

FIN3080: Investment Analysis and Portfolio Management

SCHOOL OF MANAGEMENT AND ECONOMICS
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Tips: 开个股票账户

Misconceptions about Valuation

- Myth 1: A valuation is an objective search for true value
 - Truth 1.1: All valuations are biased. The only questions are "how much" and in which direction.
- Myth 2: A good valuation provides a precise estimate of value
 - Truth 2.1: There are no precise valuations.
 - Truth 2.2: The payoff to valuation is greatest when valuation is least precise.
- Myth 3: The more quantitative a model, the better the valuation
 - Truth 3.1: One's understanding of a valuation model is inversely proportional to the number of inputs required for the model.
 - Truth 3.2: Simpler valuation models do much better than complex ones.

Advantages of DCF Valuation

- Since DCF valuation, done right, is based upon an asset's fundamentals, it should be less exposed to market moods and perceptions.
- If good investors buy businesses, rather than stocks (the Warren Buffet adage), discounted cash flow valuation is the right way to think about what you are getting when you buy an asset.
- DCF valuation forces you to think about the underlying characteristics of the firm, and understand its business. If nothing else, it brings you face to face with the assumptions you are making when you pay a given price for an asset.
- If you buy into the notion of value being driven by a company's cash flows, you are immunized (to the extent that you have a long time horizon) from what the market thinks about your investment..

DCF与市场信息无关

Basic questions

- What is financial asset?
 - Financial assets vs real goods
 - Verifiable and implementable
- How do investors make money?
 - Beta vs alpha → 投资者自身能力
 - Efficient market or not?
- Why hedge fund is more risky?
 - Hedge means reducing risk but why hedge fund is more risky? $\tilde{r}_1 = \hat{x} + \hat{y}$ $\tilde{r}_2 = \hat{x}$
 $\tilde{r}_p = \tilde{r}_1 - \tilde{r}_2 = \tilde{y}$ bet more, earn more (lose more)
可能赚得更多，也可能亏的更多.

Approaches to Valuation

- **Intrinsic valuation**, relates the value of an asset to its intrinsic characteristics: its capacity to generate cash flows and the risk of the cash flows. In its most common form, intrinsic value is computed with a discounted cash flow valuation, with the value of an asset being the present value of expected future cash flows on that asset.
- **Relative valuation or pricing**, estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable like earnings, cashflows, book value or sales.

Basis for all valuation approaches

- The use of valuation models in investment decisions (i.e., in decisions on which assets are under-valued and which are over-valued) are based upon
 - a perception that markets are inefficient and make mistakes in assessing value
 - an assumption about how and when these inefficiencies will get corrected
- In an efficient market, the market price is the best estimate of value. The purpose of any valuation model is then the justification of this value.

Discounted Cash flow Valuation (DCF)

- What is it: In discounted cash flow valuation, the value of an asset is the present value of the expected cash flows on the asset.
- Philosophical Basis: Every asset has an intrinsic value that can be estimated, based upon its characteristics in terms of cash flows, growth and risk.
- Information Needed: To use discounted cash flow valuation, you need
 - to estimate the life of the asset
 - to estimate the cash flows during the life of the asset
 - to estimate the discount rate to apply to these cash flows to get present value
- Market Inefficiency: Markets are assumed to make mistakes in pricing assets across time, and are assumed to correct themselves over time, as new information comes out about assets.

Disadvantages of DCF valuation

- Since it is an attempt to estimate intrinsic value, it requires far more explicit inputs and information than other valuation approaches
- These inputs and information are not only noisy (and difficult to estimate), but can be manipulated by the analyst to provide the conclusion he or she wants. The quality of the analyst then becomes a function of how well he or she can hide the manipulation.
- In an intrinsic valuation model, there is no guarantee that anything will emerge as under or over valued. Thus, it is possible in a DCF valuation model, to find every stock in a market to be over valued. This can be a problem for
 - equity research analysts, whose job it is to follow sectors and make recommendations on the most under and over valued stocks in that sector
 - equity portfolio managers, who have to be fully (or close to fully) invested in equities

When DCF Valuation works best

- At the risk of stating the obvious, this approach is designed for use for assets (firms) that derive their value from their capacity to generate cash flows in the future.
- It works best for investors who
 - have a long time horizon, allowing the market time to correct its valuation mistakes and for price to revert to "true" value or
 - are capable of providing the catalyst needed to move price to value, as would be the case if you were an activist investor or a potential acquirer of the whole firm
 - are not easily swayed or affected by market movements that are contrary to their "value" views

Relative Valuation (Pricing)

- What is it?: The value of any asset can be estimated by looking at how the market prices "similar" or "comparable" assets.
- Philosophical Basis: The intrinsic value of an asset is impossible (or close to impossible) to estimate. The price of an asset is whatever the market is willing to pay for it (based upon its characteristics)
- Information Needed: To do a relative valuation, you need
 - an identical asset, or a group of comparable or similar assets
 - a standardized measure of value (in equity, this is obtained by dividing the price by a common variable, such as earnings or book value)
 - and if the assets are not perfectly comparable, variables to control for the differences
- Market Inefficiency: Pricing errors made across similar or comparable assets are easier to spot, easier to exploit and are much more quickly corrected.

Advantages of Relative Valuation

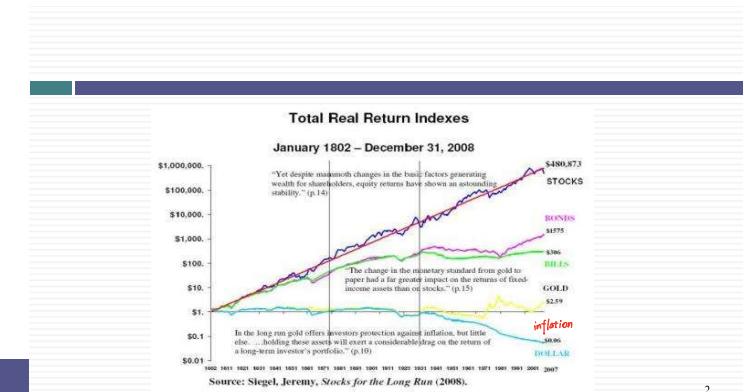
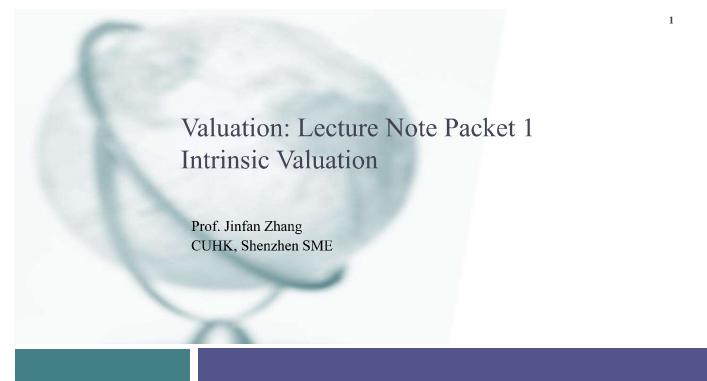
- **In sync with the market:** Relative valuation is much more likely to reflect market perceptions and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when
 - the objective is to sell an asset at that price today (IPO, M&A)
 - investing on "momentum" based strategies
- With relative valuation, there will always be a significant proportion of securities that are under valued and over valued. Since portfolio managers are judged based upon how they perform on a relative basis (to the market and other money managers), relative valuation is more tailored to their needs
- Relative valuation generally requires less explicit information than discounted cash flow valuation.

Disadvantages of Relative Valuation

- A portfolio that is composed of stocks which are under valued on a relative basis may still be overvalued, even if the analysts' judgments are right. It is just less overvalued than other securities in the market.
- Relative valuation is built on the assumption that markets are correct in the aggregate, but make mistakes on individual securities. To the degree that markets can be over or under valued in the aggregate, relative valuation will fail
- Relative valuation may require less information in the way in which most analysts and portfolio managers use it. However, this is because implicit assumptions are made about other variables (that would have been required in a discounted cash flow valuation). To the extent that these implicit assumptions are wrong the relative valuation will also be wrong.

When relative valuation works best

- This approach is easiest to use when
 - there are a large number of assets comparable to the one being valued
 - these assets are priced in a market
 - there exists some common variable that can be used to standardize the price
- This approach tends to work best for investors
 - who have relatively short time horizons
 - are judged based upon a relative benchmark (the market, other portfolio managers following the same investment style etc.)
 - can take actions that can take advantage of the relative mispricing; for instance, a hedge fund can buy the under valued and sell the over valued assets



The essence of intrinsic value

- In **intrinsic valuation**, you value an asset based upon its fundamentals (or intrinsic characteristics). *future cash flow*
- For **cash flow generating assets**, the intrinsic value will be a function of the magnitude of the **expected cash flows** on the asset over its lifetime and the **uncertainty** about receiving those cash flows.
- Discounted cash flow valuation is a tool for estimating intrinsic value, where the expected value of an asset is written as the present value of the expected cash flows on the asset, with either the cash flows or the discount rate adjusted to reflect the risk.

Risk Adjusted Value: Two Basic Propositions

- The value of an asset is the risk-adjusted present value of the cash flows:

$$\text{Value of asset} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} + \dots + \frac{E(CF_n)}{(1+r)^n}$$

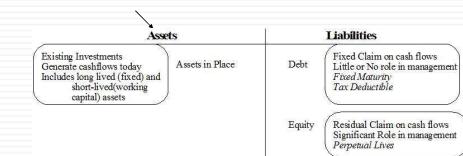
$$\text{Value of asset} = \frac{CE(CF_1)}{(1+r_f)^1} + \frac{CE(CF_2)}{(1+r_f)^2} + \frac{CE(CF_3)}{(1+r_f)^3} + \dots + \frac{CE(CF_n)}{(1+r_f)^n}$$

1. If it does not affect the expected cash flows or the riskiness of the cash flows, it cannot affect value.
2. For an asset to have value, the expected cash flows have to be positive some time over the life of the asset. *discount* *cash flow*
3. Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.

*whether to pay dividend: ① Any good opportunity to invest
② No opportunity → pay dividend > affect stock price.*

DCF Choices: Equity Valuation versus Firm Valuation

Firm Valuation: Value the entire business



Book Value & Market Value *discounted future cash flow*

Equity Valuation

Assets	Liabilities
Assets in Place	Debt
Cash flows considered are cashflows from assets, after debt payments and after making reinvestments needed for future growth	Discount rate reflects only the cost of raising equity financing

Present value is value of just the equity claims on the firm

Firm Valuation

Assets	Liabilities
Assets in Place	Debt
Cash flows considered are cashflows from assets, prior to any debt payments but after firm has reinvested to create growth assets	Discount rate reflects the cost of raising both debt and equity financing, in proportion to their use

Present value is value of the entire firm, and reflects the value of all claims on the firm.

Cash Flows and Discount Rates

- Assume that you are analyzing a company with the following cash flows for the next five years.

Year	CF to Equity	Interest Exp	CF to Firm
1	\$ 50	\$ 40	\$ 90
2	\$ 60	\$ 40	\$ 100
3	\$ 68	\$ 40	\$ 108
4	\$ 76.2	\$ 40	\$ 116.2
5	\$ 83.49	\$ 40	\$ 123.49
Terminal Value			\$ 2363.008

- Assume also that the cost of equity is 13.625% and the firm can borrow long term at 5%. The current market value of equity is \$1,073 and the value of debt outstanding is \$800.

Equity versus Firm Valuation

- Method 1: Discount CF to Equity at Cost of Equity to get value of equity
 - Cost of Equity = 13.625%
 - Value of Equity = $50/1.13625 + 60/1.13625^2 + 68/1.13625^3 + 76.2/1.13625^4 + (83.49+1603)/1.13625^5 = \1073
- Method 2: Discount CF to Firm at Cost of Capital to get value of firm

Capital 抽自 Debt + Equity

 - Cost of Debt = 5%
 - Cost of Capital = $13.625\% (1073/1873) + 5\% (800/1873) = 9.94\%$
 - PV of Firm = $90/1.0994 + 100/1.0994^2 + 108/1.0994^3 + 116.2/1.0994^4 + (123.49+2363)/1.0994^5 = \1873
 - Value of Equity = Value of Firm - Market Value of Debt
= $\$ 1873 - \$ 800 = \1073

First Principle of Valuation

- Discounting Consistency Principle: Never mix and match cash flows and discount rates.
- Mismatching cash flows to discount rates is deadly.
 - Discounting after debt cash flows (equity cash flows) at the weighted average cost of capital will lead to an upwardly biased estimate of the value of equity
 - Discounting pre-debt cashflows (cash flows to the firm) at the cost of equity will yield a downward biased estimate of the value of the firm.

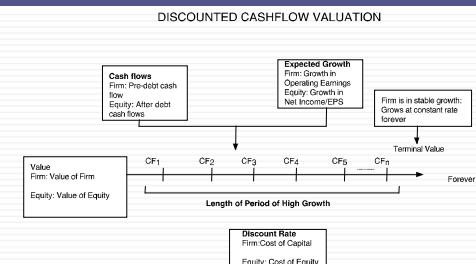
The Effects of Mismatching Cash Flows and Discount Rates

- Error 1: Discount CF to Equity at Cost of Capital to get equity value
 - PV of Equity = $50/1.0994 + 60/1.0994^2 + 68/1.09943 + 76.2/1.0994^4 + (83.49+1603)/1.0994^5 = \1248
 - Value of equity is overstated by \$ 175.
- Error 2: Discount CF to Firm at Cost of Equity to get firm value
 - PV of Firm = $90/1.13625 + 100/1.13625^2 + 108/1.13625^3 + 116.2/1.13625^4 + (123.49+2363)/1.13625^5 = \1613
 - PV of Equity = $\$1612.86 - \$800 = \$813$
 - Value of Equity is understated by \$ 260.
- Error 3: Discount CF to Firm at Cost of Equity, forget to subtract out debt, and get too high a value for equity
 - Value of Equity = \$ 1613
 - Value of Equity is overstated by \$ 540

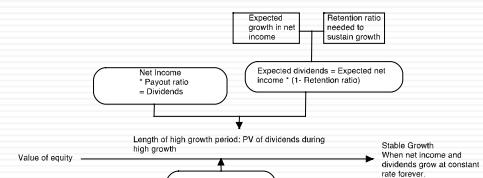
Discounted Cash Flow Valuation: The Steps

- Estimate the discount rate or rates to use in the valuation
- Estimate the current earnings and cash flows on the asset, to either equity investors (CF to Equity) or to all claimholders (CF to Firm)
- Estimate the future earnings and cash flows on the firm being valued, generally by estimating an expected growth rate in earnings.
- Estimate when the firm will reach "stable growth" and what characteristics (risk & cash flow) it will have when it does.
- Choose the right DCF model for this asset and value it.

Generic DCF Valuation Model



Start easy: The Dividend Discount Model



What does a stock analyst look like

Philosophical Problems: Do you REALLY know the value of the company that you invest in



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To distinguish risk & Uncertainty

Asset Price

- Present Value of all Capitals: $PV = \frac{CF_1}{(1+k)} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_n}{(1+k)^n}$

$$= \sum_{t=1}^n \frac{CF_t}{(1+k)^t}$$

Expected Return

- If CF remains unchanged: $PV = \frac{CF_I}{k}$

- If CF is growing at a rate g :

$$PV = \frac{CF_I}{k-g}$$

估量

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Dividend discounted Model

- Gordon Model, also known as Constant Growth Model, assumes that dividend on shares are increasing on a constant rate of g:

$$V_0 = \frac{D_0(1+g)}{(1+r)} + \frac{D_0(1+g)^2}{(1+r)^2} + \dots = \frac{D_0(1+g)}{r-g} = \frac{D_0}{r-g}$$

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The Accounting Basis

Some important financial data

- Earnings before Interest, Taxes, Depreciation and Amortization (EBITDA)
 - =EBIT + Depreciation and amortization (DA)
 - EBITDA Margin=EBITDA/Sales Revenue
- Net Income
 - =EBIT - Interest - Taxes - Non-controlling Interest (NCI)
 - Preferred Dividend 优先股红利 (股息较高)
 - It is customary to calculate net income as earning per share (EPS)
 - P/E ratio = Share price/ EPS
 - ROE=Net Income/Net Asset
 - ROA=Net Income/Total Asset

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Book Value

$$\text{Net Asset} + \text{Debt} = \text{Total Asset}$$

假设A持有B 6%的股份，假设B的股利率为10%，那么A公司与B公司共分
剩下10% 股份所对应利息从A公司与B公司共分
E/P: 利率 (年收益率) 固定：
Earning Per Share E/P %
Interest 房地产：R/S = 1%-3% < 固定
股票 市价 张劲帆
从金融方面看，房产(中国)投资

The Accounting Basis

Some important financial data

- enterprise value (EV) 收购某公司所需价格
 - =stock market value+ total liability + preferred dividend
 - + non-controlling interest -value of associate company
 - cash and cash equivalents

占多数其他
公司股权
占较少其他公司股权

A simplified version: EV= Stock market value+ Total liability
-cash and cash equivalents

- Interest coverage ratio

$$\Rightarrow =\text{EBIT} / \text{EBITDA} / \text{Interest}$$

Bankrupt of a company: out of cash (没有钱付股息)

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Asset Price

Earnings of a firm: ① Dividend

② Cash in balance sheet
③ reinvestment

$$\text{CF Unchanged } PV = \frac{CF}{k}$$

$$\text{CF grows at a rate } g \quad PV = \frac{CF}{k-g}$$

- Suppose CF of a company equals 100 each year, discounted rate =20%, then:

$$\begin{aligned} \text{If } g=0, \quad PV &= 100/0.20=500 \\ g=5\%, \quad PV &= 100/0.15=667 \\ g=18\%, \quad PV &= 100/0.02=5000 \\ g=19\%, \quad PV &= 100/0.01=10000 \\ g=19.5\%, \quad PV &= 100/0.005=20000 \end{aligned}$$

Estimate Value are Extremely Sensitive to Growth Rate.

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Example: Constant Growth Model (CGM)

- This is 2009. In 2008, American Electric Power (AEP) paid a dividend of \$1.64 per share. From 2006 to 2008, the average dividend increased 3.3% a year.

- From 1927 to 2008, the average market return in U.S was 11.4%. The historical average risk-free rate is 6.4%.

According to the data, a valuation of the market risk premium is 5%.

- AEP's beta is 0.62 (defensive stock). The yield of 10-year bond is 3.32%.

- What's the discounted rate?

$$r = 3.32\% + 0.62 * 5\% = 6.42\%$$

- What is the valuation?

$$V = \frac{1.64 \times 1.033}{0.0642 - 0.033} = 54.30$$

- The price was \$31.06 on September 25, 2009.

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CAPM

- Generally Speaking, for any security i,

$$E(r_i) - r_f = \beta_i [E(r_M) - r_f]$$

where $\beta_i = \frac{\text{Cov}(r_i, r_M)}{\sigma_M^2}$.

- This model demonstrates the relationship of expected rate of return between particular securities and whole market;

Example: Assume the risk free rate is 4%, the stock market average return is 11%. Firm A's Beta is 1.2.

According to the CAPM theory, the expected return (or the discount factor, or cost of equity) of firm A should be

$$R = 4\% + 1.2 * (11\% - 4\%) = 12.4\%$$

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Applicable conditions & limitations of CGM

- Applicable conditions

- Mature companies that pay stable dividends.

» Dividends can represent cash flow.

- A company whose growth rate is close to or below economic growth.

- A company that is not cyclical.

周期性的

- Limitations

- Very sensitive to growth rates.

- Undervalued company, which scarcely pays dividend.

- Not applicable to unstable companies, cyclical industries.

年与年间盈利不稳定

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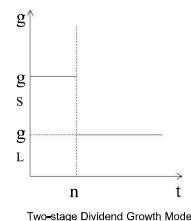
Two-stage Dividend Growth Model

Two-stage model assumes that the company's dividend growth experienced two stages.

In the first stage, dividend increases every year by a higher (or lower) growth rate.

After that time, growth of dividend becomes stable at a low (or high) level (as shown on the right) :

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Case: Consolidated Edison

One of the largest energy companies in the U.S.
About \$14 billion in sales.
\$36 billion in assets.

Pricing is required in August 2008.

Last 12 months:

EPS: \$3.17

DPS: \$2.32

Beta: 0.8

The U.S. 10-year Treasury rate: 4.1% → 17

U.S market risk premium : 4.5%

Companies' leverage : 70% equity, 30% debt, stable for several decades.

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Two-stage Dividend Growth Model

$$P_0 = \sum_{t=1}^n \frac{D_t}{(1+k_{hg})^t} + \frac{P_n}{(1+k_{hg})^n}$$

$$P_0 = \frac{D_0 \times (1+g) \times \left[1 - \frac{(1+g)^n}{(1+k_{hg})^n} \right]}{(k_{hg} - g)} + \frac{D_0 \times (1+g)^n \times (1+g_n)}{(k_{st} - g_n) \times (1+k_{hg})^n}$$

g = The growth rate of the first n years

k_{hg} = discounted rate of high growth period

k_{st} = discounted rate of stable growth period

g_n = Stable growth rate after n years

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The Choice of Long-term Growth Rate

- Long-term reinvestment ratio, growth rate and ROA must be consistent.

$$g = b \times ROE$$

e.g.

A	$B: 60 + 10 \frac{40}{40}$	$Earnings = 30$
	$Dividend = 20$	$Book Equity \uparrow$
100 + 25	$C: 40 + 10$	$Retained Earnings = 10$
	$\Rightarrow b = \frac{1}{3}$	$= b \cdot ROE$

$$g = \frac{\text{Earnings} \cdot b}{\text{Book Equity}}$$

$$\frac{30}{40} \downarrow \frac{\frac{1}{3}}{\frac{1}{3}}$$

- ① 部门 Equity 成一定比例 (leverage)
 ② 所有的收益：1. Dividend 2. Retained Earnings
 ③ 只通过扩大生产来增加收益
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Pricing

- Discount rate
 $-4.1\% + 0.8 \times 4.5\% = 7.7\%$
- Stable discount rate
 $b=27\%$ 对于该种类型公司适用 (utility company)
 $-ROE=7.7\%$
- Price
 $-g=ROE \times b=2.1\%$
 $-=2.32 \times (1.021) / (0.077-0.021)$
 $-=42.30$
- August 12, 2008, the market price is \$40.76.

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Pricing

- Consider applying two-stage model due to extremely high ROE:
- Discount Rate 若一个公司较大，则理论上 $ROE = Discount rate$
 $-4.35\% + 0.95 \times 4\% = 8.15\%$
- The First Stage
 $-b = (1 - 0.9 / 1.85) \times 51.35\% = \frac{1.85 - 0.9}{1.85} = 51.35\%$
 $-ROE = 16\%$
 $-g = 51.35\% \times 16\% = 8.22\%$ → $k < g$, 故分两期计算
- The Second Stage
 $-g=4\%$ 假设，可在4%-5%之间为正常
 $-Discount Rate = 4.35\% + 1 \times 4\% = 8.35\%$
 $-ROE = 8.35\%$ firm big enough to have market beta = 1
 $-Dividend Rate = 1 - 4 / 8.35 = 0.521$
 \downarrow
 $b = \frac{g}{ROE}$

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- Terminal Value
 $EPS_t = 1.85 \times (1.0822)^t \times 1.04 = 2.86$
 $P_t = EPS_t \times 0.521 / (0.0835 - 0.04) = 34.20$
- Price

$$\frac{EPS \times (1 - b_{hg}) \times (1 + g_{hg}) \times \left(1 - \frac{(1 + g_{hg})^T}{(1 + k_{hg})^T} \right)}{k_{hg} - g_{hg}} + \frac{P_t}{(1 + k_{hg})^T}$$

$$= \frac{1.85 \times 48.65\% \times (1 + 8.22\%) \times \left(1 - \frac{(1 + 8.22\%)^5}{(1 + 8.15\%)^5} \right)}{8.15\% - 8.22\%} + \frac{34.20}{(1 + 8.15\%)^5}$$
 $= 27.62$
- In December 2003: market price was 18.55 Euro
 End of the year 2007: RBS offered 38.5 Euro per share to takeover ABN AMRO

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A Method to Adjust Free Cash Flow

- ◆ American companies are more likely paying dividends by repurchasing shares.
 - Now, over 50% of dividends are paid by repurchasing shares.
 - » Why? *decreasing tax payment*
- ◆ An adjusting method:
 - “Dividend” = dividend + Buy-Back
 - Dividend Ratio= (Dividend + Share Repurchase) / net earnings

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Pricing

- ◆ Result
 - Present value of high growth stage:124.71
 - Terminal Value: 587.75
 - Value: 712.46
- ◆ On January 1st 2009:
 - Actual Index Price: 903
- ◆ Any questions?

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Pricing

- ◆ Considering two stage model
 - At this stage the expected growth rate is far higher than interest rates.
- ◆ discounted rate
 - $=3.84\%+1*5\% = 8.84\%$
- ◆ The first stage
 - $g=7.2\%$
- ◆ The last stage
 - $g=3.84\%$
 - Assume the market risk premium goes back to 4%

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Case: S&P500 Index (S&P500:January, 2009)

The dividend during last 12 months: 28.05
Estimated value of $g = 4\%$ in next 5 years
Treasury Bond Long-term Risk-free Rate: 2.21%
Current Market Risk Premium: 6%

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Pricing

- ◆ Adjust Dividend pricing Model, plus repurchasing shares
- ◆ Dividends during last 12 months + repurchasing Shares = 52.58
- ◆ Result
 - Present value of high growth stage: 233.76
 - Terminal Value: 1101.75
 - Value: 1335.51

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Pricing

- ◆ The result
 - The present value of high growth stage: 192.95
 - The present value of ultimate stage : 971.63
 - The price: 1164.59
- ◆ 2010.1.1
 - The actual point of the index: 1115

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Pricing

- ◆ Consider applying two stage model
 - Current expected growth rate is much greater than current interest rate
- ◆ Discount rate
 - $=2.21\%+1*6\% = 8.21\%$
- ◆ First Stage
 - $g=4\%$
- ◆ Last Stage
 - $g=2.21\%$
 - Assuming market risk premium gets back to 4%

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Case: S&P500 Index (S&P500: January, 2010)

Dividends during last 12 months + Repurchasing Shares : 40.38
Estimated value of $g = 7.2\%$ in next 5 years
Treasury Bond Long-term Risk-free Rate : 3.84%
Current Market Risk Premium : 5%

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Three-Stage model

- ◆ The high growth stage were divided into high growth and middle growth stage, the last is the stable growth phase
 - the transformation of stable growth phase and the middle growth stage can be little by little.

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Case: Goldman Sachs: 2008.8

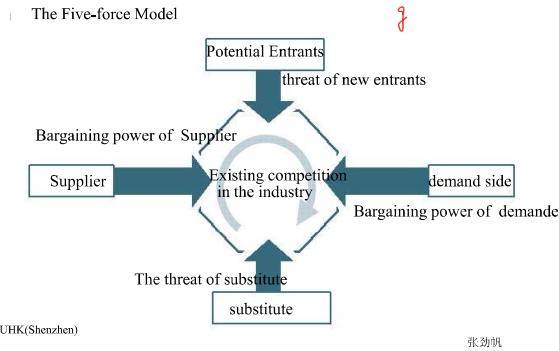
2008.8
EPS: 16.77 dollar
DPS: 1.40 dollar
Average Beta of Investment Bank: 1.40
Risk free rate of T-Bills: 4.10%
Risk premium of mature market: 4.5%
ROE: 13.19%



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What factors decide the earning growth rate?



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Market Capitalization Management and Valuation

Why investing?

$$\frac{P}{E} = \frac{(1-b)}{r - b \times ROE}$$

$$\frac{P}{B} = \frac{ROE(1-b)}{r - b \times ROE}$$

Book Value \leftarrow B
How much should investment rate b be to create value?

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Pricing

- Considering three-stage model
 - The dividend payout and the growth pattern of the company shows the potential of the company.
- discounted Rate
 - $= 4.10\% + 1.40 * 4.5\% = 10.4\%$
- The first stage
 - $b = (1 - 1.4 / 16.77) = 91.65\%$
 - $ROE = 13.19\%$
 - $g = 91.65\% * 13.19\% = 12.09\%$
- The last stage
 - $g = 4\%$
 - discounted rate $= 4.10\% + 1.2 * 4.5\% = 9.5\%$
 - $ROE = 10\%$

should be closed

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assumption, also can be 1.

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Pricing

- The secondary stage
 - growth rate, dividend payout ratio and beta are all gradually move to stable stage in the period from year 6 to 10.
- Price after calculation = 222.49 dollar
- 2008.8: the price of Goldman Sachs 169 dollar

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Why companies do not pay dividend?

- risk control
- the future need for investment
- tax rate
- the signal for long-term profitability
- management benefit

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DCF model: calculating equity value using FCFE

- Equity present value
 - discount rate
 - same as calculating dividend
 - cash flow
 - free cash flow of equity (FCFE) = net income + depreciation-capital expenditure - the change of working capital
 - final value
 - assuming the company has a permanent steady growth rate
 - the final value at $n = FCFE_{n+1} / (k_e - g_n)$

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Market Capitalization Management and Valuation

When to invest?

- the investment (b) would decrease the cash flow ($1-b$)
 - with all other factors the same, firms with heavy asset are inferior to firms with light asset
- The investment only creates value when the ROE is high enough

Critical point:

- $ROE = r$: cash cow $\curvearrowright P/B > 1, P/E > \frac{1}{r}$
- $ROE > r$: high growth company
- $ROE < r$: investment ruins the wealth
 - the market value drops below book value

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Market Capitalization Management and Valuation

- The high growth on company earnings is hard to maintain, even if it can, it is not necessary create true value
 - ROE may be too low (lower than cost of capital)
 - the weakness of business model \curvearrowright 毛利率
 - Many companies have low profit margin, but they keep issuing new shares to finance new capital expenditure.
 - IPO provides a platform for many companies to ruin the value of their shareholders

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Market Capitalization Management

- The stock price is the running machine of expectation
 - force the management level to pursue risky investment
 - large M&A

McKinsey: Return of growth

The value created by a dollar increase in the consumer good company

Growth type	Value
New product released	1.75-2.00
Expand current market	0.30-0.75
Expand market share on the current market	0.10-0.50
Compete in a mature market	-0.25 - 0.4
Merger	0-0.20

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The Value of Growth

- If dividends are omitted, the growth value comes from

$$\frac{P_2}{P_1} = \frac{P_2/E_2}{P_1/E_1} \times \frac{E_2}{E_1} \quad \text{e.g. Borrow money to build factory.}$$

$$\frac{P/E}{\text{ratio}} = \frac{P_2/E_2}{P_1/E_1} \times \frac{ROE_2}{ROE_1} \times \frac{B_1}{B_0} \quad \text{Return} \rightarrow \text{Equity holders' profit} \rightarrow \rightarrow ROE \uparrow \& \text{Book value} \uparrow$$

P: market value

E: earnings

B: book value

ROE₁ = E₁/B₀

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The Value of Growth

Example 3:

- first round of start-up business:
B=100, E=20, ROE=20%, PE=120/20=6;
- assume that similar company has PE equal to 10
 - a year later, the company's market value becomes 240
- assume a PE fund chip in based on the PE equal to 10 at the end of second year for 50% share

$$\frac{P_3}{P_1} = \frac{P_3/E_3}{P_1/E_1} \times \frac{ROE_3}{ROE_1} \times \frac{B_2}{B_0} = \frac{10}{6} \times \frac{20\%}{20\%} \times \frac{192}{100} = 3.2 \quad \text{ROE} = E/B$$
- the value at the end of second year is $(100+20+24+240)*0.2*10=768$, in which 384 belongs to the original shareholders
 \uparrow
conclusion: value created by the combination of valuation, earnings and financing

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Return on Input Capital (ROIC) measures the efficiency of capital utility

ROIC=Net Operating Profit after Tax / (Average Total Invested Capital)

ROIC Template					
Income Statement	2017	2018	2019	2020	2021
Revenues	102,007	116,086	131,345	142,341	156,772
Cost of Goods Sold (COGS)	39,023	48,004	48,123	53,654	56,710
Gross Profit	62,984	70,082	82,222	89,687	94,062
Expenses					
Salaries and Benefits	26,427	22,658	23,872	23,002	25,245
Rent and Overhead	10,963	10,125	10,087	11,020	11,412
Depreciation & Amortization	19,500	18,150	17,205	16,544	16,080
Operating Earnings	6,094	19,149	31,058	39,122	41,325
Interest	2,500	2,500	1,500	1,500	1,500
Earnings Before Tax	3,594	16,648	29,558	37,622	39,825
Taxes	1,120	4,858	8,483	10,908	11,998
Net Earnings	2,474	11,791	21,075	26,713	28,227
Tax rate assumption					
Operating Earnings	3716	2996	2996	2996	2996
NOPAT					
$\times (1 - \text{tax})$	4,195	13,561	22,145	27,779	29,290
ROIC Analysis					
Book Value of Debt	50,327	50,330	30,331	30,342	30,350
Book Value of Equity	175,029	186,720	207,795	234,508	262,735
Goodwill	3,580	3,460	3,910	3,870	3,850
Cash	170,853	183,995	186,501	213,866	242,355
Book Value of Invested Capital	50,923	49,595	47,715	47,114	46,881
ROIC	-	0.27	0.45	0.58	0.60

(Generate money in the market to get the earnings)
Weighted Average Cost of Capital

If ROIC < WACC,
the firm is wasting capital.

Life Cycle and Shareholders

The best shareholders:

create value for the firm (channeling, operating, marketing, corporate governance, government relationship and so on)

start-up stage: founder

creative, passionate, responsible

growing stage: PE fund and professional management team

manage big companies

internationalization: may sell to a giant company

mature stage: split, privatize, reorganize

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The Value of Growth

Example 1:

first round of start-up business: 如果一个公司经营时间长, P/E会适当上升
B=100, E=20, ROE=20%, PE=6 Market value=20*6=120;

assume the similar company has PE equal to 10 → 代表该公下一年
» a year later, the company's market value goes to 240 稳定的PE

$$\frac{P_2}{P_1} = \frac{P_2/E_2}{P_1/E_1} \times \frac{ROE_2}{ROE_1} \times \frac{B_1}{B_0} = \frac{10}{6} \times \frac{20\%}{20\%} \times \frac{120}{100} \rightarrow \text{Book Value + Earning}$$

» conclusion: value created by valuation and capital accumulation

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The Value of Growth

the growth of value comes from

- higher earnings
 - enhance efficiency
 - leverage
- higher valuation
- favorable equity financing

Companies can increase their asset through capital market (equity, debt, loan)

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Growth Path

growth path of a company

value created by valuation, earnings and leverage

$$\frac{P_2}{P_1} = \frac{P_2/E_2}{P_1/E_1} \times \frac{ROE_2}{ROE_1} \times \frac{B_1}{B_0}$$

DuPont decomposition: $\frac{E_1}{B_0} = \frac{E_1}{S_1} \times \frac{S_1}{A_0} \times \frac{A_0}{B_0}$ → Total Asset

$$ROE_1 = \frac{E_1}{B_0} = \frac{E_1}{S_1} \times \frac{S_1}{A_0} \times \frac{A_0}{B_0} \rightarrow \text{Book Value of the equity}$$

E_1 : sales margin; S_1 : capital $\frac{A_0}{B_0}$: equity multiplier $\frac{A_0}{B_0}$: turnover rate;

firm \rightarrow Money from Equity Holder
 \rightarrow Money from Bankloan
 \rightarrow Money from Debt holder

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The starting point of the analysis:

$$PB = \frac{ROE \cdot d}{(r - ROE) + ROE \cdot d} \rightarrow \text{dividend payout ratio}$$

$$1-d = b$$

Where does it come from?

$$\frac{PB}{B} = \frac{ROE(1-b)}{r-b \times ROE} = 1 + \frac{ROE-r}{r-g}$$

根据PB估值公式，决定PB高低的，其实是 r 与 ROE 比大小。当 r 大于 ROE 时，即破净。当 r 大幅超过 ROE 时，股票就破净很远。折现率 r 是一个不容易掌握的指标，并且相对外生。我们暂不展开讨论。因此，决定估值的，其实是市场对银行股未来 ROE 的预期。然后我们再展开 ROE :

$$ROE = \frac{PB \cdot r}{d - PB \cdot d + PB} \rightarrow \text{discount rate}$$

Given $PB=0.8$, dividend payout ratio $d=25\%$, if we assume $r=10\% \Rightarrow ROE=9.4\%$

Compare it to the current banking industry average $ROE=12\%$, ROE should go down by 2.6% , ROA should go from 1% to 78bps (given the leverage is 12)

$$1\% \times \frac{78\text{bps}}{12\%} \rightarrow \text{do not change}$$

22bps decline of ROA is significant, whether it is reasonable or not depends on one's insight of the banking industry. According to the report this translate into the loan interest rate cut by 44bps , which is unlikely. Another perspective is that in other countries, ROA is around 1%

2-stage Pricing Model

$$V_0 = \sum_{t=1}^n \frac{FCFF_t}{(1+WACC_{hg})^t} + \frac{V_n}{(1+WACC_{hg})^n}$$

$$FCFF_0 \times (1+g) \times \left[1 - \frac{(1+g)^n}{(1+WACC_{hg})^n} \right] + \frac{FCFF_0 \times (1+g)^n \times (1+g_n)}{(k_{st} - g_n) \times (1+k_{hg})^n}$$

g = the growth rate of previous n years

k_{hg} = the discounted rate of high growth period

k_{st} = the discounted rate of stable growth

g_n = the stable growth rate after n years

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Relative Pricing

The Importance of Relative Pricing

- ◆ Relative pricing gains its popularity in the Wall Street
 - Almost 85% of the stock research reports are based on the multiple of comparable stocks
 - More than 50% of M&A pricing is based on multiples
 - Multiples are usually the basis for making final investment decisions
- ◆ Why relative pricing
 - Pricing is often a bargain.

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Pricing Model of Company

- ◆ free cash flow of the company
- FCF to all shareholders and debt holders
- $FCFF = EBIT(1-t) + \text{depreciation} - \text{capital expenses} - \text{change of operating capital}$

Equity PU:

- ① Discount rate: same as calculating dividend
 - ② free cash flow of equity ($FCFE$) = Net Income + depreciation - capital expenditure - change of working capital (Accounts Receivable, inventory, etc.)
 - ③ Final value = $\frac{FCFE}{r-g}$
- Value of the equity

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Pricing Model of Company

- ◆ Company with stable growth

$$V = \frac{FCFF_1}{WACC - g_n} \rightarrow \text{Value of the firm}$$

$$WACC = r_d \times (1-t) \times \frac{D}{D+E} + r_e \times \frac{E}{D+E}$$

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Relative Pricing

- ◆ Determine the price of an asset by comparing the market value of similar or comparable assets
- ◆ Important steps
 - Determine the comparable assets
 - Convert the market price of comparable assets into a ratio relative to the fundamentals
 - Acquire the pricing ratio by comparison
 - » Adjust all possible deviations

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Demands for Pricing

- ◆ On February 3, 2012, the director of the relevant departments of the CSRC said that the **初次发售股票** CSRC will study the supervision of the underwriting process, and will direct it to **rationally** set IPO prices. The CSRC is working on a measure to promote the fair pricing of new shares, which is to entrust a third party to publish the average P/E ratio of listed companies in various industries for investors' reference. The report will cover mainboard, SME board and GEM.
- ◆ IPO pricing is generally no more than 25% of the industry's P/E ratio.
- ◆ Since 2014, with a P/E ratio of **23.98** times, regulators have almost ensured that every investor subscribing to new shares is profitable.

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Understanding Multiples

- ◆ The definition of multiples
 - How to figure out the multiples
- ◆ Analyzing multiples
 - Know the distribution of multiples
- ◆ The factors of multiples
 - What determines the multiples?
- ◆ Using multiples
 - Determining comparable collections and adjusting deviations is not easy.

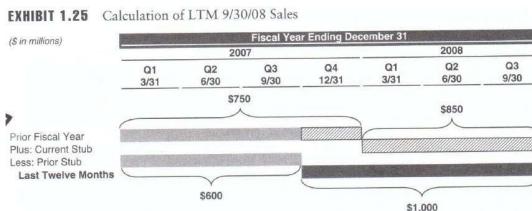
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The Calculation of Multiples

Some important financial data	
– Sales Revenue	Sales Revenue \$20,438
» The first row of the Income Statement	
– Gross Profit	SG&A
» =Sales –COGS	
» Gross Profit Margin =Gross Profit/Sales Revenue	
– Earnings before Interest and Taxes (EBIT)	
» =Gross Profit– Selling, general and administrative expenses – Depreciation and amortization–Other expenses	
» EBIT Margin=EBIT/Sales Revenue	
CUHK(Shenzhen)	如中航股价2016年实现营业收入2.65亿元，归属于上市公司股东的净利润0.13亿元，而长期股权投资达0.56亿元，占总营收的比例为21%
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Update Recent Financial Data



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The Calculation of Multiple

- ◆ Multiples
 - P/E ratio
 - » share price/earnings per share
 - P/B ratio
 - » share price/Book value per share
 - enterprise value and EBITDA
 - » EV/EBITDA
 - enterprise value and EBIT
 - » EV/EBIT
 - enterprise value and sales
 - » EV/Sales

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The Calculation of Multiples

◆ Some important financial data

- Earnings before Interest, Taxes, Depreciation and Amortization (EBITDA)
 - » =EBIT + Depreciation and amortization (DA)
 - » EBITDA Margin=EBITDA/Sales Revenue

– Net Income

- » =EBIT – Interest– Taxes – Non-controlling Interest(NCI)
 - Preferred Dividend
 - » It is customary to calculate net income as earning per share(EPS)
 - » P/E ratio = Share price/ EPS
 - » ROE=Net Income/Net Asset (Equity) } Book value on 分母
 - » ROA=Net Income/Total Asset

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The Calculation of Multiples

◆ Updating recent financial data.

- Data for the past 12 months (LTM, TTM)
 - » = Data for last financial year+ Data for the current year – Corresponding data for last financial year

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The Calculation of Multiple

◆ Adjust the income statement ↗ one time items.

- adjust the extraordinary items in the income statement
- example of expense
 - » caused by reorganization event
 - ◆ store closures, layoffs 裁员
 - » loss on sale of assets
 - » changes in accounting rules
 - » inventory cancellation
 - » derogation of goodwill
 - » litigation loss

– there are "non-recurring," "extra," and "disposable" in the annual and quarterly reports.

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Adjust the income statement

EXHIBIT 1.28 Adjusted Income Statement

Income Statement (\$ in millions, except per share data)			
	Reported 2007	Adjustments	Adjusted 2007
Sales	\$1,000.0	+ \$1,000.0	\$1,000.0
Cost of Goods Sold	\$625.0	– (5.0) ←	\$620.0
Gross Profit	\$375.0		\$380.0
Selling, General & Administrative	\$280.0		\$280.0
Restructuring Charges	(10.0) ←		
Operating Income (EBIT)	\$135.0	+ \$150.0 ←	\$150.0
Interest Expense	35.0	35.0	35.0
Pre-tax Income	\$100.0	+ \$115.0 ←	\$115.0
Income Taxes	40.0	+ 40.0 ←	40.0
Net Income	\$60.0	+ \$69.0 ←	\$69.0
Operating Income (EBIT)	\$135.0	+ 15.0 ←	\$150.0
Depreciation & Amortization	50.0	+ 50.0 ←	50.0
EBITDA	\$185.0	+ \$200.0 ←	\$200.0
Weighted Avg. Diluted Shares	30.0		30.0
Diluted EPS	\$2.00	+ \$2.30 ←	\$2.30
\$15.0 million add-back of total non-recurring items			
= (Inventory write-down + Restructuring charge) x Marginal Tax Rate = (\$5.0 million + \$10.0 million) x 40.0%			
D&A is typically sourced from a company's cash flow statement although it is sometimes broken out on the income statement			

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Benchmarking

◆ Choose a comparable company

- calculate key financial ratios and multiples
- calculate the range of financial ratios and multiples of comparable company
 - » average, median, highest and lowest
 - » investigate and understand differences

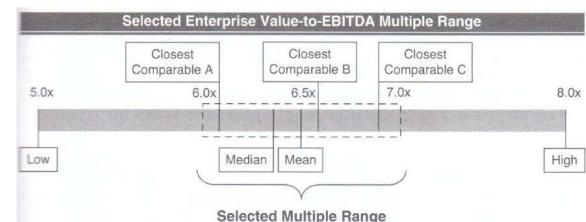
◆ Benchmarking

- Establish the range of valuation
 - » in general, to find the mean and median of the most relevant industries

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Benchmarking



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Benchmarking

	(\$ in millions, except per share data)						
	Financial Metric	Multiple Range	Implied Enterprise Value	Less: Net Debt	Implied Equity Value	Fully Dilated Shares	Implied Share Price
LTM	\$200	6.50x – 7.50x	\$1,300 – \$1,500	(500)	\$800 – \$1,000	100	\$8.00 – \$10.00
2008E	215	6.00x – 7.00x	1,290 – 1,505	(500)	790 – 1,005	100	\$7.90 – \$10.05
2009E	230	5.50x – 6.50x	1,265 – 1,495	(500)	765 – 995	100	\$7.65 – \$9.95

Multiple range: 分母代表整个公司还是 equity holder, 决定结果是 Benchmarking equity or enterprise.

Benchmarking

	(\$ in millions)					
	Net Income	Financial Metric	Multiple Range	Implied Equity Value	Plus: Net Debt	Implied Enterprise Value
LTM	\$70	12.00x – 15.00x	\$840 – \$1,050	100	\$8.40 – \$10.50	
2008E	75	11.00x – 14.00x	825 – 1,050	100	\$8.25 – \$10.50	
2009E	80	10.00x – 13.00x	800 – 1,040	100	\$8.00 – \$10.40	

Summary

The advantages of relative pricing

- Utilization of market information
» Considering market growth, risk estimates, and market sentiment 情绪
- Relativity
» Easy to be measured and compared with other companies
- Fast and convenient
» Easy to build a computing platform
- In time
» Market information: updated every day

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先例 Precedent Transaction Cases Analysis

- ◆ Pricing by using multiples of comparable companies in previous M&A cases to price.
Mergers and Acquisitions 企业并购
- ◆ It is a challenge to find comparable companies
– Sometimes different industries can be considered when there is similar:
 - » Final product market
 - » Distribution channels
 - » Financial characteristics

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Google bought Motorola Mobility LLC

- ◆ August 15, 2011 *In order to get its patent asset, not consider its financial asset (e.g. stocks).*
 - Google bought MOTOROLA with \$12.5 billion
 - 63% premium
 - How did they figure out \$12.5 billion?



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Google bought Motorola Mobility LLC

- ◆ MOTOROLA has 24,500 patents.
- ◆ In October 2010, *Novel sold 882 patents that are worth \$450 million.*
 - How much is each patent worth?
0.5 million/patent Comparable case
- ◆ If Google buys 24,500 patents for \$12.5 billion.
 - How much is each patent worth?
- ◆ Conclusion
 - Google bought 24,500 patents plus a free mobile phone company.

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How Are Patents Priced?

- ◆ Pricing of Kodak
 - Market value: On November 24, 2011, \$310 million.
 - There are 1000 patents
 - If each patent can be sold for \$510,204
 - » \$510 million

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Precedent Transaction Cases Analysis

- ◆ Transaction details
– Is the buyer a strategic investor or a financial investor?
 - » Strategic investors are generally willing to pay higher prices
- What are the motivations of buyers and sellers?
 - » Is the seller in urgent need of cash?
To get other assets rather than financial assets
- Transaction procedures and nature
 - » The auction
 - » A hostile takeover
 - » Equal participation
- Buying patterns
 - » Cash
 - » Stock

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Summary

- ◆ Advantages of Precedent Pricing
 - Leveraging Market Information
 - » Take Actual Acquisition Price into Consideration.
 - Timely
 - » Reflect market's current M&A price, circumstances of capital market, and current financial situation.
 - Easiness
 - » Easy to compare with other transactions.
 - Objectiveness
 - » No need of hypothesis on future performance.

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How Are Patents Priced?

- ◆ [Kodak's proposed \$525 million patent sale plan was approved by a bankruptcy judge]
On January 11th, kodak proposed a price of \$525 million to Intellectual.
Proposal for Ventures and RPX to sell digital imaging patents was approved by bankruptcy judges, which made the company closer to coming out of bankruptcy protection.

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Calculate Multiples

- ◆ Stock Price are decided by published purchasing price
 - Not Market Price
- ◆ Multiples
 - P/E Ratio = Price per Share/EPS
 - Market Value to LTM EBITDA Ratio
 - Market Value to LTM EBIT Ratio
 - Market Value to LTM Sales Ratio

Last 12 months

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Summary

- ◆ Disadvantages of Precedent Pricing
 - Leveraging Market Information
 - » Market Sentiment may cause option pricing deviation.
 - Time Delay
 - » May not be applicable to current situation.
 - Lack of Comparable Transactions
 - Missing Transaction Details

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Precedent Transaction Cases Analysis

- ◆ Steps
 - Select relevant M&A comparable companies
 - Collect relevant M&A and financial information
 - Calculate key data, ratios, and transaction multiples
 - Benchmark related mergers and acquisitions
 - Pricing

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Calculate Multiples

- ◆ Adjusted Synergy Multiples
- ◆ Examples:
 - Market Value = \$1.2 Billion
 - EBITDA = \$ 0.15
 - Market Value to EBITDA Ratio = 8
- Assume that synergy effect will increase EBITDA for \$30 Million
 - » Market Value to EBITDA Ratio = 12/1.8 = 6.67

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Comparasion and Reflection of Pricing Method

Jinfan Zhang