

Equity

- Equity Valuation: Application and Process
- Return Concepts
- Industry and Company Analysis
- Discounted Dividend Valuation
- Free Cash Flow Valuation
- Market-Based Valuation
- Residual Income Valuation
- Private Company Valuation

Equity Valuation: Application and Process

Value

- Intrinsic Value: IV
- Market value: price
- Analyst's estimated intrinsic value: IV_{analyst}
- $IV_{\text{analyst}} - \text{price} = (IV_{\text{analyst}} - IV_{\text{actual}}) + (IV_{\text{actual}} - \text{price})$

Assumptions

- Going concern
- liquidation value

Firm Value

- intrinsic value – valuation 大部分估值
 - public equities
 - most investment use intrinsic value: dividend, cash flow, etc
- fair market value 买卖交易
 - similar to fair value concept used for financial reporting purpose
 - market price should reflect fair market value over time
- **investment** value – **acquisition** (control premium) 收购时
 - value of a stock to a particular buyer
 - depends on buyer's needs and expectations as well as **synergies** with existing assets
- Liquidation value 清算
- Compare
 - Investment value > market value = intrinsic value > Liquidation value

Valuation

- Model-based -> fundamental asset value
- Comparison-based -> observable market value

Elements of Industry Structure

- Threat of new entries
 - High patents stop new entries
- Threat of substitutes 切换成本
 - **Switch** cost is low, less pricing power
 - High switch cost: instalment, specific products
- Bargaining power of buyers
 - Less buyers, less pricing power
- Bargaining power of suppliers
 - Less suppliers, less pricing power
- Rivalry among existing competitors
 - Concentration is low, exit barriers are high, less pricing power

Competition Strategy

- Cost leadership

- Lowest cost
- Product differentiation
 - Product features or services
- Focus
 - Focus on a **segment** with one of previous strategy

Valuation

- Absolute
 - Discounted cash flow
 - Dividend
 - FCFF/FCFE
 - Residual Income
 - Asset-based
 - Own or control natural resources
- Relative
 - Market Multiples
 - P/E, P/S, P/B, P/CF
 - Enterprise Value (EV)
 - EV/EBITDA

Valuation Approach

- Sum of the parts / breakup value / private market value
 - Value **individual** parts of a firm and add them up
 - When it operates in multiple divisions with different business models or characteristics (conglomerate)
- Conglomerate discount
 - Apply a **markdown** to a company that operates in multiple **unrelated** industries, compared to the value of a company that has a **single** industry focus.
 - The subsidiary of a conglomerate generally has a value that is **below** its stand-alone value due to a **conglomerate discount**
 - Discount = sum of parts – whole market value
- Conglomerate Discount Factors
 - Internal capital inefficiency 资本效率低
 - Capital allocation to different divisions
 - Endogenous (internal) factors 业绩不佳的公司
 - Pursued **unrelated** business acquisitions to **hide** poor operating performance
 - Research measurement errors 测量错误
 - Does not exist, but rather are a result of incorrect measurement

Valuation Factors

- Quantitative
 - Accounting information and financial disclosures
- Qualitative
 - Quality of management

- **Transparency**
- Analyst's confidence
- Accounting practices

Valuation Choices

- Controlling interest -> cash flow not dividend

Return Concepts

Summary

- Return Rate
 - HPR, realized/expected return, IRR, discount rate
- **Equity Risk Premium (ERP)**
 - Historical
 - Geometric vs arithmetic (higher), short (higher) vs long term risk fee
 - Survivorship bias (higher)
 - Forward:
 - Gordon growth model 财务 $R_p = \frac{D_1}{P} + g - R_f$
 - Supply-side models 经济
 - $(1 + R_{inflation})(1 + R_{eps})(1 + R_{P/E}) - 1 + Y - R_F$
- **Required Return (Return)**
 - CAPM
 - Multifactor
 - Fama-French (market + size + cap)
 - Pastor-Stambaugh (+liquidity)
 - Macroeconomic
 - Build-up (multifactor with beta=1)
 - **Private** business: risk free + equity + size + specific company premium
 - Public bond-yield plus premium: YTM long-term debt + risk premium
- **Beta** Estimation (Beta)
 - Public company
 - Beta $\beta = \frac{\text{cov}(P, M)}{\text{var}(M)} = \rho \frac{\sigma_p}{\sigma_m}$
 - adjusted beta $\beta_{adjusted} = \frac{2}{3}\beta + \frac{1}{3} \times 1$
 - Private company
 - levered beta $\beta = \beta_{ref} \times \frac{1+D/E}{1+(D/E)_{ref}}$
- Country risk
 - country spread model: emerging = developed + premium
 - country risk rating model: rating -> premium
- WACC
 - $WACC = w_d \times r_d \times (1 - t) + w_e \times r_e$
- Cash flow and discount rate match
 - Type: firm level and WAC, equity and required return to equity
 - Inflation: real/nominal cash flow and real/nominal discount rate

Holding Period Return

- $HPR = \frac{P_1 - P_0 + CF_1}{P_0} = \frac{P_1 - P_0}{P_0} + \frac{CF_1}{P_0}$
 - Price appreciation return
 - Cash flow yield
- Annualized
 - $(1 + R)^t = 1 + HPR \rightarrow R = (1 + HPR)^{1/t} - 1$

Return (Annualized)

- Realized return / ex post
 - Based on past observed prices and cash flows
- Expected return / ex ante
 - Based on forecasts of future prices and cash flows

Required Return / opportunity cost 要求回报率/机会成本

- **Minimum** return an investor requires given the asset's risk.
- High risk -> high required return
- Expected return > required return -> undervalued

Price Convergence

- Return from convergence of price to intrinsic value
 - V_0 : intrinsic value
 - P_0 : price
 - $P_0 \rightarrow V_0 \rightarrow \frac{V_0 - P_0}{P_0}$
- *expected return = required return + $\frac{V_0 - P_0}{P_0}$*
- Chronic inefficiencies that impede price convergence

Internal Rate of Return (IRR) 内涵

- Market-determined rate
- The rates that the value of discounted cash flows to the current price
 - $P = PV(CF|r)$
 - $NPV = CF_0 + PV(CF|r) = 0$ ($CF_0 < 0$)
- If market is **efficient**
 - IRR is the required return

Discount Rate

- Find the present value of an investment
- Market-determined rate
- Equal rates
 - Required rate
 - cost of equity
 - opportunity cost
 - IRR (efficient market)

Equity Risk Premium

- Return in excess of the risk-free rate
- The required return on a broad equity market index
- equity risk premium = required return on equity index – risk free rate
- premium is expected not realized

Historical Estimate

- select an equity index
- select a time period

- calculate the **mean** return on the index
- select a proxy for the risk-free rate
 - the time horizon should be matched
- Usually use **geometric** and **long-term** bond rate

Risk Free Rate

- Should be matched with the time
- **T-bill for short-term and T-bond for long term**
- historical estimates: **short-term** rate or depends
- forward-looking: **long-term (CGM, Supply-Side Estimates)**

CAPM

- $R = R_F + \beta(R_m - R_F)$
- β related to **systematic** risk 系统风险
- R_F : risk free rate
 - Should be matched with the time
 - **T-bill for short-term and T-bond for long term**

Build-up Model - private business

- $R = R_F + \text{equity risk premium} + \text{other risk premia}$
- Usually applied to private business
 - no β
 - It does not account for systematic risk

Historical Estimate Weakness

- Strength: Simple and objective
- **Stationary** (favour short time)
- **Countercyclical**
 - Low during good times
 - High during bad times
- **Survivorship bias** 高估
 - upward bias
 - higher return -> **higher** premium 存活偏差
 - Solution: reduce time period, increase sampling frequency
- **Mean**
 - Geometric mean return < arithmetic mean return 算术高估
 - Arithmetic mean -> higher return -> **higher** premium
 - Geometric mean: multiple period return
 - arithmetic mean: single period return
 - most models (CAPM, multi-factors) are single period return, should use **arithmetic** mean
- **Risk free**
 - **Long-term** bond premium < short-term bond premium 短期高估
 - **Long-term** bond -> higher risk-free rate -> **lower** risk premium

Forward-looking estimates

- Based on **current** information about economic and financial variables
- Gordon growth model 财务
- Supply-side models 经济
- Estimates from surveys 调查

Gordon Growth Model 财务信息

- $R_p = \frac{D_1}{P} + g - R_b$
 - $\frac{D_1}{P}$: one-year forecasted dividend yield 一年分红预测
 - g : **long-term** earnings growth rate 长期营收增长
 - R_b : **long-term government bond** yield 长期国债
- Weakness
 - Dynamic 动态变化
 - Economic boom -> low dividend yield and high growth
 - Stable growth rate 稳定增长率
 - Not good for rapid growth
 - Not good for more stages: rapid, transition, and mature
- Find the IRR of
 - equity index price = $PV_{\text{rapid}}(r) + PV_{\text{transition}}(r) + PV_{\text{mature}}(r)$

Supply-side models (Macroeconomic Models) 经济信息

- relationship between macroeconomic and financial variables
- strength
 - use of proven models and current information
- weakness 发达国家
 - only for **developed** countries where public equities represent a relatively large share of the economy
- Equity risk premium
 - $(1 + R_{\text{inflation}})(1 + R_{\text{eps}})(1 + R_{\frac{P}{e}}) - 1 + Y - R_F$
 - $R_{\text{inflation}}$: Expected inflation 通货膨胀
 - R_{eps} : expected real growth in EPS 业绩增长
 - Use real GDP instead
 - $R_{\frac{P}{e}}$: expected change in P/E ratio 市盈率
 - Y : expected **dividend** yield (including reinvestment) on the index 股利
- Inflation
 - TIPS: real interest rate 去除了通货膨胀
 - $R_{\text{inflation}} = \frac{1 + \text{YTM of 20-year T-bond}}{1 + \text{YTM of 20-year TIPS}} - 1$
- Expected **real** growth in EPS/GDP
 - = labor productivity grow rate + labor supply growth rate
 - 用真实 GDP, 不要用名义的
- P/E
 - Market is overvalued -> $P/E < 0$
- $(1 + R_{\text{inflation}})(1 + R_{\text{GDP}}^{\text{real}}) = 1 + R_{\text{GDP}}^{\text{nominal}}$

Estimates from surveys

- Easy to obtain
- Wide disparity from different groups

Forward Estimates Comparisons

Estimate	Strength	Weakness
CGM	Popular method Reasonable when applied to developed economics and markets Typical sample sources	Change through time and need update Assume a stable growth rate
Supply side estimates	Proven models Current information	Only for developed countries
Survey estimates	Easy to obtain	Wide disparity from different groups

Historical vs Forward

- **Historical**
 - **Props**
 - Unbiased and objective quality
 - **Cons**
 - **Precision** issues (length and frequency of data)
 - Difficult to maintain **stationary** assumption
 - **Survivorship bias** and positive/negative surplus
- **Forward**
 - **Props**
 - Available
 - Not subject to non-stationary or data biases
 - **Cons**
 - Subject to **model errors** and **behavior biases**
 - subjective

Required Rate of Return

- **CAPM**
- **Multi-factor models 多因素模型**
 - Fama-French Model (FM) – market, size, cap
 - Pastor-Stambaugh Model (PSM) - +liquidity
 - Macroeconomic Multifactor models
- **Build-up model 堆积模型**

CAPM

- $R = R_F + \beta(R_m - R_F)$
- For individual securities, idiosyncratic risk can overwhelm market risk and, in that case, beta may be a poor predictor of future average return.

Multi-factor models 多因素模型

- $R = R_F + RP_1 + RP_2 + \dots + RP_n$
- $= R_F + \beta_1(R_1 - R_F) + \beta_2(R_2 - R_F) + \dots + \beta_n(R_n - R_F)$
 - $RP_1 = \text{factor sensitivity} \times \text{factor risk premium}$
 - factor sensitivity = factor beta
 - factor risk premium is expected return above risk-free rate from a unit sensitivity to the factor and zero sensitivity to all other factors

Fama-French Model

- $R = R_F + \beta_{mkt}(R_{MKT} - R_F) + \beta_{SMB}(R_{small} - R_{big}) + \beta_{HML}(R_{HBM} - R_{LBM})$
 - $R_{MKT} - R_F$: value-weighted market index minus risk-free rate
 - $R_{SMB} - R_F$: small cap return – large-cap return 小盘股 vs 大盘股
 - $R_{HML} - R_F$: high book-to-market – low book-to-market 投资风格
 - *value* (high B/M, low M) – growth 成长股 vs 价值股
 - 成长股 : low dividend, high future capital gain due to growth
 - 价值股 : high dividend, low future capital gain due to growth
- Baseline value for β_{mkt} is **one**, baseline value for the rest two are **zero**
- Latter two: zero-net investment in the corresponding assets
- Use **short-term** risk-free rate

Pastor-Stambaugh Model Adds one liquidity factor to the Fama-French model

- Baseline value of beta is 0
- Liquid assets have a **negative** beta 流动性好
- Less liquid assets have a positive beta 流动性差的溢价高

Macroeconomic Multifactor Models – surprise (unexpected change)

- Confidence risk / credit risk
 - Unexpected change in return of risky corporate bonds and government bonds
- Time horizon risk / maturity risk
 - Unexpected change in return of long-term government and Treasury bills
- Inflation risk
 - **Unexpected** change in the inflation rate
- Business cycle risk
 - **Unexpected** change in the level of real business activity
- Market timing risk
 - Not explained by the other four factors

Build-up Method

- Suitable to companies when betas are not readily obtainable
- ***Required return = $R_F + \text{equity risk premium} + \text{size premium} + \text{specific company premium}$***
 - Size premium: scale up or down based on company size
 - Specific company premium: some use **beta** to scale it
- **Ignored** factors

- **Controlling** interest vs minority interest and **Marketability** of equity
- They are used directly to adjust the value instead of being used in the required rate

Bond-Yield Plus Risk Premium Method

- For a company that has **public** traded debt 有公开交易债务
- Equity risk premium = **YTM of long-term debt** + risk premium
 - Long-term YTM 长期收益率
 - Risk premium: 3% - 5%

Beta Estimation - Public Company – adjust for drift

- Regress company stock return on overall market return
 - $\beta = \frac{\text{cov}(P, M)}{\text{var}(M)} = \rho \frac{\sigma_p}{\sigma_m}$
- Which index to use?
 - S&P 500, NYSE
- length and frequency of sample data?
 - Five years of monthly data
 - Two years of weekly data (fast-growing markets)
- Adjusted Beta for public companies - Blume
 - Beta **drift**: revert to 1 over time 长期靠近 1
 - $\beta_{\text{adjusted}} = \frac{2}{3}\beta + \frac{1}{3} \times 1$

Beta Estimation – Non-public or thinly traded Company – adjust for leverage

- Suitable for non-public or thinly traded company
- Identify a benchmark company, which is public traded and similar to its operations
- Estimate the **equity beta** of the benchmark company using a regression analysis
- Assert and equity beta
 - Asset = liability + equity
 - $\rightarrow \beta_{\text{asset}} = w_d \beta_d + w_e \beta_e$
 - $\rightarrow \beta_{\text{asset}} = w_e \beta_e = \frac{\beta_e}{1 + D/E}$ (because $\beta_d = 0$)
 - $\rightarrow \beta_e = \frac{\beta_{\text{asset}}}{w_e} = \beta_{\text{asset}} \times \left(1 + \frac{D}{E}\right)$ financial leverage
- unlevered the beta 去杠杆得到资产的 beta
 - $\beta_{\text{unlevered}} = \beta_{\text{ref}} \times w_e = \frac{\beta_{\text{ref}}}{1 + \frac{D}{E_{\text{ref}}}}$
- Lever up the beta
 - $\beta = \frac{\beta_{\text{unlevered}}}{\beta} = \beta_{\text{unlevered}} \times \left(1 + \frac{D}{E}\right)$
 - $\beta = \beta_{\text{ref}} \times \frac{1 + \frac{D}{E}}{1 + \left(\frac{D}{E}\right)_{\text{ref}}}$

Method	Strength	Weakness
CAPM	Simple	Low explanatory
Multifactor	High explanatory power	Complex and expensive

Build up	Simple, closely held companies	Historical estimates may not use the current information
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International Effects 国家风险

- Exchange rate risk
 - Compute home country premium
 - Adjust it using forecasted for **change** in **exchange** rate
- Country risk premium (CRP)
 - CAPM: $R = R_F + \beta \times (R_m - R_f + \text{CRP})$
- No need to account for differences in GDP growth rates

Country Spread Model

- Use **developed** market as benchmark
- $RP = YTM_{bond}^{emerging} - YTM_{bond}^{developed}$
- Add a premium for emerging market
 - Yield on bonds in **emerging** market - the yield on corresponding bonds in **developed** market

Country Risk Rating Model

- Train - Developed countries
 - A linear regression on risk **premium** using risk **rating**
 - $\text{risk premium} = f(\text{risk rating})$
- prediction – emerging market
 - using the emerging market's rating

Weighted Cost of Capital (WACC)

- $WACC = w_d \times r_d \times (1 - t) + w_e \times r_e \rightarrow$ firm value
- forward looking
 - t : marginal tax rate
 - w_d : **target** weights
- Equity value = firm value (using WACC) – debt value

Cash Flow and Discount Rate

- Debt and equity
 - Total cash flow – WACC
 - Free cash flow to equity – required equity rate
- inflation
 - Real cash flow – real rate
 - Nominal cash inflow – nominal rate
- Example
 - its home market experiences high, unpredictable, and volatile rates of inflation. To help calculate the company's required rate of return, remove the inflation rate and use real required rate of return

Industry and Company Analysis

Approaches

- Bottom-up
 - Individual company
 - Historical revenue growth, new production
- Top-down
 - Macroeconomic and GDP
- Hybrid
 - Highlight inconsistency and assumptions

Revenue Forecast

- Grow relative to GDP growth
 - $\text{growth} = \text{GDP growth} \times (1 + x)$
- Market growth and market share
 - Industry sale and percentage

Economics of scale

- Low COGS and SG&S for big firms

COGS

- Related to revenue
- $\text{COGS} = (1 - \text{gross margin}) \times \text{future revenue}$

SG&A

- Less sensitive to revenue
- fixed cost (most) – unrelated to revenue
- Variable cost – selling and distribution costs

Financing costs

- $\text{Net debt} = \text{gross debt} - \text{cash} - \text{cash equivalents} - \text{short-term securities}$
- $\text{Net interest expense} = \text{gross interest expense} - \text{interest income on (cash and short-term securities)}$
- $\text{Gross interest rate} = \text{gross interest expense} / \text{average gross debt}$
- $\text{Net interest rate} = \text{net interest expense} / \text{average net debt}$
- $\text{interest income rate} = \text{interest income} / \text{average (cash + ST)}$

Income Tax Expense

- statutory rate
 - changed in a country
- effective tax rate
 - $\text{interest tax expense} / \text{pre-tax income}$
- cash tax rate
 - $\text{cash taxes paid} / \text{pre-tax income}$
- $\text{income tax expense} = \text{cash tax} + \Delta \text{DTL} - \Delta \text{DTA}$

Balance Sheet

- working capital
 - related to **income** statement
- inventory
 - $\text{inventory} = \frac{\text{COGS}}{\text{inventory ratio}}$
- account receivable
 - $\text{account receivable} = (\text{days sales outstanding}) \times \left(\frac{\text{sales}}{365}\right)$
- PP&E
 - Depreciation and capital expenditures (capex)
 - capital expenditures for maintenance and growth

return on invested capital (ROIC)

- ROE (after-tax and after interest)
 - NI / equity
 - most common measure of shareholder return, and share repurchase program will affect the relevance of the ratio
- NOPLAT (after-tax and before interest)
 - net operating profit adjusted for taxes (NOPLAT) = EBIT*(1-t)
- **invested capital**
 - operating assets (no cash) – operating liabilities (no debt) 经营资产 – 经营负债
 - cash: investing, debt: financing 要扣除
- ROIC
 - NOPLAT / invested capital
 - compare **different capital** structure, not affected by the deb amount
- ROCE
 - Return on capital **employed** - different countries
 - operating earnings (**before tax**) / **invested capital**
 - Compare different **tax rates**

Competitive Advantages

- Porter's five forces

Input Costs

- Price and quantity

Technological development

- Reduce cost
- cannibalization factor - New substitute
- **cannibalization rate** = $\frac{\text{new product sale that replace existing product sales}}{\text{total new product sale}}$

Forecast Horizon – long enough

- highly cyclical companies
 - forecast **mid-cycle** sales
 - normalized earnings: mid-cycle earning

Beyond Short-term Forecast

- Assume trend growth rate of previous cycle will continue
 - Cash flow - Terminal value
 - relative valuation
 - P/E
 - discounted cash flow
 - normalized to a mid-cycle value
 - **Inflection** point
 - when future will not be like the past
1. Estimate revenue growth and future expected revenue (using market growth plus market share, trend growth rate, or growth relative to GDP growth).
 2. Estimate COGS (based on a percentage of sales, or on a more detailed method based on business strategy or competitive environment).
 3. Estimate SG&A (as either fixed, growing with revenue, or using some other estimation technique).
 4. Estimate financing costs (using interest rates, debt levels, and the effects of any large anticipated increases or decreases in capital expenditures or anticipated changes in financial structure).
 5. Estimate income tax expense and cash taxes (using historical effective rates and trends, segment information for different tax jurisdictions, and anticipated growth in high- and low-tax segments).
 6. Estimate cash taxes, taking into account changes in deferred tax items.
 7. Model the balance sheet based on items that flow from the income statement [working capital accounts (i.e., accounts receivable, accounts payable, and inventory)].
 8. Use depreciation and capital expenditures (for maintenance and for growth) to estimate capital expenditures and net PP&E for the balance sheet.

Discounted Dividend Valuation

Summary

- **Cash Flow**
 - **Dividend**: theoretically justified, less volatile, minority interest
 - **Free cash flow**: Controlling interest, negative
 - Residual Income: require **transparent** reporting and high-quality **earning**
- Gordon constant growth
 - $V_0 = \frac{D_1}{r-g} = \frac{D_0 \times (1+g)}{r-g}$
- **Present Value of Growth Opportunities (PVGO)**
 - $PVGO = V_0 - \frac{E_1}{r} = V_0 - \frac{E_0}{r} \times (1+g)$
- **Justified P/E**
 - $leading \frac{P}{E} = \frac{1-b_1}{r-g}$ (b_1 : retention ratio of **current** year)
 - $trailing \frac{P}{E} = \frac{1-b_0}{r-g} \times (1+g)$ (b_0 : retention ratio of **previous** year)
- Growth and ROE
 - $ROE = \frac{E_1}{V_0}$, $SGR = \frac{RE_1}{V_0} = ROE \times b$ retained earnings growth rate
- Perpetual Preferred Stock $V_0 = \frac{D_p}{r_p}$
- **Two-stage DDM**
 - Short-term growth g_s up to n periods, and growth g_l forever
 - 正常计算 $V_n = \frac{D_n \times (1+g_l)}{r-g_l}$, 技巧计算 $V_{n-1} = \frac{D_n}{r-g_l}$
- **H-Model**
 - Start high and linear decrease to long-term stable growth rate
 - $V_0 = \frac{D_0 \times (1+g_m)}{r-g_l}$
 - $g_m = g_l + \frac{t}{2} \times (g_s - g_l)$ 长方形面积
- **Required Return**
 - CGM: $r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1+g) + g$
 - H-Model: $r = \frac{D_0}{P_0} \times (1+g_m) + g_l$
 - $\frac{D_0}{P_0} = trailing\ dividend\ yield$

Cash Flow

- dividend
 - **theoretically** justified
 - less **volatile** than others
 - cons
 - difficult for firms don't currently pay dividend
 - **minority interest** not controlling interest
 - Suitable
 - Has a **historical** dividend payment
 - Dividend policy is clear and related to earnings
 - Perspective is that of a **minority** shareholder
- free cash flow 公司角度

- FCFF and FCFE
- Regardless of capital structure or dividend policies
- Cons
 - Negative cash flow
- Suitable
 - No dividend payment history or not related to earnings
 - Free cash flow **corresponds** with profitability
 - Perspective is that of a **controlling** shareholder
- residual income 超额回报, 投资者角度
 - amount of earnings exceeds required return
 - suitable
 - firms with **no** dividend histories
 - has **negative** cash flows
 - with **transparent** reporting and high-quality **earning**

One-period DDM

- $V_0 = \frac{D_1 + P_1}{1+r}$
 - D_1 : expected dividend at the end of year 1
 - P_1 : expected sale price at the end of year 1

Two-period DDM

- $V_0 = \frac{D_1}{1+r} + \frac{D_2 + P_2}{(1+r)^2}$

Multi-period DDM

- $V_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_n + P_n}{(1+r)^n}$

General DDM

- $V_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \dots = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$
- A terminal value
- Special growth
 - Gordon constant growth
 - Two-stage growth
 - H-stage growth
 - Three-stage growth

Gordon constant growth

- $V_0 = \frac{D_0 \times (1+g)}{1+r} + \frac{D_0 \times (1+g)^2}{(1+r)^2} + \dots + \frac{D_0 \times (1+g)^n}{(1+r)^n}$
- $V_0 = \frac{D_1}{r-g} = \frac{D_0 \times (1+g)}{r-g}$
 - D_0 : just paid/previous/last year dividend
 - D_1 : expected/forecasted/end of year dividend
 - $g < r$: constant growth rate **must be** less than required return
 - $g < 5\%$ cannot be higher than GDP growth
 - sustainable growth ($g=b \times \text{ROE}$) must be less than the economy's growth rate

Present Value of Growth Opportunities (PVGO)

- $V_0 = \frac{E_1}{r} + PVGO = \frac{E_0}{r} \times (1 + g) + PVGO$
- PVGO reflects not only the value of a company's options to invest, captured by the word "opportunities," but also the value of the company's options to time the start, adjust the scale, or even abandon future projects. This element is the value of the company's real options (options to modify projects, in this context).

P/E Classification

- P
 - Market (market price) vs justified (estimated price)
- E
 - Leading (next) vs trailing (previous)

Justified P/E – P is estimated from

- Leading P/E
 - $leading \frac{P}{E} = \frac{P_0}{E_1} = \frac{\frac{D_1}{E_1}}{r-g} = \frac{1-b}{r-g}$
 - b : retention ratio
 - $\frac{D_1}{E_1} = 1 - b$: dividend pay-out ratio
- Trailing P/E
 - $trailing \frac{P}{E} = \frac{P_0}{E_0} = \frac{\frac{D_0 \times (1+g)}{E_0}}{r-g} = \frac{1-p}{r-g} \times (1+g)$
- $trailing \frac{P}{E} = leading \frac{P}{E} \times (1+g)$
- Growth rate and ROE
 - $ROE = \frac{E_1}{V_0}$
 - $g = \frac{RE_1}{V_0} = \frac{RE_1}{E_1} \times \frac{E_1}{V_0} = ROE \times b$

Perpetual Preferred Stock

- $V_0 = \frac{D_p}{r_p} = \frac{D_p}{1+r} + \frac{D_p}{(1+r)^2} + \dots$

Business Phases

- Initial growth phase
 - Increased earning, little or no dividend
 - growth rates above the average **nominal** growth for the economy
- Transition phase
 - Earning are increasing at a slower rate
 - growth rates above the average **nominal** growth for the economy but with the growth rate **declining**
- Mature phase
 - Earnings grow at a lower stable rate, equal to the nominal **economic growth** rate 和经济增长一样

Variable	Growth Phase		
	Initial Growth	Transition	Maturity
Earnings Growth	Very high	Above average but falling	Stable at long-run level
Capital Investment	Significant requirements	Decreasing	Stable at long-run level
Profit Margin	High	Above average but falling	Stable at long-run level
FCFE	Negative	May be positive, and growing	Stable at long-run level
ROE vs. Required Return	ROE > r	ROE approaching r	ROE = r
Dividend Payout	Low or zero	Increasing	Stable at long-run level
Appropriate Model	Three-stage	Two-stage	Gordon growth

Terminal Value

- Present value of last stage
- Gordon growth model
- Market multiple approach: P/E

Two-stage DDM

- Growth
 - Short-term growth: g_s up to n periods
 - Long-term growth g_l forever
- $V_0 = \sum_{t=1}^n \frac{D_0 \times (1+g_s)^t}{(1+r)^t} + \sum_{t=n+1}^{\infty} \frac{D_n \times (1+g_l)^{t-n}}{(1+r)^t}$
 - $= \sum_{t=1}^n \frac{D_0 \times (1+g_s)^t}{(1+r)^t} + \frac{D_{n+1}}{r-g_l} \times \frac{1}{(1+r)^n}$
 - $= \sum_{t=1}^n \frac{D_0 \times (1+g_s)^t}{(1+r)^t} + \frac{D_0 \times (1+g_l)}{r-g_l} \times \frac{(1+g_s)^n}{(1+r)^n}$
- $D_n = D_0 \times (1+g_s)^n$
- $V_n = \frac{D_n \times (1+g_l)}{r-g_l}$
- $V_{n-1} = \frac{D_n}{r-g_l}$
 - $V_{n-1} = \frac{D_n}{1+r} + \frac{V_n}{1+r} = \frac{D_n}{1+r} \left(1 + \frac{1+g_l}{r-g_l}\right) = \frac{D_n}{r-g_l}$
- $V_0 = \sum_{t=1}^n \frac{D_0 \times (1+g_s)^t}{(1+r)^t} + \frac{D_{n+1}}{r-g_l} \times \frac{1}{(1+r)^n}$
- $V_0 = \sum_{t=1}^{n-1} \frac{D_0 \times (1+g_s)^t}{(1+r)^t} + \frac{D_n}{r-g_l} \times \frac{1}{(1+r)^{n-1}}$
- 技巧1
 - 计算 D_0 到 D_n
 - 计算 $V_n = D_n \times \frac{1+g_l}{r-g_l}$
 - 计算 CF
 - $CF_i = D_i$ for $i \in 1 \cdots n-1$
 - $CF_n = D_n + V_n$
- 技巧1
 - 计算 D_0 到 D_n

- 计算 $V_{n-1} = \frac{D_n}{r-g_l}$
- 计算 CF
 - $CF_i = D_i$ for $i \in 1 \cdots n-2$
 - $CF_{n-1} = D_{n-1} + V_{n-1}$

H-Model

- Start high and linear decrease to long-term stable growth rate
- $V_0 = \frac{D_0 \times (1+g_l)}{r-g_l} + \frac{D_0 \times H \times (g_s - g_l)}{r-g_l}$
 - $H = \frac{t}{2}$ in years
- $V_0 = \frac{D_0 \times (1+g_m)}{r-g_l}$
 - $g_m = g_l + \frac{t}{2} \times (g_s - g_l)$ 长方形面积

Three-stage DMM

- two-stage DMM + CGM
- One stage + H-Model

Spreadsheet Modelling

- Flexible
- Pay special dividend

Required return

- CGM: $r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g$
- H-Model: $r = \frac{D_0}{P_0} \times (1 + g_m) + g_l$

Sustainable Growth rate (SGR) 权益/留存收益可持续增长

- $SGR = b \times ROE = \frac{\text{Retained earning}}{\text{common equity}}$
 - b: earning retention rate = 1 – dividend pay-out rate
 - Prefer to use the **beginning** equity to calculate SGR
- $SGR = \frac{\text{retained earning}}{NI} \times \frac{NI}{\text{sales}} \times \frac{\text{sales}}{\text{assets}} \times \frac{\text{assets}}{\text{equity}}$ (PART)
 - Financial: leverage and earning retention
 - Performance: asset turnover, profit margin
 - financial leverage = $\frac{ROE}{ROA}$
 - asset turnover = $\frac{ROA}{NPM}$
- Assumptions
 - Debt-to-equity unchanged
 - **Issue debt** and **internally** generated equity to maintain the ratio
 - No issue of equity
 - ROE constant
- How quickly it can grow with **internally** generated funds
- Equity multiplier = asset / equity

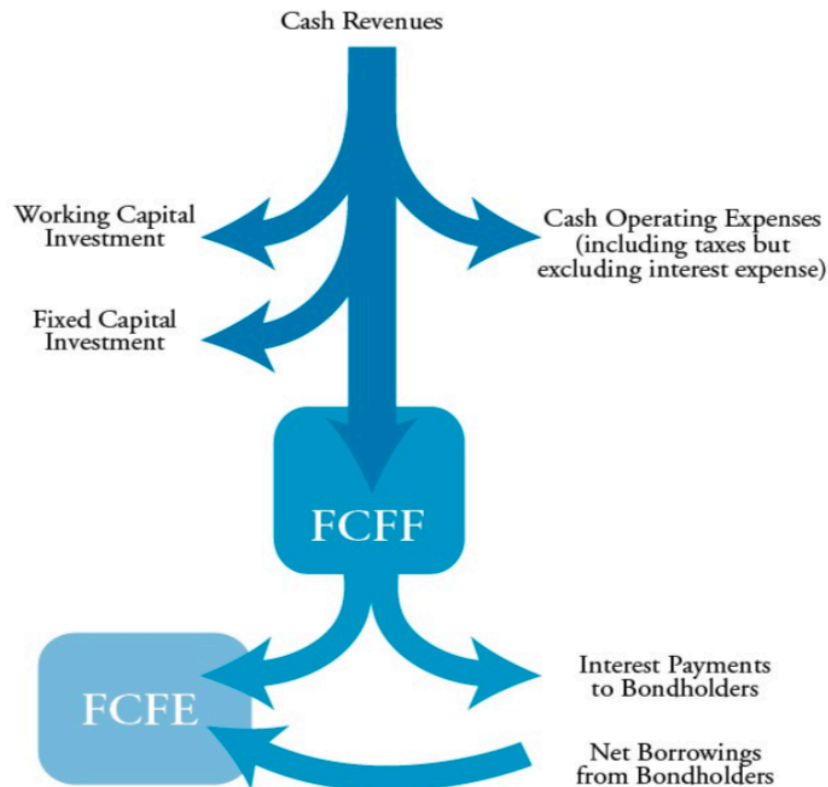
Free Cash Flow Valuation

Summary

- Value
 - Firm value = **FCFF** discounted at **WACC** (operating assets)
 - Equity value = **FCFE** discounted at required **return on equity**
 - Equity value = firm value – market value of debt
- FCFF & FCFE
 - **FCFF = NI + NCC + Int × (1 – t) – WCInv – FCInv**
 - **FCFE = FCFF – Int × (1 – t) + NB**
- CFO
 - **CFO = NI + NCC – WCInv**
 - **FCFF = CFO – FCInv + Int × (1 – t)** 经营-投资+融资
 - **FCFE = CFO – FCInv + NB** 经营-投资+融资
- Components
 - **NCC**
 - **NCC = Dep + loss on sale + DTL + bond discount + other noncash loss or charge**
 - **WCInv**
 - **WCInv = Δnoncash current asset – Δnondebt current liability**
 - **FCInv**
 - **FCInv = capex – sale**
 - **FCInv = Δnet + dep_{IS} – gain_{IS}**
 - **NB**
 - **NB = ΔDebt (both short and long term debt)**
- NB Prediction
 - **Capital = WCInv + FVInv – Dep** 资本需求
 - **NB = Capital × DR = (WCInv + FVInv – Dep) × DR**
 - **FCFE = NI – WCInv × (1 – DR) – (FCInv – Dep) × (1 – DR)**
- Preferred Stock (like debt but no taxable advantage)
 - **NI' = NI_{common} + Dividend_p**
 - **FCFF' = FCFF + Dividend_p**
 - **FCFE' = FCFE – Dividend_p + NB_p**
 - **WACC' = WACC + w_p × r_p**

Free Cash Flow

- Cash operating expense
 - Operating expense
 - **Tax** expenses
 - Working capital investment
 - Long-term investment (PP&E)
- FCFF = cash income – cash operating expense
 - Tax is included in expense: pay to government
 - interest expense is excluded from expense: pay to bondholder
- FCFE = FCFF – interest + net borrowing (borrowed - repayment)



Firm and Equity value

- Firm value = **FCFF** discounted at **WACC** (operating assets)
 - Included significant non-operating assets
 - Excess cash (not total cash on B/S)
 - Excess marketable securities
 - Land held for investment
- Equity value = **FCFE** discounted at required **return on equity**
- **Equity value = firm value – market value of debt**
- FCFE is easier where capital structure is not volatile
- FCFF is better if negative FCFE

Ownership Perspective

- Cash flow: Control perspective/control premium
- Dividend: minority

Prefer Cash Flow than Dividend

- Many firms pay no or low cash dividend
- Dividends are paid at the discretion of BOD. It may be poorly aligned with the firm's long-run profitability
- If the company is an **acquisition** target, free cash flow is a more appropriate measure
- Free cash flows may be more related to **long-run profitability** of the firm as compared to dividends

FCFF

- **FCFF = NI + NCC + Int × (1 – t) – FCInv – WCInv**
 - Net income + noncash charge + interest expense
 - FCInv: fixed capital investment (capital expenditures)
 - WCInv: working capital investment

Noncash Charge (depreciation, amortization)

- + depreciation 折旧
- + Amortization of intangible 摊销
- + Provision for restructuring charges and other **noncash** losses
- - Income from restructuring charge reversals and other noncash gains 资产处置
 - 后续要处理，避免两次考虑
- Bond issues 债券
 - + amortization bond discount
 - - amortization bond premium
- Deferred tax 永久差异税务
 - The differences in the timing of reporting income and expenses for accounting versus tax purposes. Overtime, they should offset each other. 忽略临时差异
 - + DTL not expected to reverse 考虑永久差异
 - - DTA not expected to reverse
- non-operating G/L 一般 CFA 中默认是 0
 - Assume non-operating G/L = 0 => operating income = EBIT

Working capital Investment 流动资产 – 经营(inventory, A,R, A.P)

- **WCInv = Δnoncash current asset – Δnondebt current liability**
- Current **non-cash** asset: 非现金流动资产 (inventory, A.R)
 - Exclude cash, cash equivalents
- Current **non-debt** liabilities 非债务流动负债 (A.P)
 - Exclude **debt**: notes payable, current portion of long-term debt (CFF)

Fixed capital investment 长期固定资产

- **FCInv = investments in long-term fixed assets – proceeds from sale of long-term assets** 购买 – 出售
- C/F: capex and proceeds
- **FCInv = Δgross PP&E – gain on sale**
- **FCInv = Δnet PP&E + depreciation expense in IS – gain on sale**
- If no long-term assets are sold
 - FCInv = Δnet PP&E + depreciation = **Δgross PP&E**
- If long-term assets were sold
 - Capex: **purchase** of fixed assets/PP&E
 - Proceeds from sale of fixed assets
 - Proceeds from disposal of fixed assets
 - **FCInv = capex – proceeds from sale of long term assets**
 - **FCInv = Δnet PP&E + Depreciation – gain on sale**
 - Depreciation 是 NI 里的折旧

Fixed Capital Investment

- B/S: Gross 只会应为采购和出售而变化, 还在 B/S 里
 - $\Delta \text{gross} = \Delta \text{net} + \text{dep}_{\text{BS}} = \Delta \text{net} + \Delta \text{accumulated depreciation}$
 - $\Delta \text{gross} = \text{capex} - \text{BV}_0^{\text{sold}}$
 - 出售资产的开始账面价值
- I/S: 出售资产 (全部进入 I/S, 不出现在 B/S 里)
 - $\text{gain} = \text{sale} - \text{BV}_1^{\text{sold}} \rightarrow \text{IS}$
 - $\text{dep}_{\text{sold}} = \text{BV}_0^{\text{sold}} - \text{BV}_1^{\text{sold}} \rightarrow \text{IS}$
- $\text{FCInv} = \text{capex} - \text{sale}$
- $\text{FCInv} = \Delta \text{net} + \text{dep}_{\text{IS}} - \text{gain}$
 - $\text{FCInv} = \Delta \text{gross} + \text{BV}_0^{\text{sold}} - \text{gain} - \text{BV}_1^{\text{sold}}$
 - $= \Delta \text{net} + (\text{dep}_{\text{BS}} + \text{dep}_{\text{sold}}) - \text{gain}$
 - $= \Delta \text{net} + \text{dep}_{\text{IS}} - \text{gain}$
- Sold assets 被出售的资产
 - 资产和折旧不再计入 B/S 里。
 - 折旧和 Gain 还是计算在 I/S 里, 因此要逆向操作。

Status	Beginning Gross	End Gross	Depreciation	End Net	Sale Price	Gain
New		A_1 65	0	$B_1 = A_1$ 65		
Existing	A_2 71	A_2 71	D_2 10	$B_2 = A_2 - D_2$ $71-10=61$		
Sold – 1/2	A_3 19	A_3 19	D_3 17	$B_3 = A_3 - D_3$ 2		
Sold – 2/2 (FS)		0	0	0	S_3 10	$S_3 - B_3$ $10-2=8$
BS Total	$A_2 + A_3$ $71+19=90$	$A_1 + A_2$ $71+65=136$	D_2 10	$B_1 + B_2$ $71+55$		
BS Change		$A_1 - A_3$ $65-19=46$				
I/S			$D = D_2 + D_3$ $27=10+17$			$G = S_3 - B_3$ $= 8$

Imagine that we are provided the following information for a firm:

- Net income = \$50.
- Working capital investment = \$4.
- Beginning gross fixed assets = \$90; ending gross fixed assets = \$136.
- Beginning accumulated depreciation = \$30; ending accumulated depreciation = \$40.
- Depreciation expense = \$27.
- Net borrowing = \$0.

In addition, a piece of equipment with an original book value of \$19 was sold for \$10. The equipment had a book value at the time of the sale of \$2. The gain was classified as unusual. Free cash flow to equity is *closest* to:

- Increase in gross assets = 46, sold asset original value = 19
 - So, **purchase** is $46 + 19 = 65$
- FC Capital investment = capex – sales = $65 - 10 = 55$
 - Net change PP&E + **dep** – gain = $(46 - 10) + 27 - 8 = 36 + 27 - 8 = 55$ 不好算
- NCC = Depreciation – Gain = $27 - 8 = 10 + (17 - 8) = 19$
- FFCE = NI + NCC – WCInv – FCInv + net borrowing = $50 + 19 - 4 - 55 = 10$

资产折旧	Depreciation, Amortization, Impairment	+ add back
重组	Restructuring non-cash charge expense / income	+ expense - income
固定资产处置	Fixed Asset Disposal non-cash gain /loss 后面固定资产里还会考虑 NI 里考虑过，因此从 NI 里剔除掉	+loss -gain
债务	Amortization of long-term bond discount /premium 债券折价(discount=interest expense – cash paid>, 欠对方钱，利润里扣除多，但是现金给得少，因此加回来) 债券溢价	+ discount - premium
税收	Deferred tax liabilities / assets (expected not reverse)	+ DTL - DTA

FCFF formulas

- **FCFF = NI + NCC + Int × (1 – t) – WCInv – FCInv**
- **FCFF = EBIT × (1 – t) + Dep – WCInv – FCInv**
 - $(EBIT - \text{Int}) \times (1 - t) = \text{NI} \rightarrow EBIT \times (1 - t) = \text{NI} + \text{Int} \times (1 - t)$
 - $NCC = \text{Dep}$
- **FCFF = EBITDA × (1 – t) + Dep × t – WCInv – FCInv**
 - $EBITDA = EBIT + \text{Dep}$
 - $\rightarrow EBIT \times (1 - t) = EBITDA \times (1 - t) - \text{Dep} \times (1 - t)$
- **FCFF = CFO – FCInv + Int × (1 – t) 经营 - 投资 + 融资**
 - $CFO = \text{NI} + NCC - \text{WCInv} = \text{NI} + NCC - \Delta \text{WC}$

FCFE formulas

- **FCFE = FCFF – Int × (1 – t) + NB**

- net borrowing = long and short term new debt issues – long and short term debt repayment
- **FCFE = CFO – FCInv + NB 经营 - 投资 + 融资**
- $FCFE = EBITDA \times (1 - t) - Int \times (1 - t) + Dep \times t - WCInv - FVInv + NB$
- $FCFE = EBIT \times (1 - t) - Int \times (1 - t) + Dep - WCInv - FVInv + NB$
- **FCFE = NI + Dep – WCInv – FVInv + NB**

Statement of Cash Flows	FCFF and FCFE	
Net income (NI)	Net income (NI)	
+ Noncash charges (NCC)	+ Noncash charges (NCC)	
– WCInv	– WCInv	
Cash flow from operations (CFO)	Cash flow from operations (CFO)	
– FCInv	+ Int (1 – tax rate)	After-tax interest expense is classified as financing outflow rather than operating outflow
(Almost) FCFF	– FCInv	
+ Net borrowing	(Actual) FCFF	
	+ Net borrowing	
	– Int (1 – tax rate)	
FCFE	FCFE	
– Dividends	– Dividends	
+/- Common stock issues (repurchases)	+/- Common stock issues (repurchases)	
Net change in cash	Net change in cash	

Free Cash Flow with preferred stock

- **Treat 当成利息费，但是不减税**
 - Treat just like debt
 - dividends are not taxable
- NI
 - NI to **common** shareholder
 - NI total = NI common + preferred dividend
- FCFF
 - $FCFF' = FCFF + \text{Dividend}_p$
 - Assume net income to common shareholder and preferred dividend has been subtracted before it.
 - $WACC = w_d \times r_d \times (1 - t) + w_e \times r_e + w_p \times r_p$
- FCFE
 - $FCFE' = FCFE - \text{Dividend}_p + NB_p$

Forecasting Cash Flow

- Whole - Historical free cash flow
 - Apply a growth rate
 - FCFF and FCFE have different growth rate
- Part - Forecast underlying components of free cash flow
 - More realistic, flexible and more complicated
 - Capital expenditures

- **Maintain** existing capacity – current sale level
 - Marginal outlays to support **growth – future sale**
- maintain a target **debt-to-asset** ratio in working and fixed capital
 - $\text{net borrowing} = \Delta \text{total capital} \times \frac{D}{A}$
- $\text{total capital} = \text{debt} + \text{equity} = \text{liability} - \text{AP} + \text{equity}$
 - $= \text{total asset} - \text{AP} = \text{current asset} + \text{noncurrent asset} - \text{AP}$
 - $= \text{current asset} - \text{cash} - \text{AP} + \text{fixed asset}$
 - $= \text{WC} + \text{FC} - \text{Accumulate Depreciation}$
- $\text{Capital} = \text{WCInv} + \text{FCInv} - \text{Dep}$
- $\text{net borrowing} = (\text{WCInv} + \text{FVInv} - \text{Dep}) \times \text{DR}$
- $\text{FCFE} = \text{NI} - \text{WCInv} \times (1 - \text{DR}) - (\text{FVInv} - \text{Dep}) \times (1 - \text{DR})$

Core Formula

- $\text{FCFF} = \text{NI} + \text{NCC} + \text{Int} \times (1 - t) - \text{FCInv} - \text{WCInv}$
- $\text{NCC} = \text{Dep} = \Delta \text{fixed asset accumulated depreciation}$
 - $= \text{depreciation expense} - \text{fixed asset sale gain}$
- $\text{WCInv} = \text{non cash current asset} - \text{non debt current liability}$
 - $= \Delta \text{inventory} + \Delta \text{account receivable} - \Delta \text{account payable} + \dots$
 - Exclude: cash, cash equivalents, notes payable, current portion of long-term debts
- $\text{FCInv} = \text{fixed asset purchase} - \text{fixed asset sale}$
 - $\text{FCInv} = \Delta \text{net PP\&E} + \text{depreciation} - \text{gain on sale}$
 - $\text{fixed asset purchase} = \Delta \text{gross PP\&E} + \text{sold asset begin book value}$
 - $\text{fixed asset sale gain} = \text{fixed asset sale} - \text{sold asset end book value}$
- $\text{FCFE} = \text{FCFF} - \text{Int} \times (1 - t) + \text{net borrowing}$
- $\text{net borrowing} = \Delta \text{debt} = \Delta \text{short term debt} + \Delta \text{long term debt}$
- $\text{predicted net borrowing} = (\text{WCInv} + \text{FCInv} - \text{Dep}) \times \text{DR}$

Effects

- dividends, share repurchases, share issues
 - no effect on FCFF and FCFE
- **change of leverage**
 - no effect on **FCFF**
 - minor effect on **FCFE**
 - decrease leverage via repayment -> decrease FCFE in the current year
 - next year interest is decreased -> FCFF increase
 - issue debt
 - In the year the debt is issued, it increases the FCFE by the amount of debt issued. (NB increase)
 - After the debt is issued, FCFE is then reduced by the after-tax interest expense. (NB unchanged, but interest paid increase)

Approximation

- NI is a poor proxy for FCFE
- EBIDTA is a poor proxy for FCFF

FCFF and FCFE

- FCFF
 - Always discount using WACC
 - Use **target weights** or market-value weights
 - Leveraged: preferred when a company is **leveraged** and expecting a change in capital structure.
 - Leveraged: FCFF growth will reflect fundamentals more clearly because FCFE growth will reflect **fluctuating** amounts of net borrowing
 - FCFF is likely to be easiest when a company is levered and has **negative** FCFE.
- FCFE
 - Compare companies with high **inflationary** expectations
 - **Real** (inflation-adjusted) values are estimated
 - Required return on equity might be expected to be more **sensitive** to changes in financial leverage than changes in the **WACC**
 - Use FCFE is **preferred** and **simpler** than relying on FCFF when a firm's capital structure is relatively **stable** and FCFE is **positive**.

Multi-stage

- Two-stage
 - A short-term supernormal growth and a long-term stable growth
- Three-stage
 - A growth transition, mature

Residual Income Valuation

Summary

- $RI_t = NI_t - E_{t-1} \times r_e = E_{t-1} \times (ROE - r_e)$
- $EVA = NOPAT - \$WACC = EBIT \times (1 - t) - \text{Capital}_{t-1} \times WACC$
- $MVA_t = \text{Market Value}_t - \text{Capital}_t$ 都是年底的值
- **Clean Surplus Relation**
 - $g = ROE \times b$
 - $B_t = B_{t-1} + E_t - D_t = B_{t-1}(1 + g)$
 - $RI_t = RI_{t-1} \times (1 + g)$
- **Single-stage** $V_0 = B_0 \times \frac{ROE - g}{r_e - g}$
- **Multi-Stage Residual Income**
 - $PVRI_{t-1} = \frac{RI_t}{r - g} = \frac{RI_t}{1 + r - \omega}$ growth at $\omega - 1$
 - $PVRI_{t-1} = \frac{RI_t + PVRI_t}{1 + r} = \frac{RI_t + P_t - B_t}{1 + r}$ P/B multiple
- **Properties**
 - terminal value does not dominate
 - economic profitability
- **Clean Surplus Violations**
 - Investment AFS, pension, FX, hedge, revaluation, credit loss

Residual Income (RI) – Economic Profit 股东超额收益

- $RI_t = NI_t - E_{t-1} \times r_e$
 - *equity capital* \times *cost of equity*
- $RI_t = E_{t-1} \times ROE - E_{t-1} \times r_e = E_{t-1} \times (ROE - r_e)$
 - $ROE = \frac{NI_t}{E_{t-1}}$

Economic Income 经济收入

- 经济收入 = 现金流 + 价值升值（其实是贬值）
 - $EI_t = CF_t + \Delta M_t = M_{t-1} \times r$

Total capital 初始投入资本

- Total capital = book value of long-term debt + book value of equity
- Total capital = net working capital + net fixed assets（都用来投资了）
- capital repayment = $-\Delta \text{capital} = \text{principle} = D$ 本金降低

EVA 公司超额收益

- **EVA**
 - $EP = EVA = NOPAT - \$WACC = EBIT \times (1 - t) - \$WACC$
- **Decompose**
 - $EBIT \times (1 - t) = NI + \text{Int} \times (1 - t)$
 - $\$WACC = C_d \times r_d \times (1 - t) + C_e \times r_e$
 - $EVA = NI + \text{Int} \times (1 - t) - C_d \times r_d \times (1 - t) - C_e \times r_e$
 - $EVA = (NI - C_e \times r_e) + (\text{Int} - C_d \times r_d) \times (1 - t)$
 - $EVA = RI + DI$ 股东和债权人的超额收益
- NOPAT adjustment 未来盈利的

- Capitalize and amortize R&D charge, and **add** them back to NOPAT
- Add back charges on **strategic** investments that will generate returns in the future
- Only consider cash tax: add DTA – cash tax
- Treat operating lease as capital lease and adjust non-recurring items
- Add LIFO reserve to invested capital, and add change in LIFO reserve to NOPAT
- $EVA_t = \text{Cash} - \text{capital repayment} = EBIT \times (1 - t) + D - (D + \$WACC)$
- Increase EVA
 - Reduce SG&A fees
 - Adjust to optimal leverage
- R&D costs are added back to NOPAT when calculating EVA. Therefore, decreasing R&D will serve to lower NOPAT and thus lower EVA.

Market value added 公司市值增加(年底)

- $MVA = \text{market value} - \text{capital book value} = M - C$
- $MVA_t = \text{Market Value}_t - \text{capital book value}_t$ 都是年底的值

Clean Surplus Relation

- $B_t = B_{t-1} + E_t - D_t$ (equity + earning - dividend)
- $B_t = B_{t-1} + B_{t-1} \times ROE - B_{t-1} \times ROE \times (1 - b)$
 - b : earning retention ratio
- $B_t = B_{t-1}(1 + ROE \times b) \rightarrow g = b \times ROE$
- $RI_t = B_{t-1} \times (ROE - r) = B_{t-2} \times (ROE - r) \times (1 + g) = RI_{t-1} \times (1 + g)$
- Summary
 - $g = b \times ROE$ 留存收益/权益增长率
 - $B_t = B_{t-1} \times (1 + g)$
 - $RI_t = RI_{t-1} \times (1 + g)$
 - Growth will approach zero

Residual Income Valuation (equity fair value = book value + future value)

- $V_0 = B_0 + \sum_{t=1}^n \frac{RI_t}{(1+r_e)^t}$
- Grow at growth rate $g = b \times ROE$
- $V_0 = B_0 \times \frac{ROE-g}{r_e-g}$
 - $V_0 = B_0 + \sum_{t=1}^n \frac{RI_t}{(1+r_e)^t} = B_0 + \frac{RI_1}{r_e-g} = B_0 + \frac{B_0 \times (ROE-r_e)}{r_e-g} = B_0 \times \frac{ROE-g}{r_e-g}$
- $V_0 = B_0 + PV(RI) = B_0 + \frac{RI_1}{r_e-g}$
 - Two parts: current book value and present value of future residual income
- $V_0 = \frac{D_1}{r_e-g}$
 - $V_0 = B_0 \times \frac{ROE-b \times ROE}{r_e-g} = B_0 \times ROE \times \frac{1-b}{r_e-g} = \frac{E_1 \times (1-b)}{r_e-g} = \frac{D_1}{r_e-g}$
- Sensitive to terminal value
 - Dividend/CF: more sensitive to terminal value
 - RI: less sensitive, because most are from **initial** book value 大部分来自于年初的净资产

P/B

- $$\frac{V_0}{B_0} = \frac{ROE - g}{r_e - g}$$

Multi-Stage Residual Income

- Stages: high-growth (1 to **t-1**) and continuing (from t)
- $V_0 = B_0 + PV(\text{high growth RI}) + PV(\text{continuing RI})$
- persistence factor ω
 - $RI_{t+1} = RI_t \times \omega$
 - High
 - Low dividend and high residual income
 - Low
 - High return on equity
 - high accounting accruals
 - significant levels of non-recurring items
- $PV_{t-1} = \frac{RI_t}{r-g} = \frac{RI_t}{1+r-\omega}$
 - $RI_t = RI_{t-1} \times \omega = RI_{t-1}(1+g) \rightarrow \mathbf{g = \omega - 1}$
- ω
 - $\omega = 1 \rightarrow PV = \frac{RI_t}{r} \quad (RI_{t+1} = RI_t)$
 - $\omega = 0 \rightarrow PV = \frac{RI_t}{1+r} \quad (RI_{t+1} = 0)$
- decrease to a long run level
 - $PV_t = P_t - B_t$
 - P_t can be estimated using a price-to-book value ratio
 - $P_t = \left(\frac{P}{B}\right) \times B_t$
 - $PV_{t-1} = \frac{RI_t + PV_t}{1+r} = \frac{RI_t + P_t - B_t}{1+r}$ 未来现金流和 terminal 值的折现
 - 相当于这里有 3 个阶段了

Intrinsic Value - Identical

- Expected dividends
- expected free cash flow to equity
- Book value plus expected residual income

Strength

- Terminal value does not **dominate** the intrinsic value estimate 重点值不
- Use **accounting** data, which is easy to find 会计数据, 经济收益
- Focus on **economic** profitability rather than just on accounting profitability
- Applicable even when cash flows are volatile
- estimate of the profit of the company after deducting the cost of all capital: debt and equity
- It makes no assumptions about future earnings and dividend growth

Weaknesses

- Accounting data can be **manipulated** by management 操纵
- Accounting data requires numerous and significant **adjustments** 调整

- interest expense may **not reflect** the true **cost** of debt capital
- Assume **clean surplus relation** holds or that is failure to hold 关系
 - Paid capital,

Appropriate

- Pay no dividend
- free cash flow is **negative**
- terminal value is highly uncertain 终点值不确定

not appropriate

- clean surplus accounting relation is violated significantly
- significant uncertainty concerning the estimates of book value and return on equity

I/S - Clean Surplus Violations

- contributed capital
- OCI
 - **Investment:** Unrealized G&L of AFS securities
 - **Pension** adjustment
 - **Foreign** translation G&L in current method
 - **Hedge** G & L
 - IFRS: **Revaluation** surplus
 - IFRS: value of certain liabilities due to changes in the liability **credit** risk
- **Book** value is correct, **net income** is wrong
- Whether they will **offset** in the future

B/S - Variation of fair value

- Operating leases
- Special purpose entities
- Reserves and allowances
- Inventory for LIFO -> FIFO
- Pension asset or liability
- Deferred tax liabilities

Intangible asset effects on Book Value

- Intangibles recognized at acquisition - goodwill
 - Impairment will reduce ROE
- R&D expenditures

Nonrecurring items and other aggressive accounting practices

- Not expected to continue
- The analyst need not adjust the book value of common equity for non-recurring items.

International Accounting differences

- Differences in national accounting

Market-Based Valuation

Summary

- Price multiples
 - P/E, P/S, P/B, P/CF, D/P
 - Market/justified/predicted
 - Leading/trailing
 - CF: CFO, adjusted CFO, FCFE, EBITDA
- P/E
 - Market/justified/predicted (linear regression)
 - Leading/trailing
 - **Underlying** earning (**persistent** recurring)
 - **Normalized** earnings (**average** over business cycle)
 - Average EPS (ignore firm size) or average ROE
 - $EPS = ROE \times BVPS$
- Formula
 - $leading \frac{P}{E} = \frac{\frac{D_1}{E_1}}{r-g} = \frac{1-b}{r-g}$
 - $trailing \frac{P}{E} = \frac{1-b}{r-g} \times (1+g) = (1+g) \times leading \frac{P}{E}$
 - $trailing \frac{P}{B} = \frac{ROE-g}{r-g} = ROE \times leading \frac{P}{E}$
 - $trailing \frac{P}{S} = \frac{E_0}{S_0} \times trailing \frac{P}{E} = \text{net profit margin} \times trailing \frac{P}{E}$
 - $trailing \frac{D}{P} = \frac{D_0}{P_0} = \frac{D_0}{D_0 \times \frac{1+g}{r-g}} = \frac{r-g}{1+g}$
 - **PEG** = $\frac{P/E}{g} \times 100$ lower is better more growth
 - not linear, fail to consider risk, not affect duration
 - $\frac{P}{FCFE}$ good for **international**
 - Portfolio P/E – harmonic mean
- Compare
 - P/E
 - + popular, investment value
 - - Negative, volatile, manipulation
 - P/B (common stock)
 - + Positive, stable, go out of business, **liquidation**, **liquid** asset
 - - **intangible** assets, ignore asset size, inflation
 - P/S
 - + positive, not volatile, not easy to manipulate
 - + Distressed firm, mature, cyclical or start-ups
 - - cannot capture profitability, cost structure
 - P/CF
 - + hard to manipulate
 - DY (D/P)
 - + not risky, part of total return
 - - displacement, ignore capital appreciation
- Enterprise value
 - EV/EBITDA
 - EV (debt + equity – cash, use **market** value), TIC (debt + equity)

- denominator: EBITDA, FCFE, EBIT, Sales
- EBITDA
 - Leverage, different tax rate, capital-intensive
- Cross-border
 - P/FCFE is least affected
- Momentum indicators
 - Price or earning to values in **earlier** periods

Methods of comparable

- Average price multiple of stock similar companies
- Law of one price
 - Sell at comparable price multiples
- Relative valuation to benchmark value

Methods of forecasted fundamentals

- Stock based on ratio of its value from a discounted cash flow to fundamental variables
- Justified price multiple

P/E

- price: market or justified
- Timing: leading or trailing
- Advantages
 - Earning power, EPS, is the primary determinant of **investment** value
 - Popular in investment community
 - P/E differences are significantly related to long-run average stock return
- Disadvantages
 - Can be **negative**
 - **Volatile**, transitory portion
 - **Management** discretion, distorted
- Trailing
 - Past 12 month's earnings
 - Not useful for forecast if business has changed (e.g., acquisition)
- Leading
 - Next 12 month's earning or next fiscal earning
 - May not be relevant if earnings are sufficiently volatile

P/B

- Only consider **common equity**
- $P/B = \frac{\text{market value of common equity}}{\text{book value of equity}}$
 - *book value of equity = assets – liabilities – preferred stock*
- Advantages
 - **Positive**, even when earning is negative 正的
 - More **stable** than EPS 稳定
 - Firms hold **liquid** assets 流动
 - 因为价值价值和市场价值很接近

- Financial institutions, investment companies
 - Firms that **go out of** business 破产
 - Explain long-run average stock returns
- Disadvantages
 - Does not reflect **intangible** assets 无形资产
 - Misleading for different **asset size** 没有考虑规模
 - **Inflation** and technological change cause book and market value of asset to differ
- Adjustment
 - Use tangible value, ignore intangible (goodwill, patents)
 - Off-balance-sheet
 - Different between book and fair value
 - Ensure comparability, FIFO and LIFO

P/S

- Advantages
 - Positive: meaningful for **distressed** firms
 - Not easy to manipulate
 - Not volatile as P/E
 - For stocks in mature, **cyclical or start-ups** with no record of earnings
- Disadvantages
 - **Profitability**: High sale does not indicate high operating profits
 - Cannot capture **cost structures** across firms
 - Revenue recognition can still distort forecasts

P/CF

- Advantages
 - **Harder** to manipulate
 - More **stable** than P/E
 - Handle problem of differences in quality of reported earnings
 - Related to long-run average stock returns
- Disadvantages
 - Items affect actual cash flow from operations are ignored when EPS + NCC is used
 - FCFE is more preferable than operating cash flow, but it is more volatile

D/P dividend yield

- Advantages
 - Contribute to total investment return
 - **Not risky** than capital appreciation
- Disadvantages
 - Ignores capital appreciation
 - **Displacement**: Dividend paid now **displace** future earnings
- Trailing D/P
 - Past four quarters' dividend = 4 * just paid quarter dividend
- Leading D/P

- Next four quarters' dividend

Market P/E - **Underlying earnings** 核心持续

- Persistent, continuing, or core earnings 持续
- **Exclude non-recurring components** 减掉非持续费用
 - Gains/losses from asset sales
 - Asset write-down
 - Provisions for future losses
 - Changes in accounting estimates
- Adjust EPS for differences in **accounting methods** between companies
- Analyst uses **diluted** EPS for comparative
- **Molodovsky effect**- Cyclical
 - top -> high EPS -> low P/E
- $trailing \frac{P}{E} = \frac{P}{annual\ EPS}$ 过去一年的 EPS

Market P/E - **Normalized earnings** 季节性：归一化

- EPS in the **middle** of business cycle 平均季节
- Historical **EPS** 直接过去多年平均
 - Average EPS over some years
- Average ROE 考虑资产规模
 - $EPS = ROE \times BVPS$
 - *BVPS* related to firm size
 - $EPS = \text{average } ROE \times \text{most recent } BVPS$

Market P/E - **Negative earning**

- Use normalized EPS
- Use earning yield **E/P** because price is never negative

P/E – **Predicted**

- Linear regression on fundamental variables
- Limitations
 - Predictive power for different time period is uncertain
 - Relationship may change over time
 - Multi-collinearity

P/E – **PEG** 成长型股票

- $PEG = \frac{\frac{P}{E}}{g} \times 100$
 - *g* growth rate
- Growth stock
 - P/E high, PEG low
- **Low PEG is better**
- Disadvantages
 - Assume P/E and *g* is **linear**, does not account for **nonlinear**
 - Does not **account for risk**

- does not account for differences in the **duration** of growth
 - Does not reflect the **duration** of **high-growth** period for a multistage valuation model, longer-term growth forecasts are better

Justified P/E - CGM

- *leading* $\frac{P}{E} = \frac{\frac{D_1}{E_1}}{r-g} = \frac{1-b}{r-g}$
- *trailing* $\frac{P}{E} = \frac{\frac{D_1}{E_0}}{r-g} = \frac{1-b}{r-g} \times (1+g)$

Portfolio P/E – weighted harmonic mean

- Arithmetic mean is incorrect, affected most
- Weighted mean and harmonic mean are the same when weights are equal
- $\frac{P}{E} = \frac{P_1 + P_2}{E_1 + E_2} = \frac{1}{\sum \frac{w_i}{x_i}}$
- $X_1 = \frac{P_1}{E_1}, X_2 = \frac{P_2}{E_2}$
- $w_1 = \frac{P_1}{P}, w_2 = \frac{P_2}{P}$

Justified P/B – trailing - RI or CGM

- $\frac{P}{B} = \frac{ROE-g}{r-g}$
- Residual income
 - $P_0 = B_0 \times \frac{ROE-g}{r-g} \rightarrow \frac{P}{B} = \frac{ROE-g}{r-g}$
- P/E
 - $\frac{P_0}{B_0} = \frac{P_0}{E_1} \times \frac{E_1}{B_0} = \frac{1-b}{r-g} \times ROE = \frac{ROE-ROE \times b}{r-g} = \frac{ROE-g}{r-g}$
 - $g = b \times ROE$

Justified P/S - trailing

- $\frac{P}{S} = \frac{P_0}{S_0} = \frac{P_0}{E_0} \times \frac{E_0}{S_0} = PM_0 \times \frac{1-b}{r-g} \times (1+g)$
- $\frac{P}{S} = \text{net profit margin} \times \text{trailing P/E}$

Justified P/CF

- Based on cash flow FCFE or FCFF
- *trailing* $\frac{P}{FCFF} = \frac{1+g}{r-g}$
- *leading* $\frac{P}{FCFF} = \frac{1}{r-g}$

Cash Flow

- $CF = NI + NCC$
- Adjusted CFO = CFO + Int \times (1 - t)
- $FCFE = CFO - FCInv + NB$
- **EBITDA** = EBIT + DA = **NI + Tax + Int + D**

Justified Dividend Yield - trailing

- trailing $\frac{D}{P} = \frac{D_0}{P_0} = \frac{D_0}{D_0 \times \frac{1+g}{r-g}} = \frac{r-g}{1+g}$

EV Multiples

- $EV = M_{\text{debt}} + M_{\text{common}} + M_{\text{preferred}} + \text{Minority Interest} - \text{Cash \& short term investments}$
 - 所有债务 + 权益 - 现金
 - All use **market** value 所有都用市场价值
- Advantages
 - Consider **financial leverages**
 - Value **capital-intensive** business with high levels of **depreciation**
 - positive
- Disadvantages
 - **Overstate** CFO is working **capital** is increasing
- Total invested capital (TIC) / **market** value of invested capital
 - **TIC = debt + equity (includes cash)**

Cross-border International firms

- P/FCFE is least affected
- All income-based are affected, and **cash-based** are least affected
- P/B, P/E, P/EBITDA, EV/EBITDA affected
- A company **high** inflation will have **lower** justified P/E 高通胀低价值
- If the inflation rates are equal but pass-through rates differ,
 - **lower** pass-through rate -> **lower** justified P/E 高转手

Momentum indicators 趋势分析

- Unexpected earning or Earning surprise
 - **Earning surprise = reported EPS – expected EPS**
- Standardized unexpected earning (SUE)
 - $SUE = \frac{\text{earning surprise}}{\sigma(\text{earning surprise})}$
- Relative strength
 - Compare return with previous return or peer return

Private Company Valuation

Summary

- **Private company**
 - Size, quality, lifecycle
- **Income-based approach - Earning Adjustment**
 - **Normalized earnings**: nonrecurring items, real estate expenses, tax
 - strategic or financial buyer: synergy
- **Income-based Approach - Valuation**
 - **High growth** stage
 - FCFM: free cash flow method (two-stage)
 - Firm value = debt value + equity value
 - CCM: capitalized cash flow (one-stage)
 - **EEM: intangible asset**
 - **excess earning** = **earning** – **WC** × **r_{wc}** – **FA** × **r_{fa}**
 - $firm\ value = WC + FA + \frac{excess\ earning}{r_{ia} - g} \times (1 + g)$
- **Income-based Approach - Discount**
 - CAPM: risk free + beta * equity
 - Expanded CAPM: risk free + beta * equity + **size** + **firm**
 - Build up: risk free + **equity** + size + firm + **industry**
- **Market Multiples**
 - **Mature** companies
 - GPCM: guideline public company method (may consider control premium)
 - EV (market value debt + equity - cash)
 - MVIC (market value of invested capital = debt + equity)
 - GTM: transaction (control premium included)
 - PTM: prior transaction of the firm itself
- **Asset-based – liquidation value**
 - Good for **start-ups**, liquid assets, financial firms, investment, natural asset
 - Not good for **intangible** assets
- **Discount**
 - $(1 - \text{control discount}) \times (1 + \text{control premium}) = 1$
 - $1 - \text{total discount} = (1 - \text{lack of control}) \times (1 - \text{lack of marketability})$
 - 流动性

Valuation

- Private equity
 - goodwill from acquisitions and VC investments
- Public equity
 - public firms buy start ups

Company-specific Factors

- lifecycle stage
 - less mature
- size
 - smaller and riskier

- quality and depth of management
 - lower quality
 - reduce depth of management, slow growth, increase risk
- management/shareholder overlap
 - overlap a lot
 - take long-term perspective
 - less agency cost
- short-term investors
- quality of financial and other information
- taxes
 - major concern

Stock-specific factors – usually negative

- liquidity
 - less liquid
- restrictions on marketability
 - agreements
- concentration of control
 - a few shareholders

Valuation

- transaction-related – investment banker
 - selling or financing a firm
 - VC finance
 - IPO
 - Sale in an acquisition
 - Bankruptcy proceedings
 - Performance-based managerial compensation
- compliance-related – accounting or tax knowledge
 - legal and regulatory reasons
 - focus on financing **reporting** and **tax** issues
- litigation – legal and specific jurisdictions
 - shareholder suits, damage claims, lost profits claims, divorce settlements

Value

- fair **market** value - **tax** purpose – **controlling interest** - buy or sell
- fair value for **reporting** – purchase or transfer
- fair value for **litigation** - legal
- market value
 - real estate and other real assets where purchase will be **levered**
- investment value – **minority** interest - **synergy**
 - focus on a particular buyer
- intrinsic value

Approaches

- income approach – present value of future income

- high growth
- market approach – price multiples
 - mature
- asset-based approach
 - start up

Income-base Valuation

- normalized earning
 - SG&A
 - depreciation
 - real estate
 - leverage - interest
- strategic and nonstrategic buyers
 - add synergy for strategic buyer
- estimating cash flow
 - free cash flow – two-stage
 - capitalized cash flow (CCM) – single-stage
 - excess earnings method (EEM) 无形资产

Normalized Earning – Adjust expenses

- similar to underlying earning 基本都是高估费用
- Steps
 - 异常费用
 - **Exclude** nonrecurring and unusual items
 - 非市场费用
 - Adjust **expense** to **market/fair value**
 - 非经营资产 real estate
 - Real estate -> **exclude** income and expense
 - 财务杠杆
 - If too little leverage -> **reduce** interest expense
 - 收购
 - Add **synergy** for strategic buyer
- real estate – SG&A and depreciation
 - I/S (remove income and expense)
 - - income + expense
 - B/S
 - If it is used for business, **market**-estimated **rental** expense
 - Asset -> nonoperating asset
 - Lease -> adjust to market rate
- Non-optimal structure - interest expense
 - + interest to calculate cash flow

Strategic and Financial buyers

- Buyers
 - Strategic: synergy
 - Financial

- Synergy
 - Increase in revenue
 - Decrease in cost

Estimating cash flow

- Scenarios
- Whole – a single discount rate
 - Weighted average cash flow
 - discount rate
- Part - multiple discount rates
 - For each case
 - Discount rate and probability
 - Weighted average value
- **FCFF – large firm**
 - Less sensitive to change in financial leverage
 - Suitable for significant changes in **capital** structure
 - WACC less sensitive to equity discount
- FCFE – small firm
- Small firm
 - Cannot be applied
 - dividend discount – no dividend
 - RI – equity change

The Free Cash Flow Method – two stage

- Discrete cash flows
- Terminal value
 - Constant growth model
 - Price multiple

The capitalized cash flow Method (CCM) – single stage

- capitalization rate = $r - g$
- **small private firms with stable growth**
- $V_0 = \frac{FCFF_1}{r-g} = \frac{FCFF_1}{cap\ rate}$
- Value of equity
 - equity = firm value – debt value
 - $V_{equity} = \frac{FCFE_1}{cap\ rate\ of\ equity}$

The Excess Earnings Method (EEM) 无形资产

- **excess earning = earning – required return WC – required return FC**
- **Small** firms with significant **intangible** assets
- firm value = equity + debt = equity + liability – AP
- = asset – AP = current asset + noncurrent asset – AP
- = WC + NCA = **WC + FA + IA**
 - Asset = current asset + noncurrent asset
 - noncurrent asset = fixed + intangible

- $PV(intangible) = \frac{excess\ earning_1}{r_{ia}-g}$
- $firm\ value = WC + FA + PV(intangible)$

Required Return Premium Factors

- Size premium
 - For small firm
- Availability and cost of equity
 - Less access to capital
 - High cost of equity and debt
- Acquirer vs target
 - Should use **target's** rate
- Projection risk
 - Less information and **uncertain**
- Lifecycle stage
 - Earlier stage -> high level of unsystematic

Required Return Methods

- CAPM
 - For public
 - Not suitable for private firms
 - Return = risk free + beta * equity
 - Equity premium = (market – risk free)
- Expanded methods
 - Return = **CAPM + size + firm**
- Build-up method (beta=1) - private
 - No comparable public firms for beta
 - Return = risk free + equity + size + firm-specific + **industry**

WACC

- Current capital structure- maybe conservative
- **Optimal** capital structure – used for **acquisition**
- Industry capital structure
 - Do not use, cannot access to capital

Market-based Valuation

- Methods
 - Guideline public company method (GPCM)
 - Guideline transaction method (GTM)
 - Prior transaction method (PTM)
- Market Comparable
 - Large firm
 - **EBIT or EBITDA**
 - **Market value of invested capital (MVIC)**
 - book value can be used with low financial leverage
 - High debt levels or volatility
 - Matrix pricing

- Small firms with limited assets
 - **NI** multiples
- Extremely small firms
 - **Revenue** multiple
- Nonfinancial measures in some industries

Guideline public company method (GPCM) 相似的上市公司

- Trade data for **similar public** companies
- Public company: **noncontrolling** interest
- Need to consider **control** premium
- Transaction type
 - Strategic (**higher** premium) vs financial
- Industry conditions
 - Industry acquisition activity may drive up the price
 - And control premium is included
- Type of consideration
 - Stock (overstate) vs cash
- Reasonableness
- **MVIC = debt + equity**
- Adjustment of multiple
 - MVIC/EBITDA 8
 - Deflate average public company multiple by 20%
 - So multiple = $8 \times 0.8 = 6.4$
 - Synergy transaction and stock purchase -> may be no need to apply control premium
- **Control premium** is only applied to **equity**
- Usual method
 - **$(M \times (1 - \text{discount}) \times \text{EBITDA} - \text{debt}) \times (1 + \text{control premium})$**
- Method 1
 - Firm value without control premium
 - Raw multiple * EBITDA -> MVIC
 - Equity value
 - - debt value
 - **Apply control premium**
 - * (1 + control premium)
- Method 2
 - Adjusted control premium = **control premium * (1-DR)**
 - DR: debt to asset ratio of private company
 - Adjusted control premium is applied to MVIC-multiple-based value

Guideline transaction method (GTM) 类似的交易

- Prior acquisition transactions
 - Control **premium** is already included
 - 不用再考虑控股权溢价了
- Transaction type
 - Strategic vs financial

- Contingent consideration
 - It increases risks
- Type of consideration
 - Stock vs cash
- Availability of data
- Date of data
 - Long time ago -> may be not relevant

Prior transaction method (PTM) 公司过去的自己

- The firm's **past** transaction data
- Value **minority** (noncontrolling) interest
- Arm's-length, same motivation, fairly recent

Asset-based Approach 清算，最低的价值

- **Firm equity = asset – liabilities**
- Value to potential buyer
- Not used for going concern 清算时用
- More liquid assets
- Less intangible assets 无无形资产
- Suitable
 - Minimal profits and little hope for better prospects
 - Liquidation > going concern
 - **Finance firms** such as banks, where their assets and liabilities can be based on **market** prices
 - **Investment companies** such as **REIT and CEIC** where underlying assets values are determined using the market or income approach
 - Small or **early stage firms** with few **intangible** assets
 - **Natural** resources firms

Discount for lack of control

- Minority interest: Discount for lack of control
- Controlling interest: Control premium
- **$(1 - DLOC)(1 + \text{control premium}) = 1$**
- **$DLOC = \frac{1}{1 + \text{control premium}} - 1$**

Discount for lack of marketability - liquidity

- DLOM
 - Price of **restricted** shares
 - Price of pre-IPO shares vs post-IPO shares
 - Price of put option / stock price
- **$1 - \text{total discount} = (1 - DLOC) \times (1 - DLOM)$**
- **$\text{total discount} = 1 - (1 - DLOC) \times (1 - DLOM) = DLOC + DLOM - DLOC \times DLOM$**

Comparable Data	Subject Valuation	Adjustment to
Controlling interest	Controlling interest	None
Controlling interest	Noncontrolling interest	DLOC
Noncontrolling interest	Controlling interest	Control premium
Noncontrolling interest	Noncontrolling interest	None