} - \text{end value}$
  - $\text{net profit} = \text{gross profit} - \text{securities dividend} - \text{commissions}$
    - $\text{commissions} = \text{borrow commission} + \text{sale commission}$
  - $\text{return} = \frac{\text{investment}}{profit}$
- Return when no transaction cost
  - $\text{return} = \frac{begin\ value - end\ value}{begin\ value \times margin\ ratio} = \frac{\text{gross return}}{\text{margin ratio}} = \text{gross return} \times \mathbf{leverage}$

Leveraged positions

- process
  - deposit margin to broker
    - initial margin
  - **margin loan** - borrow money from broker
  - **call margin rate**
    - need to pay interest on the margin loan
    - lower when large investors have better collateral
  - **receive** dividend or interest of the stock
  - sell stock
  - pay loan and interest back to broker
- leverage
  - $\text{equity} = \text{initial margin}$
  - $\text{asset} = \text{initial margin} + \text{loan}$
  - $\text{margin rate} = \frac{\text{margin}}{asset}$

- $\textbf{leverage} = \frac{\textbf{asset}}{\textbf{equity}} = \frac{\mathbf{1}}{\boldsymbol{margin}}$
- variation margin and **margin call**
  - when asset price drop and margin drop below **variation** margin
  - $\mathrm{P}_0 \times (1 - \mathrm{M}_0) = \mathrm{P} \times (1 - \mathrm{M}) \rightarrow \mathrm{P} = \mathbf{P_0} \times \frac{\mathbf{(1-M_0)}}{\mathbf{1-M}}$
- Return
  - $\text{begin value} = \text{margin} + \text{loan}$
    - $\text{margin} = \text{begin value} \times \text{margin ratio}$
    - $\text{loan} = \text{begin value} \times (1 - \text{margin ratio})$
  - $\textbf{investment} = \textbf{margin} + \textbf{purchase commission}$
  - $\text{gross profit} = \text{end value} - \text{begin value}$
  - $\text{net profit} = \text{gross profit} + \text{securities dividend} - \text{interst} - \text{commissions}$
    - $\text{dividend} = \text{dividend received from holding securities}$
    - $\text{interest} = \text{loan} \times \textbf{call margin rate}$
    - $\text{commissions} = \text{purchase commission} + \text{sale commission}$
  - $\text{return} = \frac{\text{investment}}{profit}$
- Cash flow
  - Beginning: $\textbf{investment}$
  - Ending: $\textbf{margin} + \textbf{net profit}$

Execution instructions - what

- Market
  - at the best current price
- Limit
  - Take the market: buy > ask
  - Make a new market: ask > buy > best bid
  - Make the market: buy = best bid
  - Behind the market: buy < best bid
  - Far from the market: buy << best bid
  - Standing limit orders
    - Limit orders waiting to be executed
- **All-or-nothing**
  - execute only if the whole order can be filled
- can specify minimum size of a trade
- Hidden
  - brokers or exchange receive them, but cannot disclose to other traders until they can **fill** them
- display size
  - some trade is visible to the market, but the rest is not
- Iceberg
  - any **additional** size is hidden from public but can be filled if suitably large order arrives

Validation instruction – when

- Day orders
  - good for the day. Not been filled by the close of business or expire unfilled

- Good-till-cancelled order (GTC)
    - filled or canceled manually
- Immediate-or-cancel/Fill-or-kill orders
    - cancelled unless they can be filled immediately
- Good-on-close
    - filled at the close of the trading day
- Market-on-close
    - Market orders filled at the end of the trading day
- Good-on-open
    - Filled at the open of the trading day
- **Stop/stop loss orders**
    - Not executed unless stop condition has been met which **triggers** an action
    - Stop-sell
        - Trigger a sell when price decline
        - hedge a long
    - Stop-buy
        - Trigger a buy when price increase
        - hedge a short
    - reinforce market momentum

Clearing instruction – how

- how to clear and settle a trade
- standing instructions and not attached to an order
- retail – settled by broker
- institutional trade
    - by a custodian or another broker (prime broker)
- whether a short sale or long sale order
    - short sale: confirm security can be borrowed
    - long sale: security can be delivered

Primary market

- Public offering
    - Indicators of interest
    - Book building
    - **Underwriting**
        - Buy all
    - **Best efforts**
        - No guarantee
    - Under price -> hot issue
- Private placement
    - Sold to qualified investors
    - No need to disclose
    - Issuance cost are less and offer prices is lower
    - Cannot be resold, lower price
- Shelf registration
    - Disclose once and then issue **over** time

- Dividend reinvestment plan
    - Existing shareholders use dividends to buy new shares at a **slight** discount
- Rights offering
    - Existing shareholders are given the rights to buy new shares at discount
    - Dislike: diluted

Secondary market

- Seasoned/secondary issues
    - **liquidity**
    - **price**/value information
- call and continuous
    - call: one negotiated price
    - continuous: any time, dealer or auction

market structure

- quote-driven
    - dealer/price-driven, OTC
- order-driven
    - exchange and automated trading
    - order matching
        - **price** priority
        - secondary precedence rule: **non-hidden earliest**
    - trading price
        - Uniform pricing
            - **One** price yield **highest** trading **volume**
        - Discriminatory pricing
            - Limit price of the **first** order
        - Derivative pricing
            - Batch orders and use average of spreads quotes from exchange
- Broker market
    - Arrange trades between customers
    - Hard to find **counterparty**
    - Unique, illiquid
    - Artwork, real estate, large block

Market Information

- Pre-trade transparent
    - Quotes and orders
- Post-trade transparent
    - Completed trade prices and sizes
- Dealer -> opaque (transaction costs and spread are large)

Well-functional financial system

- Operational efficient
    - Low trading **cost** (commission, spread, price impacts)

- Informationally efficient
    - Price reflect all information related to fundamental in **timely** fashion
- Allocational efficient
    - Capital is allocated to the most productive use

Market Regulation

- Problems without regulation
    - Fraud and theft
    - Insider trading
    - Costly information
    - Defaults
- Regulation
    - Protect investors
    - Prevent insiders
    - Require common financial reporting
    - Require minimum levels of capital

Security Market Indexes

Security market index

- The performance of an asset class
- **constituent** securities 成分证券
  - individual securities of the index
- index **value 指数值**
  - an index has a value calculated at point in time
- index **return 指数回报**
  - percentage change in index value over a period of time
  - $\text{index return} = \frac{\text{new index vlaue}}{old\ index\ value} - 1$

index value & return – price index and price return

- price index 价格指数
  - use only price
- price return 价格回报
  - based on price index

index value & return – return index and total return

- return index
  - use both price and incomes (dividend and interests) form securities
- total return
  - based on return index
- Price return and total return
  - Equal when no dividend or interest

Index construction

- what is the **target** market?
- Which **securities** should be included?
- How to **weight** securities?
- How often to **rebalance**?
- When should **re-examine** the selection and weight?

Weighting

- Initial price is $\mathrm{S_i}$, ending price is $\mathrm{E_i}$, return is $\mathrm{R_i} = \frac{E_i}{S_i} - 1$, Quantity is Q_i
- Price weighting
  - $R = \frac{\sum_{\mathrm{i}} E_i}{\sum_i S_i} - 1 = \sum_{\mathrm{i}} \frac{S_i}{TS} \times R_i$
  - weight is the relative price $\frac{S_i}{TS}$
- Equal weighting
  - $R = \sum_{\mathrm{i}} \frac{1}{N} \times R_i$
  - Weight is $\frac{1}{N}$
- Market capital weighting
  - $R = \frac{\sum_{\mathrm{i}} E_i \times Q_i}{\sum_i S_i \times Q_i} - 1 = \sum_{\mathrm{i}} \frac{S_i \times Q_i}{TM} \times R_i$

- Weight is relative market value $\frac{S_i \times Q_i}{TM}$

Price-weighting (数量一样，高价)

- Index
  - $\text{price weighted index} = \frac{\text{sum of stock prices}}{number\ of\ stocks\ adjusted\ for\ splits}$
- Adjustment for splits
  - Before split
    - Calculate the average index $\frac{\sum_i P_i}{n}$
  - After split
    - k-for-1 split P_j reduce price to $\frac{P_j}{k}$
    - $\frac{\sum_i \boldsymbol{P_i}}{\mathbf{n}} = \frac{\sum_{i \cong j} \boldsymbol{P_i} + \frac{\boldsymbol{P_j}}{\boldsymbol{k}}}{\mathbf{x}} \rightarrow$ x is the new divisor
- Advantages
  - Simple
  - Adjust for splits, changes in composition of index
- Disadvantages
  - Weight **high price** more
- Portfolio
  - equal **number** of shares from each stock

Equal weighting（投入价值一样, SMB）

- return index
  - arithmetic average return
- value index
  - $\text{current index vlaue} = \text{base index value} \times (1 + \textbf{return index})$
- disadvantages
  - Balance most **frequently when price change**
  - Wight **small cap** more
- Portfolio
  - equal **number of dollars invested in** each stock
- Equal > market cap weighting
  - If Small cap stock outperform large cap

market cap weighting (value weighting, UMD/momentum)

- Index value
  - $\text{current index value} = \text{base index value} \times \frac{\text{current total market value}}{\text{base total market value}}$
- Different weighting
  - market capitalization = outstanding stocks
  - market float (available to public and investors)
    - outstanding – **controlling** stockholders – corporation or governments
  - free float
    - market float – shares not available to **foreign** buyers
- advantages
  - no adjustment

    - used by most global securities
- disadvantages
    - momentum (overvalue weight more)
- Portfolio
    - Value of each stock is proportion to its relative value in the market

Fundamental (value tilt, HML)

- Weight
    - earning, cash flow, dividend
    - Unaffected by share prices
- Value tilt
    - **Overweight** firms with higher value-based metric, i.e., book-to-market
- Contrarian effect
    - increase weight to stock with lower relative value
    - decrease weight to stocks with higher relative value

Fixed income

- characters
    - large universe
    - **dealer** market
    - illiquid
        - high cost
        - infrequent trading
        - difficult to replicate
    - price – **dealer** price
    - high **turnover** 会到期
- weight
    - issuer, coupon, collateral, maturity, default risk, inflation protection

Alternative weighting

- commodity (future price and roll yield)
    - based on **future** contracts (not spot)
    - weighting method: different weighting
    - future vs actual
        - future: risk-free, change in **future** prices, **roll** yield.
        - Contract mature -> be replaced, different from commodity itself
- real estate
    - appraisal index, repeat property sale, REIT
- hedge fund
    - determined by the **constituents** of index
    - most use equal weight
    - leverage, short
    - survivorship
    - unregulated

Efficient market hypothesis

- informationally efficient market
  - price adjust fully, quickly, rationally reflect all available information
- prefect market
  - use passive investment
  - active investment **underperforms**: transaction cost and management fee
- price affected by **unexpected** new information
- market and intrinsic/fundamental value
  - market: current price
  - intrinsic: PV of expected cash flow
    - uncertain
    - difficult to estimate
    - changing
  - not efficient
    - undervalue: intrinsic > market -> buy
- market efficiency **measure**
  - **time** lag between from information dissemination to reflect in price
- market efficiency **factors**
  - number of participants (more is efficient)
  - information availability (more is efficient)
  - arbitrate (allow is efficient)
    - impediment: high cost of lack of information
    - short selling (allow is efficient)
      - prevents assets from being overvalued
  - information and transaction cost (more is **inefficient**)
- **market efficiency types**
  - weak
    - all past/market information (price and volume)
    - technical analysis no use
  - semi-strong
    - past/market + public
    - fundamental analysis no use
    - passive portfolio **outperforms** active trading
  - strong
    - past/market + public + private
    - all analysis no use
- market efficiency **tests**
  - **abnormal** profit (risk-adjusted returns) Is used
    - CAPM or a multifactor model
    - If return > equilibrium expected return
      - Reject efficiency
  - Weak-form
    - Statistical test of independence
      - Auto correlation
      - Run test
    - Test of trading rules
  - Semi-strong

        - Event study
    - Strong-form
        - Corporate insider trading
        - Stock exchange specialist
        - Security analysts
- **Implications**
    - Technical analysis
        - Can earn abnormal profit in **weak form inefficiency**
        - Cannot reject weak form
        - Success in emerging market (cannot be tested)
    - Fundamental analysis
        - Can earn abnormal profit in **weak form efficiency**
        - Test - **Event study** (before and after new information)
        - Developed countries – semi-strong
        - Emerging market – semi-strong **inefficiency**
        - Fundamental analysis -> cause informationally efficient
        - Abnormal profits
            - Skilled investors who act rapidly
    - Active vs passive portfolio
        - Why need portfolio manager?
            - Establish and implement risk and return objective
            - Portfolio diversification, asset allocation and tax management
- **Market anomalies**
    - Anomaly -> lead to **reject** of market efficiency
    - Most anomaly
        - Happen by **chance**
        - Cannot **persist or recur** over time
    - **Implication for investors**
        - Not **violation** of efficiency but due to **methodologies** used
        - Both underreaction and overreaction in the market, price are efficient on average.
        - Anomalies are **transient** (cannot **persist or recur**), too small to profit from.
        - Difficult to translate statistical anomalies into economic profits
    - Data-mining basis
        - Look for economic basis
    - Time series – weak form
        - Calendar
            - January effect
            - Tax-loss selling, window dressing
        - Overreaction and momentum
            - Violate **weak** form
        - Momentum effects
            - High return in short term -> high return in subsequent
    - Cross-sectional – semi-strong
        - Size effect: small > large
        - Value effect: value > growth

                - Value: high dividend, low price-to-**earning**, market-to-**book**
            - Violate semi-strong (but not capture risk adjustment)
    - Other
        - Close-end investment
        - Earning announcements
        - Initial public offering (not anomaly)
        - Economic fundamental
- **Behavior finance**
    - Traditional finance
        - Risk aversion
    - Actual decision-making process
    - Not **rational** utility-maximizing
    - Exhibit **bias** in decision making
    - Market efficiency not assume investor act rationally
    - Bias
        - **Loss** aversion
            - Explain **overreaction** but not underreaction
        - Investor overconfidence
            - Mispriced, increase portfolio risk
        - Herding
        - **Information cascade** – improve efficiency
            - Mimic decision of others
            - Less-informed trader follow informed trader
            - Allow information to be incorporate into price
        - Representation
        - Gambler's fallacy
            - Recent results affect investor's estimates of future probabilities
        - Mental accounting
            - Not view as a portfolio
        - Conservatism
            - Act slowly
        - Disposition effect
            - Willing to **realize gains** but unwilling to realize losses
        -
- Market **anomalies** and behavioral **biases** not reject market efficiency
- market efficiency: cannot earn **consistent abnormal** return