

**Alternative**

- Private Real Estate Investment
- Public Traded Real Estate Securities
- Private Equity Valuation
- Commodities and Commodity Derivative

## Private Real Estate Investment

### Summaries

- Forms
  - Private or public, debt or equity
- Classification
  - Residential vs non-residential
  - Commercial: office (gross & net lease), retail (fixed + percentage fee of sales)
- Value
  - Market value (sell), investment value (buy), value in use (use), assessed value (tax authority), mortgage lending value (bank)
- Highest and best use
  - Implied land value = value – cost of construction (profit to constructors)
- Income Approach
  - NOI: rental income (fully occupied) – vacancy & collection loss – operating expense (property tax, maintenance)
    - Excluding: interest, income tax, depreciation
  - **Stable** NOI: new NOI once completed, value should deduct loss
  - Cap rate
    - Gross lease: NOI, cap rate
    - Net lease: use rent, all risk yield
  - direct capitalization method
    - cap rate = discount rate – growth rate
  - discounted cash flow
    - sale: terminal value
    - reversion (no growth)
      - term & reversion: term cap rate and reversion cap rate
      - layer method: term cap rate and incremental cap rate
- Cost Approach
  - Land market value + replacement cost – other losses
    - Replacement cost – curable cost
    - Incurable cost = (Replacement cost – curable cost) \* **effective** age/life
    - Replacement cost after physical cost
      - (Replacement cost – curable cost) \* (1-age/life)
- Sales comparison approach
  - Total sale price -> adjustment -> psf -> average psf -> estimated price
- Index
  - Appraisal-based (lag behind, smooth, low correlation)
  - Transaction-based (repeat-sales, hedonic)
- Financial Ratios
  - DSCR, LTV, equity yield, leveraged IRR, unleveraged IRR
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### Forms

- Private or public
  - Public
    - Indirect investment
    - Real estate investment trust (**REIT**)

- Real estate operating company (REOC)
  - MBS
- Private
  - Directed investment
  - CREF (commingled real estate funds)
  - mortgages
- Debt or equities
  - Debt
    - Senior claim, MBS
  - Equity
    - Ownership interest, control decisions
    - REIT and REOC
- Properties
  - Most are private market
    - Indivisible and illiquid
  - Actively managed
  - High rate of return
  - Return form
    - Debt: cash flow
    - Equity: appreciation value

### Characteristics

- Heterogeneity
  - No two properties are not exactly the same
- High unit value
  - Indivisible, difficult to diversify
- Active management
- High transaction costs
- Depreciation and desirability
  - Wear out over time, less desirable
- Cost and availability of debt capital
- Lack of liquidity
- Difficulty in determining price

### REIT properties for investor

- Actively traded, reflect market values, more liquid
- Diversified portfolio
- No need active management

### Property Classification

- **Residential**
  - Single-family (owner-occupied) homes
  - Multi-family properties (apartments)
- **Non-residential**
  - **Commercial properties**
    - Residential purchased to produce **income**

- Other than multi-family properties
- Other properties (farmland, timberland)
  - Produce a saleable commodity

### Returns

- current income
  - collect rents, pay operating expenses, financial costs, and taxes
- capital appreciation
- inflation hedge
- diversification
  - private real estate, less perfectly correlated with stocks and bonds
- tax benefits

### Risks

- business conditions
  - GDP, income, employment, interest rate, inflation
- new property lead time
  - market condition may change when it is approved
- cost and availability of capital
  - easy and low interest rate -> more demand
- unexpected inflation
- demographic factors
  - size and age distribution
- lack of liquidity
  - due diligence, takes time and is costly
- environmental issues
- availability of information
- management expertise
- leverage
- other factors

### Bond and Stock Characteristics

- real estate investment has both bond-like and stock-like
  - **between** bond and stock
- bond like – contract period
  - contractual agreements for periodic rental payments
- stock like – contract expire
  - renewal and future rental rates

### Commercial Property Types

- By its end use
- Multi-family – population growth
- **Office** – job growth
  - **Gross lease**
    - Owner is responsible for fees
  - **Net lease**

- Tenant is responsible for fees
  - Owner pay first, tenant pay latter (reimbursement)
- **Expense reimbursement**
  - First year, owner pay
  - Later pay up to the first year, rest pay be tenant
- **Retail**
  - Demand
    - consumer spending
    - economic health
    - job growth, population growth, savings rate
  - fees
    - fee per square foot 每平方
    - fixed fees 固定价格
    - percentage lease of sales once sales reach a certain level 销售额外百分比
- Industrial (Warehouse) – overall economy
- hospitality, parking, restaurants, recreational
- **mixed-use** development: serve more than one end user
- some require more management attention
  - hotel

## Valuation

- market value – sell
- investment value – buy (highest)
- value in use – use
- assessed value - tax authority
- mortgage lending value – bank - conservative

## Valuation Approaches

- cost – 成本法（重新建造减去折旧）
  - purchase land and construct a comparable building
  - **cost of land + replacement cost – depreciation**
  - relative **new** building
- sales comparison – sell 可比销售法
  - pay for similar properties
  - **active** markets
- income – invest 收入法/现金流法
  - expected rate of return required by a buyer to invest
  - present value of future cash flows
  - **commercial** real estate transactions

## Highest and Best Use 土地价值最大化

- a vacant site
  - not the highest total value 不是最大的价值
  - but the highest **implied land** value 最大的隐含土地价值

- implied land value
  - value of property – **cost of constructing** (profit to the developer to handle construction and lease-out)

### Income Approach

- NOI
- direct capitalization method – single stage
  - first year NOI using capitalization rate
- discounted cash flow - NOI

### NOI – gross lease 净现金流（不是财务报表里的）

- **rental income** if **fully** occupied 完全使用收入
- +other income 其它收入
- =**potential** gross income 潜在毛收入
- - **vacancy** and **collection** loss 空置和收入损失
- =effective gross income 有效毛收入
- - operating expense 经营费用
  - Insurance, **property** tax, utilities, maintenance, repairs
  - 不考虑 financial cost and income tax
  - 不考虑 depreciation
- = net operating income 净经营收入

### Stabilized NOI

- Temporarily experience high vacancy during a major renovation
- First-year NOI should be **stabilized**
- Calculated as if the renovation is complete 稳态收入
- Subtract **present** value of **temporary** decline in NOI 临时损失

### Capitalization Rate

- cap rate = discount rate (r) – growth rate (g)
- $\text{cap rate} = \frac{\text{NOI}_1}{\text{comparable sale price}}$ 
  - going-in cap rate
- $\text{value} = \frac{\text{NOI}_1}{\text{cap rate}}$

### All Risk Yield (ARY) – net lease

- tenants are required to pay all expense
- use **rent** instead of NOI
- $\text{ARY} = \frac{\text{rent}}{\text{comparable sale price}}$
- Use ARY as the cap rate
- $\text{value} = \frac{\text{rent}_1}{\text{ARY}}$
- IRR = cap rate + growth rate

### Direct Capitalization Method – Single Stage

- Gross lease
  - NOI and cap rate  $V_0 = \frac{NOI_1}{cap\ rate}$
  - Stabilizing NOI  $V_0 = \frac{Stable\ NOI_1}{cap\ rate} - \frac{first\ year\ loss}{1+discount\ rate}$
- Net lease
  - Rent and ARY  $V_0 = \frac{rent_1}{ARY}$

### Gross Income Multiplier

- multiplier =  $\frac{sales\ price}{gross\ income}$  (from comparable transactions)
- value = gross income × multiplier
- shortfall
  - ignores vacancy rates and operating expenses

### Discounted Cash Flow Method – Two Stage Model

- After stage 1, sell it
  - terminal value 卖掉
- After stage 1, change rent 改变合约
  - term & reversion: term + reversion
  - layer method: fixed + incremental

### Terminal Value – Sell it at stage 2

- reversion or resale
- use direct capitalization method
- future NOI
- Terminal/Residual Cap Rate
  - Interest rate increase -> higher cap rate
  - Lower growth -> higher cap rate
  - Uncertainty about NOI -> higher cap rate
- Terminal value -> present value
- $V_0 = \sum_i^n \frac{Rental_{contract}}{(1+R)^i} + \frac{Rental_{new}}{(R-growth\ rate) \times (1+R)^n}$ 
  - One discount rate
  - Terminal: there is a growth rate

### Different Lease Structures – UK – net lease

- Tenant to pay all expenses
- Use ARY as cap rate
- **Contract** rent and current **market** rent differ
- One lease expires, rent will be adjusted to the current market rent
- **Reversionary** potential when contract expires

### Term and Reversion Approach – horizontal split

- Contract and reversion are appraised separately using different cap rate
- Contract period 合同期间
  - Rental fee
  - Discount rate

- Reversion period – 修正期间 - ARY (net lease)
  - New rental fee
  - All risk yield/cap rate
    - Derived from Comparable, fully let, properties
  - Growth rate = 0 无增长
  - discount rate = cap rate 用这个这折旧
  - Present value 用 ARY 来折旧到 0 时刻, 和 equity 不一样
- Contract discount rate (less risky) < reversion discount rate
- $$V_0 = \sum_i^n \frac{Rental_{contract}}{(1+R_{rental})^i} + \frac{Rental_{new}}{cap_{preversion} \times (1+cap_{preversion})^n}$$
- Similar to terminal value approach but use different rate

### Layer Method - vertical split

- First layer
  - the contract (term) rent will continue in perpetuity
  - Cap rate similar to ARY is applied
  - 合同现金流折旧利率
- Second layer
  - **Increase** in rent will occur when rent is reviewed
  - An **incremental** higher cap rate is applied here
  - 增量现金流折旧利率, 永远按照这个利率折旧
- $$V_0 = \frac{Rental_{contract}}{term\ rent\ cap\ rate} + \frac{Rental_{new} - Rental_{contract}}{cap_{incremental} \times (1+cap_{incremental})^n}$$

### Equivalent Yield

- Reversion and layer method, different cap rates were used
- A single discount rate – equivalent yield can be used
- The average, but not simple average, of the two cap rates

### Steps

- Project income from existing leases
- assumptions
  - Lease renewal
    - Probability of renewal
  - Operating expense
    - Fixed, variable, or hybrid of the two
    - Variable: change with occupancy
  - Capital expenditure
    - Capital improvement, replacement, renovation, finish-out
  - Vacancy assumptions
- Estimated resale price
- Appropriate discount rate
  - Higher than mortgage rate

### Operating Expense Example

- 30% fixed and 70% variable
- \$6 psf when fully occupied



- What is the cost if 90% occupied?
  - Fixed:  $6 \times 0.3 / 0.9 = 2$
  - Variable:  $6 \times 0.7 = 4.2$
  - Total:  $2 + 4.2 = 6.2$

### Cost Approach

- Cost
  - Market land value
    - Sales comparison approach
  - + **replacement** cost
    - **Current** construction costs and standards
    - Include builder's profit
  - + adjustment for depreciation and obsolescence
    - physical, functional, locational, economic obsolescence
- Suitable
  - Unusual properties
  - Properties where comparable transaction are limited
- Replacement vs reproduction
  - Replacement: current standard
  - Reproduction: exactly the same
- Physical deterioration
  - Curable
    - - from replacement cost
  - Incurable
    - Not economically feasible
    - Structural problem
    - Depreciation based on **effective** age relative to total **economic** life
    - Avoid double counting
      - **(Replacement cost – fixing curable item) \* age/life ratio**
- Functional obsolescence
  - Defects in design that impairs utility
  - NOI is lower, capitalizing the decline in NOI
- Locational obsolescence
  - No longer optimal
  - Deduct loss
- Economic obsolescence
  - New construction is not feasible
- Steps
  - Land market value
  - Replacement cost 新房子的总成本
  - – physical curable cost 额外修复的成本
    - 只考虑资本化成本 capitalized cost
    - 不用考虑费用支出 **expense**
  - – physical incurable cost
    - $= (\text{replacement cost} - \text{physical curable cost}) * \text{effective age} / \text{economic life}$

- – other obsolescence costs
  - functional, locational, economic
- the **upper** limit of the value 价格的上限

### Sales Comparison Approach

- pay for similar properties
- adjusted for differences related to
  - size, age, location, property condition, market conditions at the time of sale
- value of comparable transactions is adjusted **upward** for **undesirable** differences
- new sale price = Avg((sale price + adjustment)/size) \* target size
  - 先调整总价格, 算出每平方的价格, 算出平均单价
  - 面积\*平均单价 -> 总价
- Best
  - A number of similar properties have been sold
  - Single-family homes

### Reconciliation of value

- A final value
- Higher weight for sales comparison approach when market is active

### Appraisal-based index

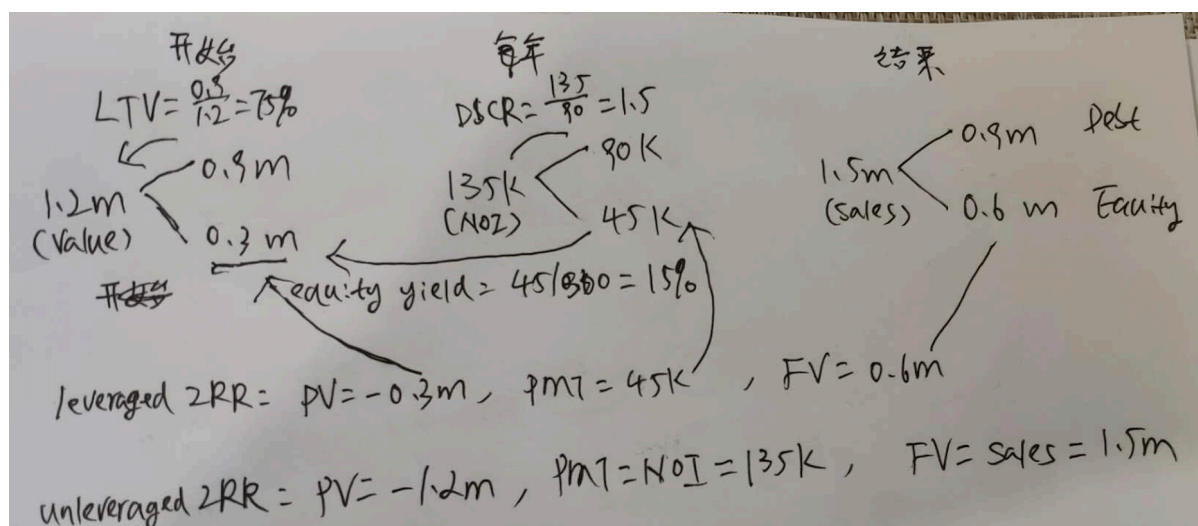
- Holding period return
  - cash flow return + value appraisal
  - $\text{return} = \frac{\text{NOI} - \text{capital expenditures} + (\text{end market value} - \text{beg market value})}{\text{beginning market value}}$
  - $\text{return} = \frac{\text{NOI} - \text{capex}}{M_0} + \frac{M_1 - M_0}{M_0} = \text{cap rate} - \frac{\text{capex}}{M_0} + \frac{M_1 - M_0}{M_0}$
- Weighting
  - value-weighted of holding-period return
  - single-period IRR
- quarterly returns -> measure risk
- disadvantage - appraisal lags
  - price is not affected until next appraisal
  - tends to **smooth** the index, reduce its volatility
  - **lower** correlation with other asset classes
- appraisal lags solution
  - unsmooth or use transaction-based

### Transaction-based Index

- repeat-sales index 重复销售
  - repeat sales of the same property
  - once a property is sold twice
  - regression is developed to allocate the change in value to each quarter
- a hedonic index 一次销售
  - require only one sale
  - regression is developed to control for differences in property characteristics such as size, age, location, and so forth.

## Financial Ratios

- debt service coverage ratio (DSCR) 越高越好
  - $DSCR = \frac{\text{first year NOI}}{\text{debt service}}$
  - Debt service is loan repayment, which includes interest and principal
- loan-to-value (LTV) ratio 越小越好
  - $LTV = \frac{\text{loan amount}}{\text{appraisal value}}$
- Maximum loan is the **minimal** value
- **Equity dividend rate** (cash-on-cash return)
  - equity dividend rate =  $\frac{\text{first year cash flow}}{\text{equity}}$
  - $\text{equity} = \text{appraisal value} - \text{loan amount}$
  - $\text{first year cash flow} = \text{first year NOI} - \text{debt service}$
- Leveraged IRR – equity 权益的回报
  - PV: equity investment
    - $\text{equity} = \text{appraisal value} - \text{loan amount}$
  - PMT: cash flow received by investor
    - $\text{cash flow} = \text{NOI} - \text{debt service}$
  - FV: sale price – mortgage
    - $\text{sale price} - \text{loan amount}$
- Unleveraged IRR – all cash 总回报
  - PV:  $\text{appraisal value}$
  - PMT: cash flow  $\text{NOI}$
  - FV: sale price



## Public Traded Real Estate Securities

### Summaries

- Public securities
  - REIT (rent), REOC (sale property), MBS
- REIT Advantages
  - Tax exempted, high dividend, stable income
- NAVPS
  - $\text{Cash NOI} = \text{NOI} - \text{non-cash NOI} + \text{annual adjustment}$
  - $\text{NAV} = \text{Asset} - \text{Liability} = \text{real estate} + \text{other asset} - \text{liability}$
- Price Multiples
  - $\text{FFO} = \text{NI} + \text{depreciation} + \text{deferred tax expense} + \text{loss (-gain) from property sale \& debt restructuring (similar to EBITDA)}$
  - $\text{AFFO} = \text{FFO} - \text{non-cash rent} - \text{recurring maintenance capex \& commissions}$ 
    - similar to free cash flow
- DCF - dividend

### Public Traded Securities

- REIT: investment trusts
- ETOC: operating company
- MBS: RBMS or CBMS

### Classification

- Debt
  - **Mortgage REIT**
    - Invest in mortgages, mortgage securities, or loans,
  - MBS
    - RBMS, CBMS
- Equities - ownership
  - **Equity REIT**
    - Tax-advantage companies
    - Actively managed, generate cash
  - REOC
    - Develop and sell real estate

### REIT & REOC - Advantages

- Superior **liquidity**
- Lower minimum investment
- Limited liability
- Access to **premium** properties
- Active **professional** management
- Protections accorded to publicly traded securities
- Greater potential for **diversification**

### REIT-Specific Advantages 免税高收益

- Exemption from taxation
  - A major part of REIT is treated as capital return

- High yield
  - To maintain tax-advantage, REIT are obligated to pay out most of their taxable income
- Predictable earnings
  - Earnings are relatively consistent over time

#### **REIT & REOC – Disadvantages**

- Taxes versus direct ownership
- Lack of control
- Costs of a publicly traded corporate structure
- Price is determined by stock market
- Structural conflicts of interests

#### **REIT-Specific Disadvantages**

- Limited potential for income growth
- Forced equity issuance
- Lack of **flexibility**

#### **REITs vs REOC**

- REITs are traded much more than REOCs in the United States; they comprise up to 97% of public real estate equity securities.
- REOCs have more **freedom** with regards to leverage: a wider range of capital structures and degrees of financial leverage may be used by REOCs

#### **Economic Value Determinants of REITS**

- **GDP growth** is the largest driver
- retail sales growth
  - **Retail: consumer spending**
  - Industrial
- job creation
  - **Office**
  - Hotel/Hospitality
- population growth
  - Residential
  - Healthcare
  - Storage

Relative Importance of Factors Affecting REIT Economic Value				
REIT Type	Population Growth	Job Creation	New Space Supply vs. Demand	Retail Sales Growth
Shopping/Retail	3	2	3	1
Office	3	1	2	4
Residential	1	1	3	4
Healthcare	1	3	2	4
Industrial	2	4	3	1
Hotel	3	1	2	4
Storage	1	2	3	4

Note: 1 = most important, 4 = least important

C is correct. The justification for REIT 2 is correct: GDP growth is the top economic driver in all sectors. Job creation also has a strong impact on the office sector.

A is incorrect because job creation has a low ranked impact on the industrial sector.

B is incorrect because 1) Job creation has a strong impact on the hospitality sector, not a low sensitivity; and 2) poor GDP growth (i.e., economic contraction) is not a positive indicator in any of these sectors.

#### REIT investment Characteristics

- Exemption from corporate-level income taxes
- High dividend yield
- Low income volatility
  - Depend on interest and rent as income sources
- Secondary equity offerings
  - Sell additional shares

#### REIT Due Diligence

- Remaining lease terms
- Inflation protection
- In-place rents versus market returns
- Costs to release space
- Tenant concentration in the portfolio
- Tenants' financial health
- New competition
- Balance sheet analysis
- Quality of management

#### REIT Valuation NAVPS

- Net asset **market** value per share
- $\text{cap rate} = \frac{\text{net operating income}_1}{\text{property value}}$
- $\text{property value} = \frac{\text{cash NOI}_1}{\text{cap rate}}$
- $\text{NAV} = \text{property value} + \text{other tangible assets} - \text{liabilities}$

- cash NOI = NOI – noncash rent
  - noncash rent: difference between average rent over the term of a lease contract (straight-line rent) versus the amount of cash rent actually received in a period
- Steps
  - $NAVPS = \frac{NAV}{Shares}$
  - NAV = Asset – Liability
  - Asset = **Real estate** + Cash + AR + prepaid assets + other assets
    - Book value of non-real-estate assets
    - **Exclude:** intangible assets, goodwill, DTL, DTA
  - Liability = Debt + other liabilities
  - Real estate =  $\frac{cash\ NOI_1}{cap\ rate}$
  - $cash\ NOI_1 = cash\ NOI_0 \times (1 + g)$ , growth
  - $cash\ NOI_0 = NOI_0 - noncash\ rent + new\ acquisitions$
  - $NOI_0$ : past 12-month NOI
  - *noncash rent*: non cash used for rent 非现金的租金
  - *full year adjustment for new acquisitions* 年化租金收入
- BVPS
  - neither BVPS nor NAVPS include **intangibles** in their calculation
  - Property that is not generating income (e.g., because it is undeveloped) has no contribution to NAV.
  - NAVPS is preferable to BVPS in valuing REITs because of the use of the **market** value of assets. Although accounting values based on the fair value method also serve as a useful valuation metric, those based on historical cost are generally not relevant

### Funds from Operations - FFO (CFO) 现金流

- FFO = NI + depreciation
  - +Deferred tax expenses (DTL)
  - +(loss – gain) of sales of property and debt restructuring
    - 债务重组
    - 无 change in working capital (AR, inventory, AP)
- AFFO (Adjusted FFO)
  - Cash available for distribution, funds available for distribution
- AFFO = FFO
  - –non cash (straight line) *rent adjustment* 非现金租金
    - Average contractual rent – cash rent actually paid
  - –recurring ***maintaince capex and leasing cmmissions*** 维护支出
    - Leasing cost = leasing agents' commissions + tenants' improvement allowance
- AFFO is a better measure of economic income than FFO
- FFO is more frequently cited in practice, because AFFO is more subjective

### Three Approaches

- Absolute Value – asset based

- NAVPS
- Relative Value (price multiples)
  - Price-to-FFO and Price-to-AFFO
  - Expectations for growth of FFO and AFFO
  - Level of risks inherent in the real estate
  - Risk related to firm's leverage and access to capital
- Discounted cash flow
  - Dividend discount and discounted cash flow

### Compare

- Discount rate
  - the discount rate (cap rate) used in NAV calculation is based on **private** valuation of comparable properties 私有市场
  - The discount rate used in **DDM** calculation is based on the discount rate for a **public** equity investment 公开市场
- Future income growth
  - NAV is based on projections of **NOI**, including expected growth rate for the next 12 months 有预测
- Income
  - DDM is based on dividends, which is the fraction of income paid out to investors, not all earned income. 部分收入
  - NAV is based on **all relevant** income, not just income retained 全部收入



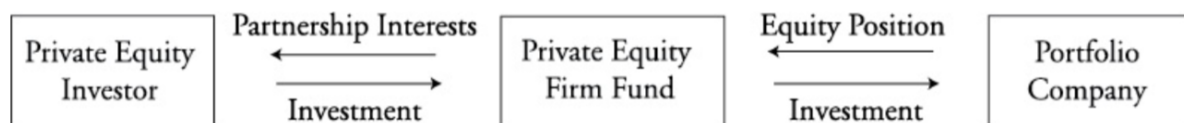
## Private Equity Valuation

### Summaries

- Portfolio company & PE Fund
- **Buyout Valuation - IRR**
  - Exit Value
  - **Claim:** debt > preferred shares > common shares > management shares
  - IRR
- **Venture Capital Funding Valuation – P/S**
  - **Single Round** (exit value, investment, ownership, shares, price)
  - Multiple Round (exit value is the pre-money of next round)
  - Discount rate adjusted for failure
  - Expected terminal value
- **PE Funds Performance - GIPS**
  - IRR: gross IRR (fund), net IRR (investor)
  - **Quantitative:** PIC, DPI, PVPI, TVPI
  - Qualitative: realized, unrealized, NAV

### Private Equity Types

- Early stage: Venture Capital
- Mature stage: buyout transaction
  - Takeover, MBO, LBO



### Private Equity Value Creation

- Reengineering
  - Better efficiency 提高效率
- Obtain favourable **debt** financing
  - More debt 大量债务不是权益
  - More favorable terms than comparable public companies
- **Alignment** of interests between managers and PE owners

### Private Equity Control Mechanism

- compensation
- Tag-along, drag-along clauses
  - Tag-Along 随售权
    - 某一方出售股权，其他一方或几方也有权要求以同等股价一起出售股权，是保护少数股东利益的。
  - Drag-Along 拖售权
    - 某一方出售股权，有权要求其他一方或几方也同时出售股权，是保护多数股东利益的。
- Board representation
- Noncompete clauses 竞业协议

- Priority in claims – preferred shares
- Required approvals
- **Earn-outs** 对赌条款/盈利能力支付计划
  - Ties the acquisition price to future performance over a specified time period

### Valuation Characteristics

- VC
  - **Less mature, more risky**
  - Acquire via **relationship** between **VC and entrepreneurs** 关系
  - weak management team
  - low asset, low debt and low leverage, more equity 低杠杆
  - high **cash burnout** rate 高现金消耗
  - high **working capital** needs 高运营资产
  - focus on a specific industry
- LBO
  - **More mature, less risky**
  - acquire via **auction** 拍卖
  - Strong management team
  - High asset, high debt and high leverage
  - Low cash burnout rate
  - Low working capital needs
  - EBIT or EBITDA growth

### Valuation Method

- Discounted cash flow
  - Requires operating history and cash flow
- Relative or market value
  - Requires operating history and cash flow
- Replacement cost
  - Not applicable to mature companies
- **Real options analysis – VC**
  - Immature companies
- **Venture capital method VC**
- **Leveraged buyout method**

### Other considerations

- Control premium
  - **Buyout: complete control (All in)**
  - **VC: minority**
- Emerging market: country risk

### Buyout Valuation

- Forms
  - Takeover, management buyout, leveraged buyouts
- LBO
  - High **amount of debt** is used to finance acquisition

- LBO Model
  - Forecasted cash flows
  - Expected returns
  - Total amount of financing
- Key driver of return
  - **Earnings growth** 收入
  - **Increase in multiples upon exit** 价值
  - **Reduction in debt** 债务减少

### Buyout Valuation - Exit Value and IRR

- **Exit value = investment cost + earnings growth + increase in price multiple + reduction in debt** 收入+升值-减债
- Exit value T
  - Pay debt: left debt D 剩余债务
  - Pay preferred equity:  $V_1^{pe} = V_0^{pe} \times (1 + r_p)^n$  有利息
  - Residual value:  $R = T - D - V_1^{pe}$
  - Pay common equity:  $V_1^{ce} = R \times p$
  - management equity  $V_1^{mgt} = R \times (1 - p)$
- **Payoff multiple**
  - **Payoff multiple** = exit value / initial investment  $\frac{T}{Inv}$
  - $IRR = \sqrt[n]{\frac{T}{Inv}} - 1$ 
    - PV=-initial investment, FV=exit value, PMT=0
- PE IRR
  - Initial -> final ( $V_1^{pe} + V_1^{ce}$ ) preferred + common
- Returns
  - Increased multiple upon exit
  - Reduction in debt claim
  - Return on the preference shares for PE

### Venture Capital Valuation

- Pre-money valuation (PRE) and post-money valuation (POST)
- $PRE + INV = POST$
- **ownership =  $\frac{INV}{POST}$**
- methods
  - cash flow -> NO
  - price multiple -> NO
  - replacement cost -> NO
  - **real options and VC method**
- pre-money valuation
  - a cap value is put
- key driver
  - pre-money valuation
  - **investment**
  - **subsequent dilution**

Valuation Issue	Buyout	Venture Capital
Applicability of DCF Method	Frequently used to estimate value of equity	Less frequently used as cash flows are uncertain
Applicability of Relative Value Approach	Used to check the value from DCF analysis	Difficult to use because there may be no truly comparable companies
Use of Debt	High	Low as equity is dominant form of financing
Key Drivers of Equity Return	Earnings growth, increase in multiple upon exit, and reduction in the debt	Pre-money valuation, investment, and subsequent dilution

### Exit Routes

- IPO – sell to public
  - Highest exit value
  - **More** costly
- Secondary market sale – sell to other investors
  - For **strategic** reasons
  - Quite frequent
- Management buyout (MBO)
  - sell to management
  - high level of **debt**
- Liquidation
  - Sale of company assets

### Exit timing

- Timing is important

### PE Fund Structure - Limited partnership

- Limited partners
  - Provide funds
  - not active in management
- General partners
  - unlimited liability
  - manager of fund

### PE Fund Structure – limited by shares

- better protection for partners
- subject to jurisdiction
- most are close end

### PE Fund Terms

- align interest of GP and LP
- economic and corporate governance terms

### PE Fund Economic Terms

- **management fees**
  - percentage of committed capital
  - 2% based on **NAV** or paid-in capital
- transaction fees
  - advisory capacity
  - split evenly with LPs and, when received, are deducted from management fee
- **carried interest/performance fees**
  - 20% of profits (after management fees)
- **hurdle rate**
  - **IRR** that the fund must meet before GP can receive performance fee
  - Usually 7% - 19%
  - Invest 50, 3 years, 65, IRR=9.14%
  - If hurdle rate =9%, can earn carried interest
  - If hurdle rate=10%, no carried interest
- **Ratchet**
  - **Allocation** between management and shareholders, allows management to increase their allocation
- Target fund size
- Vintage
  - Year the fund was started and compare with other funds
- term of the fund
  - life of the firm and usually 10 years

#### **PE Fund Corporate Governance Terms**

- key man clause
  - a key people leave or spend insufficient time in the fund, GP is prohibited from making additional investment
- performance disclosure and confidentiality
- clawback
  - underperform, GP pay back a portion of earl profits
- **distribution waterfall**
  - **deal-by-deal method**
  - total return – entire portfolio
    - paid after entire **committed** capital is returned to LP
    - paid when value of portfolio **exceeds invested capital** by some minimum amount, typically 20%
- tag-along, drag-along
- no-default divorce
  - fire GP is 75% LP agree
- removal for cause
  - fire GP or terminate a fund given sufficient cause
- investment restrictions
- co-investment
  - avoid using capital from another fund

#### **Net Asset Value (NAV)**

- at cost, adjusted for subsequent financing and devaluation
- at cost, no adjustment
- at minimum of cost or market value
- using a discount factor
- revaluing a portfolio company anytime there is new financing

### **PE Fund Investment**

- returns tends to persist
- return discrepancy between outperformer and underperformers is large
- illiquid and long-term investment, but duration is shorter than expected

### **Post-investment Investor Expectations**

- funds are committed and later drawn down
- returns follow a **J-curve**
  - negative and then positive upon exit

### **PE Investing Risks**

#### **PE Investing Costs**

- transaction costs
- investment vehicle fund setup cost
- administrative costs
- audit costs
- management and performance costs
- dilution costs
- placement fees

### **PE Funds Performance - IRR**

- IRR
  - GIPS
  - Cash-weighted (money-weighted) return
- Gross IRR – from fund's point of view
  - Cash flow between fund and portfolio companies
- Net IRR – from investor's point of view
  - Net of management fees, carries interests, compensation
  - Cash flow between **fund and LPs**
- Multiplies
  - Ignores time value of money

### **PE Funds Performance - Quantitative Measures – GIPS**

- PIC (paid-in capital)
  - % paid-in/committed capital
  - Absolute cumulative capital called down
- DPI (distributed to paid-in capital)
  - LP's **realized** return (cumulative distributions to invested capital)
- PVPI (residual value to paid-in capital)

- LP's **unrealized** return (LP's holding value NAV /invested capital)
- TVPI (**total value** to paid-in capital)
  - Sum of the two above
  - Net of management fees and carried interest

### PE Funds Performance - Qualitative Measures – GIPS

- Realized investment
  - success and failures
- Unrealized investment
  - Exit horizons and potential problems
- Cash flow projections at the fund and portfolio company level
- Fund valuation, NAV, and financial statements

### Quantitative Measures - Formulas

- $\text{paid in capital}_t = \text{paid in capital}_{t-1} + \text{call down capital}_t$
- $\text{management fee}_t = 2\% \times \text{paid in capital}_t$
- $NI_t$  is operating income
- $NAV_t^{\text{before}} = NAV_{t-1}^{\text{after}} + \text{called down capital}_t - \text{management fee}_t + NI_t$
- Carried interest – hard watermark
  - first time carried interest $_t = 20\% \times \max(NAV_t^{\text{before}} - \text{committed capital}, 0)$
  - rest time carried interest $_t = 20\% \times \max(NAV_t^{\text{before}} - NAV_{t-1}^{\text{before}}, 0)$
  - carried interest $_t = 20\% \times \max(NAV_t^{\text{before}} - \max(\text{committed capital}, NAV_{t-1}^{\text{before}}), 0)$
- $\text{distribution}_t$
- $NAV_t^{\text{after}} = NAV_t^{\text{before}} - \text{carried interest}_t - \text{distribution}_t$
- $DPI = \frac{\sum_t \text{distribution}_t}{\sum_t \text{called down capital} = \text{paid in capital}}$
- $RVPI = \frac{NAV_t^{\text{after}}}{\text{paid in capital}}$

### Venture Capital Funding – Single Round

- Exit value
- $POST = PV(\text{exit value}) = \frac{\text{exit value}}{(1+r)^n}$  折现
- $PRE = POST - INV$  投资前
- fractional
  - $f = \frac{INV}{POST}$  (NPV) 折现
  - $f = \frac{FV(INV)}{\text{Exit Value}}$  (IRR) 复利回报
- Shares
  - $\text{shares}_{vc} = \text{shares}_{\text{funders}} \times \frac{f}{1-f}$
- Price
  - $\text{price} = \frac{INV}{\text{shares}_{vc}}$

### Venture Capital Funding – Multiple Round

- Assume two rounds
  - Invest Time  $n_1$  and  $n_2$
  - Invest amount  $INV_1$  and  $INV_2$
  - Exit value
- Second Round
  - $POST_2 = PV(exit\ value) = \frac{exit\ value}{(1+r)^{n_2}}$
  - $PRE_2 = POST_2 - INV_2$
  - $f_2 = \frac{INV_2}{POST_2}$
- First Round
  - $POST_1 = PV(exit\ value|pre_2) = \frac{PRE_2}{(1+r)^{n_1}}$
  - $PRE_1 = POST_1 - INV_1$
  - $f_1 = \frac{INV_1}{POST_1}$
- Shares VC
  - $Shares_{vc1} = Shares_{founders} \times \frac{f_1}{1-f_1}$
  - $Shares_{vc2} = (Shares_{founders} + Shares_{vc1}) \times \frac{f_2}{1-f_2} = Shares_{founders} \times \frac{f_2}{(1-f_1) \times (1-f_2)}$
- Total shares
  - $Shares_1 = Shares_{founders} \times \frac{1}{1-f_1}$
  - $Shares_2 = Shares_{founders} \times \frac{1}{(1-f_1) \times (1-f_2)}$

### Discount Rate with Failure

- Assume no failure, discount rate is  $r$
- Assume failure probability  $p$ , new discount rate is
  - $r^* = \frac{1+r}{1-p} - 1$
- Derivative
  - $CF \rightarrow CF \times (1-p)$
  - $PV = \sum \frac{CF}{(1+r)^i} \rightarrow \sum \frac{CF \times (1-p)^i}{(1+r)^i} = \sum \frac{CF}{\left(\frac{1+r}{1-p}\right)^i} = \sum \frac{CF}{(1+r^*)^i}$
  - $\rightarrow (1+r^*) = \frac{1+r}{1-p}$

### Terminal Value with Scenario Analysis

- Price multiple? Early-stage, not easy to find
- Expected terminal value under different assumptions



## Commodities and Commodity Derivative

### Summaries

- Sectors
- Return theory
- Return components: collateral + price + roll
- Swaps and index

### Sectors

- Energy
- Metal
  - Industrial metals
  - Precious metals
- Agriculture
  - Grains
  - Livestock
  - Softs (cash crops)

### Energy Sector

- Crude oil
  - Factors: quality, weather, technology, **politics**, business cycle
- Refined products
  - Gasoline, heating oil, jet fuel, propane, bunker fuel
  - Factors: output, weather, seasonal
- Natural gas
  - High transportation cost,
  - factors: **supply** of oil 替代

### Industrial metals

- Aluminium, nickel, zinc, lead, tin, iron, copper
- factors: **GDP** growth, business cycle, political, environmental

### Precious metals

- Gold, silver, platinum
- Gold: hedge inflation risk
- Jewellery: wealth
- Factor: business cycle, demand & supply, technology

### Grains

- Wheat, corn, soybeans, rice
- Factors: storage period, weather, disease and pests, technology and politics

### Livestock

- Hogs, sheep, cattle, poultry
- Factors: storage, price of grain, weather, disease, income growth, substitute protein

## Softs (cash crops 经济作物)

- Coffee (robusta, arabica), sugar, cocoa, cotton
- Factors: **weather**, disease, consumer tastes

## Life Cycle

- Industrial: mining, smelting

## Participants

- Hedgers: long or short
- Speculators: profit, leverage
- Arbitrageurs: buy and sell at zero initial cost
- Traders
- Investors
- Exchanges
- Analysts
- Regulators

## Spot and Futures

- **Basis = spot price - future price**
- Calendar spread = future price **near** maturity – future price **more-distant** maturity
- Contango – positive trend 远期升水
  - future price > spot price
  - basis < 0, calendar spread < 0
  - long futures: **negative** return
- Backwardation – negative trend 远期贴水
  - Future price < spot price
  - Basis > 0, calendar spread > 0
  - Long futures => positive **roll** return
- Normal backwardation
  -

## Return Theories

- Insurance – 生产者角度 - 套期保值 - **Backwardation**
  - Producers sell futures -> drive down future price
  - Normal Backwardation
- Hedging pressure hypothesis - ?
  - Producers (sell futures, backwardation) and users (long futures, contango)
  - Shortcoming
    - Both may be speculator
    - Hedging pressure is not observable
- **Theory of storage - contango**
  - Costs of storing and benefits of holding physical inventory
  - Cost is high -> contango
  - Benefits is high -> backwardation
  - Convenience yield
    - benefits of holding physical commodity

- low supply -> high benefits
- **future price = spot price + storage cost – convenience yield**

### Futures Returns 期货总收益

- **components: collateral return, price return, roll return**
- collateral return (收入, 保证金)
  - investor post collateral
  - collateral return/yield: holding period return on T-bills
- price return/spot yield (change in spot price, 现货价格变化导致的)
  - $\text{price return} = \frac{\text{current price} - \text{previous price}}{\text{previous price}}$
  - *previous price* → current price
- roll return (续约成本, future price)
  - $\text{roll return} = \frac{\text{expiring future price} - \text{new futures price}}{\text{expiring future price}} = - \frac{\text{new price} - \text{expiring price}}{\text{expiring future price}}$
  - discount yield: expiring futures → new futures 卖方的盈利, 买方的亏损
  - Contango
    - future price increase, buy less contracts but at expensive price, roll return negative
  - current FP is 397, n-month later FP is 406, roll return is  $-(406-397)/397 = -2.27\%$

### Swaps

- Increase or decrease exposure to commodity risk

### Total return Swap 双方支付

- Buyer
  - Pay fixed payment
  - Receive change in price of a commodity
  - Pay net fee: commodity return – fixed payment
- Gain exposure to price risk of commodity, avoiding either holding commodity or managing a long position in futures contracts over time

### Excess Return Swap 单方面支付

- initial
  - long party: makes a single payment
- Later on
  - If price > threshold or benchmark
    - Long party receive excess return
  - Else
    - No payment

### Basis Swap

- Difference between prices of two **commodities**

### Commodity Volatility Swap 双方支付

- If volatility > threshold or benchmark
  - Buyer receives a payment

- Else
  - Seller receives a payment

## Index

- Roll strategy
  - Passive: simply roll the expiring into near-month contract each month
  - Active: maximize roll return by selecting the further-out contracts with **greatest backwardation** or smallest contango 成本最低的