IBM

Valuation of a Company

Dr. Ian Giddy

New York University

Applications

- Corporate valuation techniques are critical elements in a variety of business transactions
- Examples: mergers, acquisitions, restructurings, capital raising and lending
- Different situations require different valuation methods and measures

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What's a Company Worth?

- Required returns
- Types of Models
  - Balance sheet models
  - Comparables
  - Corporate cash flow models
- Estimating Growth Rates
- Applications
- Option-based models

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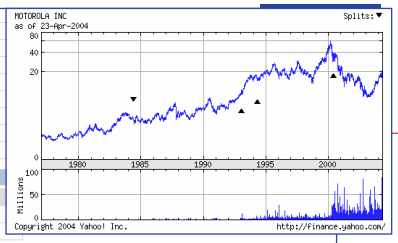
Motorola

Market Cap (intraday):	47.82B
Enterprise Value (24-Apr-04)*:	46.92B
Trailing P/E (ttm, intraday):	37.56
Forward P/E (fye 31-Dec-05)*:	24.04
PEG Ratio (5 yr expected)*:	2.84
Price/Sales (ttm):	1.64
Price/Book (mrq):	3.69
Enterprise Value/Revenue (ttm)*:	1.59
Enterprise Value/EBITDA (ttm)*:	26.42



FINANCIAL HIGHLIGHTS	
Fiscal Year	
Fiscal Year Ends:	31-Dec
Most Recent Quarter (mrq):	31-Mar-04
Profitability	
Profit Margin (ttm):	4.51%
Operating Margin (ttm):	6.00%
Management Effectiveness	
Return on Assets (ttm):	4.31%
Return on Equity (ttm):	10.93%
Income Statement	
Revenue (ttm):	29.68B
Revenue Per Share (ttm):	12.272
Revenue Growth (fy)*:	-11.10%
Gross Profit (ttm)*:	8.74B
EBITDA (ttm):	1.78B
Net Income Avl to Common (ttm):	1.33B
Diluted EPS (ttm):	0.544
Earnings Growth (fy)*:	N/A
Balance Sheet	
Total Cash (mrq):	8.42B
Total Cash Per Share (mrq):	3.6
Total Debt (mrq)*:	7.51B
Total Debt/Equity (mrq):	0.573
Current Ratio (mrq):	1.953
Book Value Per Share (mrq):	5.615
Cash Flow Statement	
From Operations (ttm)*:	2.39B
Free Cashflow (ttm)*:	1.69B

TRADING INFORMATION	
Stock Price History	
Beta:	1.379
52-Week Change:	158.61%
52-Week Change (relative to S&P500):	103.79%
52-Week High (23-Apr-04):	20.89
52-Week Low (28-Apr-03):	7.76
50-Day Moving Average:	17.55
200-Day Moving Average:	13.91
Share Statistics	
Average Volume (3 month):	16,066,071
Average Volume (10 day):	26,426,000
Shares Outstanding:	2.34B
Float:	2.32B
% Held by Insiders:	1.00%
% Held by Institutions:	63.21%
Shares Short (as of 7-Apr-04):	39.90M
Daily Volume (as of 7-Apr-04):	N/A
Short Ratio (as of 7-Apr-04):	2.923
Short % of Float (as of 7-Apr-04):	1.72%
Shares Short (prior month):	37.50M
Dividends & Splits	
Annual Dividend:	0.16
Dividend Yield:	0.77%
Dividend Date:	15-Apr-04

Source: biz.yahoo.com

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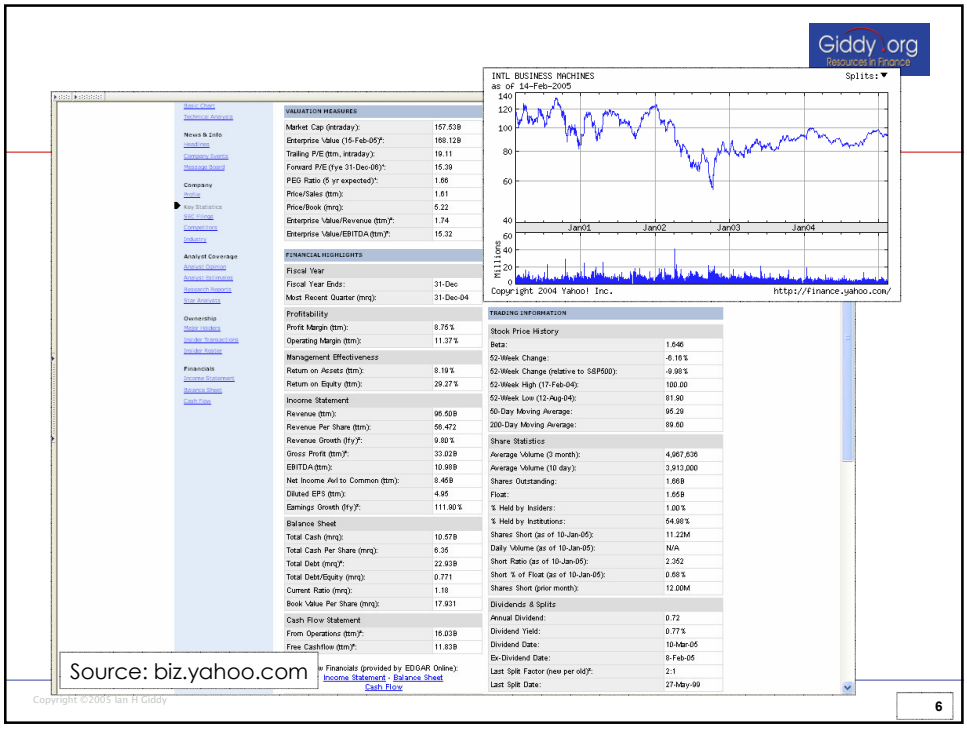
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Resources in Finance
INTL BUSINESS MACHINES
as of 14-Feb-2005
Splits:
Jan01
Jan02
Jan03
Jan04
Millions
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http://finance.yahoo.com/
VALUATION MEASURES
Market Cap (intraday):
Enterprise Value (15-Feb-05)*:
Trailing P/E (ttm, intraday):
Forward P/E (fye 31-Dec-06)*:
PEG Ratio (5 yr expected)*:
Price/Sales (ttm):
Price/Book (mrq):
Enterprise Value/Revenue (ttm)*:
Enterprise Value/EBITDA (ttm)*:
FINANCIAL HIGHLIGHTS
Fiscal Year
Fiscal Year Ends:
Most Recent Quarter (mrq):
Profitability
Profit Margin (ttm):
Operating Margin (ttm):
Management Effectiveness
Return on Assets (ttm):
Return on Equity (ttm):
Income Statement
Revenue (ttm):
Revenue Per Share (ttm):
Revenue Growth (fy)*:
Gross Profit (ttm)*:
EBITDA (ttm):
Net Income Avl to Common (ttm):
Diluted EPS (ttm):
Earnings Growth (fy)*:
Balance Sheet
Total Cash (mrq):
Total Cash Per Share (mrq):
Total Debt (mrq)*:
Total Debt/Equity (mrq):
Current Ratio (mrq):
Book Value Per Share (mrq):
Cash Flow Statement
From Operations (ttm)*:
Free Cashflow (ttm)*:
TRADING INFORMATION
Stock Price History
Beta:
52-Week Change:
52-Week Change (relative to S&P500):
52-Week High (17-Feb-04):
52-Week Low (12-Aug-04):
50-Day Moving Average:
200-Day Moving Average:
Share Statistics
Average Volume (3 month):
Average Volume (10 day):
Shares Outstanding:
Float:
% Held by Insiders:
% Held by Institutions:
Shares Short (as of 10-Jan-05):
Daily Volume (as of 10-Jan-05):
Short Ratio (as of 10-Jan-05):
Short % of Float (as of 10-Jan-05):
Shares Short (prior month):
Dividends & Splits
Annual Dividend:
Dividend Yield:
Dividend Date:
Ex-Dividend Date:
Last Split Factor (new per old)*:
Last Split Date:
Source: biz.yahoo.com
Income Statement - Balance Sheet
Cash Flow
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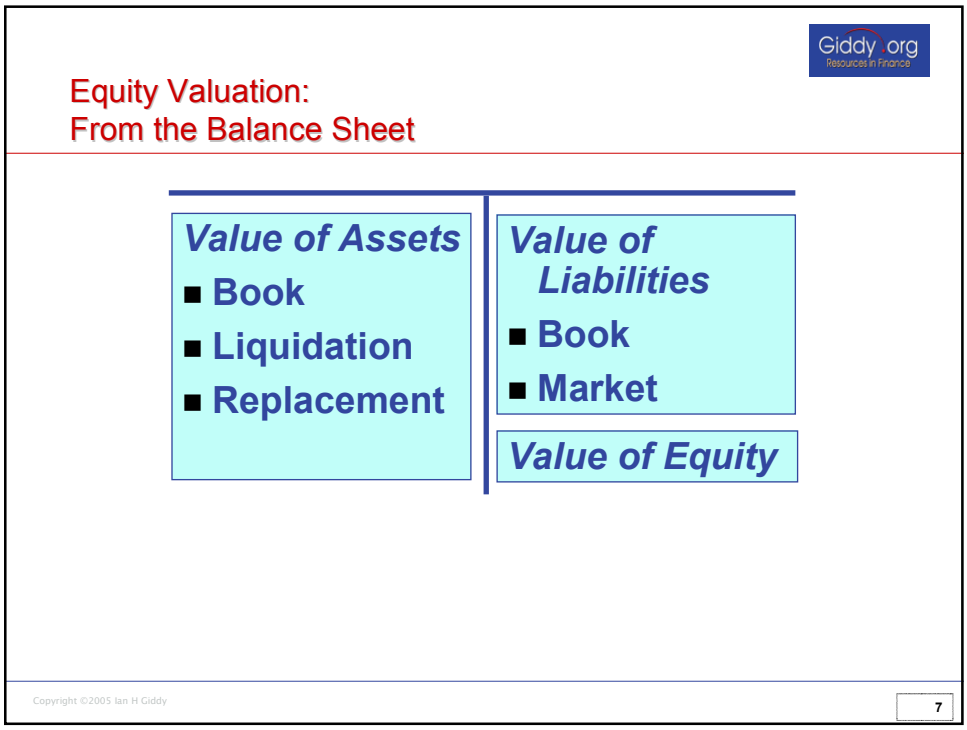
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Equity Valuation:
From the Balance Sheet
Value of Assets
Book
Liquidation
Replacement
Value of Liabilities
Book
Market
Value of Equity
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Motorola's Financials

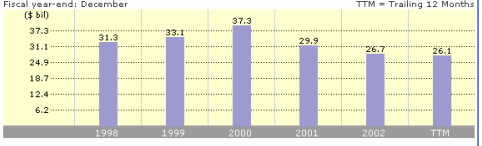
Motorola MOT

Invest FREE for 3 Months

10-Yr Income | 10-Yr Cash Flows | 10-Yr Balance Sheet | 5-Yr Restated | Quarterly Results

Income Statement

Fiscal year-end: December — TTM = Trailing 12 Months



	1998	1999	2000	2001	2002	TTM
Sales $Mil	31,340	33,075	37,346	29,873	26,679	26,132
Operating Income $Mil	-1,325	241	895	-5,803	-1,813	---
Income Tax $Mil	-373	392	913	-1,574	-961	---
Net Income $Mil	-907	891	1,318	-3,937	-2,485	578
Earnings/Share $	-0.44	0.41	0.58	-1.78	-1.09	0.25
EPS (Cont Ops) $	-0.44	0.41	0.58	-1.78	-1.09	0.25
Dividends/Share $	0.16	0.16	0.16	0.16	0.16	0.16
Total Shares Mil	2,061	2,121	2,161	2,212	2,280	2,328

Cash Flow $Mil

Fiscal year-end: December — TTM = Trailing 12 Months

	2000	2001	2002	TTM
Operating Cash Flow	-1,164	1,976	1,339	2,391
- Capital Spending	3,957	1,307	464	561
= Free Cash Flow	-5,121	669	875	1,830

Balance Sheet

Assets	$Mil	Liabilities and Equity	$Mil
Cash	7,163.0	Current Liabilities	8,817.0
Other Current Assets	9,214.0	Long-Term Liabilities	9,703.0
Long-Term Assets	14,094.0	Shareholders' Equity	11,951.0
Total	**30,471.0**	**Total**	**30,471.0**

Source: morningstar.com

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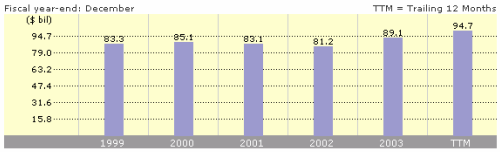
IBM's Financials

10-Yr Income | 10-Yr Cash Flows | 10-Yr Balance Sheet | 5-Yr Restated | Quarterly Results

Income Statement

Fiscal year-end: December — TTM = Trailing 12 Months



	1999	2000	2001	2002	2003	TTM
Sales $Mil	83,334	85,089	83,067	81,186	89,131	94,745
Operating Income $Mil	---	---	---	7,669	11,019	---
Income Tax $Mil	---	---	-3,304	2,190	3,261	---
Net Income $Mil	7,712	8,093	7,713	3,579	7,583	8,099
Earnings/Share $	4.12	4.44	4.35	2.06	4.32	4.55
EPS (Cont Ops) $	3.93	4.32	4.59	3.07	4.34	4.70
Dividends/Share $	0.47	0.51	0.55	0.59	0.63	0.68
Total Shares Mil	1,815	1,767	1,733	1,704	1,723	1,665

Cash Flow $Mil

Fiscal year-end: December — TTM = Trailing 12 Months

	2001	2002	2003	TTM
Operating Cash Flow	13,966	13,788	14,569	14,569
- Capital Spending	---	4,753	4,393	4,393
= Free Cash Flow	---	9,035	10,176	10,176

Balance Sheet

Assets	$Mil	Liabilities and Equity	$Mil
Cash	9,671.0	Current Liabilities	35,167.0
Other Current Assets	32,759.0	Long-Term Liabilities	35,807.0
Long-Term Assets	58,246.0	Shareholders' Equity	29,702.0
Total	**100,676.0**	**Total**	**100,676.0**

Source: morningstar.com

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Book Value of a Mining Company?

Mining companies trade at about 3x book! Why?

	Stock	Industry
Price/Earnings	NMF	36.1
Price/Book	2.5	3.1
Price/Sales	1.8	2.9
Price/Cash Flow	24.1	15.4
Dividend Yield %	0.0	1.7

* Price/Cash Flow uses 3-year average.

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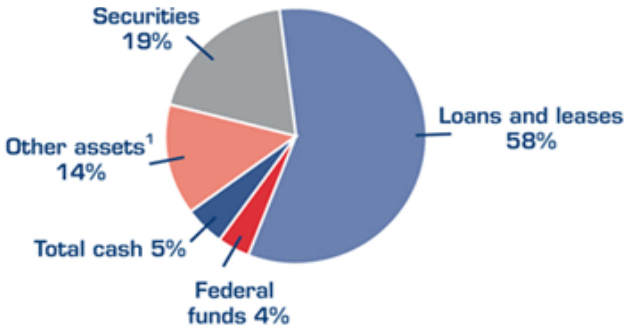
When Does Book Value Make Sense?

ASSETS OF FDIC-INSURED COMMERCIAL BANKS, 2002



(1) Includes assets held in trading accounts, bank premises and fixed assets, other real estate owned, intangible assets, and all other assets.

Source: Federal Deposit Insurance Corporation.

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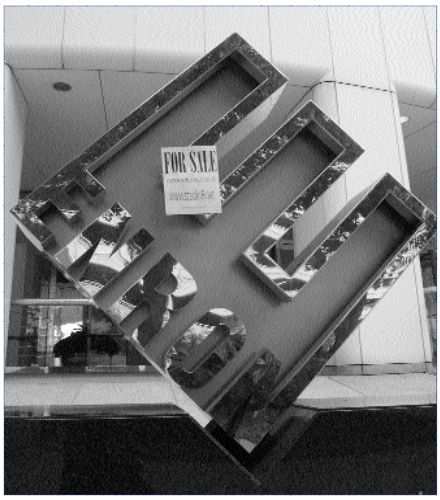
When Does Liquidation Value Make Sense?



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Equity Valuation: From the Balance Sheet

Value of Assets

- **Book**
- **Liquidation**
- **Replacement**
- ***Or what?***

A New York City study estimated that the 322 trees surveyed had an average value of $3,225 per tree and a total value of $1,038,458. The value was said to be the amount the city would have to pay to replace the tree. (*New York Times*, 12 May 2003)

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Replacement Value?

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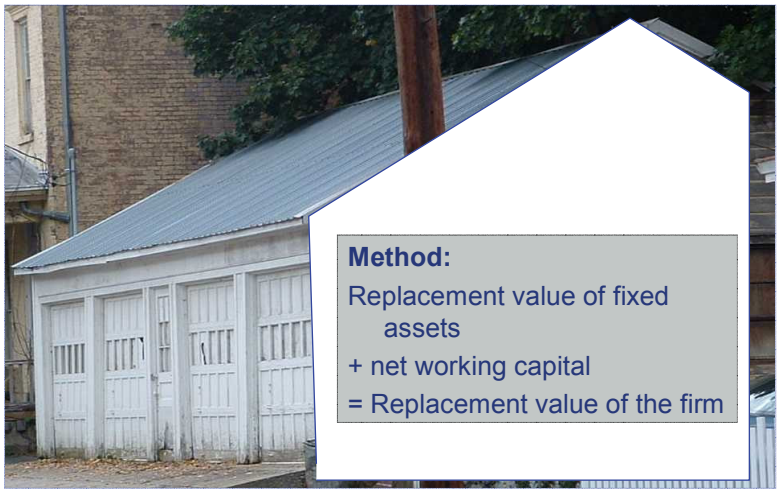
Replacement Value?



Method:

Replacement value of fixed assets

+ net working capital

= Replacement value of the firm

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Relative Valuation

- In relative valuation, the value of an asset is derived from the pricing of 'comparable' assets, standardized using a common variable such as earnings, cashflows, book value or revenues. Examples include --
  - Price/Earnings (P/E) ratios
    - and variants (EBIT multiples, EBITDA multiples, Cash Flow multiples)
  - Price/Book (P/BV) ratios
    - and variants (Tobin's Q)
  - Price/Sales ratios

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Example: Valuing a Private company

Earnings:

- **Current: $2.3m**
- **Trailing: $1.7m**
- **Expected: $2.8m**

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P/E Ratios by Industry

Industry Name	Number of Firms	Aggregate Market Cap/ Aggregate Net Income	Price/Current EPS	Price/Trailing EPS	Price/Forward PE	Expected Growth	Payout
Advertising	34	37.87	32.38	28.06	30.54	14.59%	19.22%
Aerospace/Defense	72	21.74	50.23	38.78	24.05	18.11%	30.42%
Air Transport	43	NA	80.89	29.57	41.31	14.47%	NA
Apparel	59	22.70	24.14	14.13	17.05	14.58%	45.78%
Auto & Truck	21	15.59	40.46	26.08	20.76	19.07%	26.18%
Auto Parts	62	16.91	22.18	29.49	15.61	12.01%	29.52%
Bank	504	19.15	21.25	19.07	18.73	10.61%	55.57%
Bank (Canadian)	7	20.45	17.92	17.48	13.03	13.75%	0.08%
Bank (Foreign)	4	18.60	18.28	22.01	NA	0.00%	64.22%
Bank (Midwest)	43	16.30	18.26	17.05	15.48	9.76%	42.22%
Beverage (Alcoholic)	24	21.92	32.27	27.89	17.42	11.88%	31.19%
Beverage (Soft Drink)	17	25.02	24.23	48.65	18.07	15.44%	38.53%
Biotechnology	84	973.03	52.03	56.27	51.61	30.32%	0.00%
Building Materials	48	NA	30.89	19.63	16.25	14.36%	NA
Cable TV	24	NA	84.20	16.35	147.34	13.08%	NA
Canadian Energy	10	19.01	19.66	14.13	15.84	5.48%	20.25%
Cement & Aggregates	14	20.15	34.60	22.19	20.55	13.06%	31.76%
Chemical (Basic)	16	39.45	42.31	37.82	110.38	27.92%	128.03%
Chemical (Diversified)	33	24.12	34.61	28.58	20.12	11.69%	42.87%
Chemical (Specialty)	95	24.75	26.19	22.49	27.90	16.31%	45.97%
Coal	8	58.35	50.39	23.52	55.29	16.17%	87.28%
Computer Software/Svcs	387	36.15	71.68	113.16	44.94	19.45%	14.38%
Computers/Peripherals	148	38.13	66.20	113.29	44.53	20.30%	18.92%
Diversified Co.	102	22.50	47.15	29.62	22.37	13.56%	24.60%
Drug	276	32.29	49.21	33.87	30.60	22.43%	52.57%
E-Commerce	41	NA	82.58	62.03	78.20	23.79%	NA
Educational Services	34	79.40	48.00	36.64	35.07	20.50%	0.70%
Electric Util. (Central)	27	17.83	16.31	15.01	13.99	6.23%	68.73%
Electric Utility (East)	29	14.97	14.40	16.10	14.53	3.46%	61.62%
Electric Utility (West)	15	43.73	19.53	29.80	15.79	1.00%	98.64%
Electrical Equipment	86	23.97	45.03	31.40	45.18	12.84%	53.33%
Electronics	181	NA	56.60	111.07	44.85	16.94%	NA

Source: http://pages.stern.nyu.edu/~adamodar

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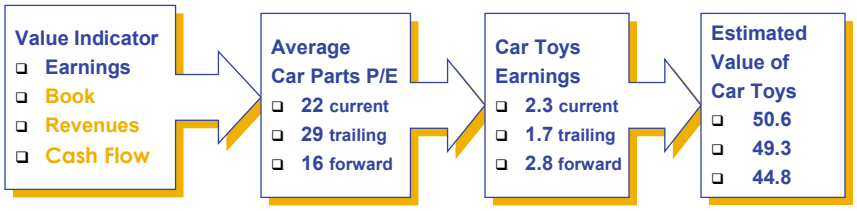
Comparables Method



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Price to Book Ratios

Industry Name	Number of Firms	Price/BV	ROE	Expected Growth in EPS	Payout	Beta	Value/BV	ROC
Advertising	34	2.89	7.63%	14.59%	19.22%	1.30	2.48	8.47%
Aerospace/Defense	72	2.66	12.23%	18.11%	30.42%	0.79	1.91	11.78%
Air Transport	43	4.64	-6.66%	14.47%	NA	1.66	2.59	10.55%
Apparel	59	3.60	15.86%	14.58%	45.78%	0.93	3.20	14.32%
Auto & Truck	21	2.12	13.60%	19.07%	26.18%	1.26	1.44	10.69%
Auto Parts	62	2.30	13.60%	12.01%	29.52%	1.16	1.80	27.55%
Bank	504	2.43	12.67%	10.61%	55.57%	0.62	1.89	NA
Bank (Canadian)	7	2.42	11.83%	13.75%	0.08%	0.83	2.05	NA
Bank (Foreign)	4	3.00	16.11%	0.00%	64.22%	1.53	1.96	NA
Bank (Midwest)	43	2.73	16.71%	9.76%	42.22%	0.73	2.14	NA
Beverage (Alcoholic)	24	6.63	30.26%	11.88%	31.19%	0.57	3.52	18.29%
Beverage (Soft Drink)	17	6.74	26.95%	15.44%	38.53%	0.59	4.37	19.33%
Biotechnology	84	4.80	0.49%	30.32%	0.00%	1.49	6.22	4.47%
Building Materials	48	3.21	-2.07%	14.36%	NA	0.90	2.39	4.88%
Cable TV	24	2.51	-5.49%	13.08%	NA	1.95	1.60	6.47%
Canadian Energy	10	2.64	13.86%	5.48%	20.25%	0.66	1.89	15.55%
Cement & Aggregates	14	1.97	9.79%	13.06%	31.76%	0.78	1.74	13.54%
Chemical (Basic)	16	4.15	10.52%	27.92%	128.03%	0.88	2.67	14.26%
Chemical (Diversified)	33	3.68	15.28%	11.69%	42.87%	0.83	2.62	17.10%
Chemical (Specialty)	95	3.02	12.21%	16.31%	45.97%	0.83	2.10	13.40%
Coal	8	2.89	4.96%	16.17%	87.28%	0.95	2.02	17.69%
Computer Software/Svcs	387	4.96	13.71%	19.45%	14.38%	2.14	9.82	16.39%
Computers/Peripherals	148	4.20	11.01%	20.30%	18.92%	2.17	4.80	13.76%
Diversified Co.	102	2.76	12.27%	13.56%	24.60%	0.78	2.15	11.09%
Drug	276	6.87	21.27%	22.43%	52.57%	1.66	7.40	19.40%
E-Commerce	41	3.43	-37.14%	23.79%	NA	3.29	10.87	-93.80%
Educational Services	34	6.97	8.77%	20.50%	0.70%	1.17	9.89	16.23%
Electric Util. (Central)	27	1.70	9.52%	6.23%	68.73%	0.80	1.26	10.05%
Electric Utility (East)	29	1.82	12.16%	3.46%	61.62%	0.73	1.29	10.39%
Electric Utility (West)	15	1.77	4.04%	1.00%	98.64%	0.79	1.34	8.57%
Electrical Equipment	86	4.48	18.69%	12.84%	53.33%	1.64	3.94	17.11%
Electronics	181	2.49	-5.62%	16.94%	NA	1.68	2.73	3.43%
Entertainment	84	1.71	0.99%	17.46%	56.76%	1.43	1.56	7.30%

Source: http://pages.stern.nyu.edu/~adamodar

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Price to Sales Ratios

Industry Name	Number of Firms	Price/Sales	Net Margin	Expected Growth	Payout	Beta	Value/Sales	After-tax Operating Margin
Advertising	34	1.84	2.40%	14.59%	19.22%	1.30	2.13	9.35%
Aerospace/Defense	72	0.82	3.18%	18.11%	30.42%	0.79	1.10	7.71%
Air Transport	43	0.85	-1.34%	14.47%	NA	1.66	1.15	6.42%
Apparel	59	1.36	3.51%	14.58%	45.78%	0.93	1.47	8.32%
Auto & Truck	21	0.43	1.25%	19.07%	26.18%	1.26	1.00	9.55%
Auto Parts	62	0.41	2.08%	12.01%	29.52%	1.16	0.56	10.14%
Bank	504	NA	NA	10.61%	55.57%	0.62	NA	NA
Bank (Canadian)	7	NA	NA	13.75%	0.08%	0.83	NA	NA
Bank (Foreign)	4	NA	NA	0.00%	64.22%	1.53	NA	NA
Bank (Midwest)	43	NA	NA	9.76%	42.22%	0.73	NA	NA
Beverage (Alcoholic)	24	2.24	2.60%	11.88%	31.19%	0.57	2.67	14.57%
Beverage (Soft Drink)	17	2.77	5.18%	15.44%	38.53%	0.59	3.08	15.15%
Biotechnology	84	11.26	8.34%	30.32%	0.00%	1.49	10.79	12.46%
Building Materials	48	0.57	-1.13%	14.36%	NA	0.90	0.73	2.07%
Cable TV	24	2.72	-2.04%	13.08%	NA	1.95	4.44	19.22%
Canadian Energy	10	1.93	10.48%	5.48%	20.25%	0.66	2.45	19.90%
Cement & Aggregates	14	1.27	5.72%	13.06%	31.76%	0.78	1.53	13.04%
Chemical (Basic)	16	1.38	0.64%	27.92%	128.03%	0.88	1.72	10.83%
Chemical (Diversified)	33	1.42	5.66%	11.69%	42.87%	0.83	1.70	12.23%
Chemical (Specialty)	95	0.98	3.37%	16.31%	45.97%	0.83	1.28	8.91%
Coal	8	1.06	-0.18%	16.17%	87.28%	0.95	1.40	12.80%
Computer Software/Svcs	387	4.13	11.21%	19.45%	14.38%	2.14	3.73	15.71%
Computers/Peripherals	148	1.48	3.81%	20.30%	18.92%	2.17	1.46	6.76%
Diversified Co.	102	0.83	1.75%	13.56%	24.60%	0.78	1.08	7.40%
Drug	276	4.54	10.10%	22.43%	52.57%	1.66	4.53	18.71%
E-Commerce	41	3.23	-13.22%	23.79%	NA	3.29	2.60	-106.93%
Educational Services	34	4.13	6.28%	20.50%	0.70%	1.17	3.94	11.08%
Electric Util. (Central)	27	0.83	3.08%	6.23%	68.73%	0.80	1.79	15.23%
Electric Utility (East)	29	1.26	5.58%	3.46%	61.62%	0.73	2.41	19.58%
Electric Utility (West)	15	0.86	0.18%	1.00%	98.64%	0.79	1.76	13.23%
Electrical Equipment	86	3.20	12.38%	12.84%	53.33%	1.64	3.35	15.76%
Electronics	181	0.99	-2.43%	16.94%	NA	1.68	1.02	1.99%
Entertainment	84	2.67	0.47%	17.46%	56.76%	1.43	3.21	16.08%

Source: http://pages.stern.nyu.edu/~adamodar

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Price to Cash Flow Ratios

Industry Name	Number of Firms	Value/EBITDA	Value/EBIT	Value/EBIT(1-t)
Advertising	34	10.80	14.02	22.77
Aerospace/Defense	72	8.15	10.32	14.32
Air Transport	43	7.23	12.11	17.87
Apparel	59	9.68	11.66	17.65
Auto & Truck	21	5.07	7.29	10.51
Auto Parts	62	4.70	6.56	5.53
Bank	504	6.22	6.22	8.82
Bank (Canadian)	7	3.93	3.93	4.78
Bank (Foreign)	4	4.89	4.89	6.29
Bank (Midwest)	43	6.14	6.14	9.12
Beverage (Alcoholic)	24	9.52	11.67	18.31
Beverage (Soft Drink)	17	11.65	14.16	20.34
Biotechnology	84	37.66	51.87	86.64
Building Materials	48	5.75	7.40	35.32
Cable TV	24	9.56	16.65	23.13
Canadian Energy	10	5.43	7.76	12.32
Cement & Aggregates	14	5.97	8.41	11.76
Chemical (Basic)	16	8.61	13.03	15.87
Chemical (Diversified)	33	6.64	8.95	13.91
Chemical (Specialty)	95	6.89	9.40	14.40
Coal	8	6.04	10.54	10.92
Computer Software/Svcs	387	12.93	15.98	23.72
Computers/Peripherals	148	11.13	15.56	21.60
Diversified Co.	102	8.82	11.39	14.56
Drug	276	14.71	17.25	24.20
E-Commerce	41	24.53	123.90	NA
Educational Services	34	17.02	22.06	35.53
Electric Util. (Central)	27	6.11	8.46	11.73
Electric Utility (East)	29	6.40	8.69	12.30
Electric Utility (West)	15	5.98	9.16	13.28
Electrical Equipment	86	12.31	16.41	21.23
Electronics	181	15.76	29.08	51.08
Entertainment	84	10.29	14.20	19.98

Source: http://pages.stern.nyu.edu/~adamodar

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IBM: Overvalued or Undervalued?

Valuation more ▸▸ 02-14-05

	Stock	Industry	S&P 500
Price/Earnings	19.9	33.7	23.2
Forward P/E	16.7	27.1	19.9
Price/Book	5.2	6.7	4.2
Price/Cash Flow	10.7	15.6	15.0
Price/Sales	1.6	2.9	3.0
Dividend Yield %	0.8	0.5	1.6

S&P 500 data through 02-09-05

Growth more ▸▸ 02-09-05

	1 Year%	3 Year%	S&P 500
Sales	9.8	1.6	4.8
Net Income	111.9	-2.1	7.0
EPS	109.7	-0.9	7.2
Equity/Share	21.1	12.1	11.8
Dividends	6.8	8.0	8.0

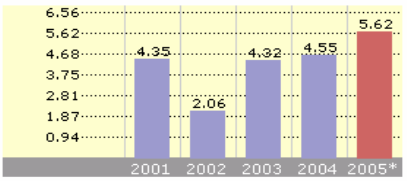
S&P 500 data - 3 Year%

Profitability more ▸▸ 12-31-03

	Stock	Industry	S&P 500
ROA %	8.0	7.0	6.8
ROE %	27.3	21.5	18.8
Net Margin %	8.5	5.9	12.9
Asset Turnover	0.9	1.2	0.8
Fin Leverage	3.4	2.8	5.3
Sales/Employee $Thousands	266.8	---	---

Stock uses trailing 12 months. Industry and S&P 500 use fiscal year-end.

Earnings Trends more ▸▸ 12-31-2003



Historical years use fiscal year-end.

Source: morningstar.com

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IBM: Forward Comparables

Current Valuation | 10-Yr Valuation | **Forward Valuation** | Yields

Forward Valuation Ratios 02-14-05

	Stock	Industry Average	S&P 500 Average
Forward Price/Earnings	16.7	27.1	19.9
PEG Ratio	1.6	1.8	1.9
PEG Payback (Yrs)	9.5	10.0	9.8

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Discounted Cashflow Valuation

$$\text{Value} = \sum_{t=1}^{t=n} \frac{CF_t}{(1+r)^t}$$

- where
- n = Life of the asset
- CF_t = Cashflow in period t
- r = Discount rate reflecting the riskiness of the estimated cashflows

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Start with the Weighted Average Cost of Capital

Choice	***Cost***
1. Equity	Cost of equity
- Retained earnings	- depends upon riskiness of the stock
- New stock issues	- will be affected by level of interest rates
- Warrants	

Cost of equity = riskless rate + beta * risk premium

2. Debt	Cost of debt
- Bank borrowing	- depends upon default risk of the firm
- Bond issues	- will be affected by level of interest rates
	- provides a tax advantage because interest is tax-deductible

Cost of debt = Borrowing rate (1 - tax rate)

Debt + equity = Capital	Cost of capital = Weighted average of cost of equity and cost of debt; weights based upon market value.

Cost of capital = k_d [D/(D+E)] + k_e [E/(D+E)]

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IBM's Cost of Capital

IBM					
	Cost of Capital		Cost	Amount	Weight
	Debt				
		10-year bond yield	4.95%		
		Tax rate	29%		
		After-tax cost	3.5%	61.9	31%
	Equity				
		Risk-free Treasury	4.50%		
		Beta	1.47		
		Market Risk Premium	5.50%		
		From CAPM	12.6%	137.4	69%
	Total		**9.77%**	199.3	
Source: IBMfinancing.xls					

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Valuation: The Key Inputs

- A publicly traded firm potentially has an infinite life. The value is therefore the present value of cash flows forever.

$$\text{Value} = \sum_{t=1}^{t=\infty} \frac{CF_t}{(1+r)^t}$$

- Since we cannot estimate cash flows forever, we estimate cash flows for a "growth period" and then estimate a terminal value, to capture the value at the end of the period:

$$\text{Value} = \sum_{t=1}^{t=N} \frac{CF_t}{(1+r)^t} + \frac{\text{Terminal Value}}{(1+r)^N}$$

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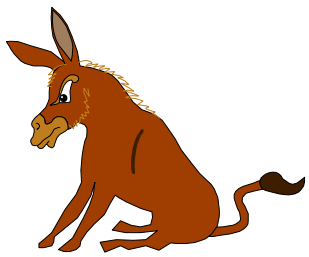
No Growth Model

$$V_o = \frac{D}{k}$$



- Stocks that have earnings and dividends that are expected to remain constant
- Preferred Stock

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No Growth Model: Example

$$V_o = \frac{D}{k}$$

- Burlington Power & Light has earnings of $5 per share and pays out 100% dividend
- The required return that shareholders expect is 12%
- The earnings are not expected to grow but remain steady indefinitely
- What's a BPL share worth?

$E_1 = D_1 = \$5.00$

$k = .12$

$V_0 = \$5.00/0.12 = \$41.67$

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Corporate Cash Flow Valuation: The Steps

- Estimate the **discount rate** or rates to use in the valuation
  - Discount rate can be either a cost of equity (if doing equity valuation) or a cost of capital (if valuing the firm)
- 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 asset 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.

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Constant Growth Model: Example

$$Vo = \frac{D_o(1+g)}{k-g}$$

- Motel 6 has earnings of $5 per share. It reinvests 40% and pays out 60%dividend
- The required return that shareholders expect is 13%
- The earnings are expected to grow at 5% per annum
- What's an M6 share worth?

E = $5.00 D = $3.00 k = 13% g = 5%

V_0 = 3.00(1+5%) / (13%-5%)

= $39.38

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Estimating Dividend Growth Rates

$$g = ROE \times b$$

- g = growth rate in dividends
- ROE = Return on Equity for the firm
- b = plowback or retention percentage rate
  i.e.(1- dividend payout percentage rate)

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Or Use Analysts' Expectations?

Earnings Growth	Int\'l Business Machines	Industry	Sector	S&P 500
This Quarter Est.	9.6%	34.5%	22.5%	6.7%
Next Quarter Est.	11.2%	34.5%	35.9%	11.0%
This Year Est.	9.1%	29.6%	43.7%	16.3%
Next Year Est.	13.5%	24.1%	33.8%	14.7%
Past 5 Years	5.7%	N/A	N/A	N/A
Next 5 Years Est.	10.0%	11.61%	15.22%	11.66%
Price/Earnings (ttm)	18.1	20.25	27.69	15.81
PEG Ratio	1.81	1.74	1.82	1.36

Source: biz.yahoo.com

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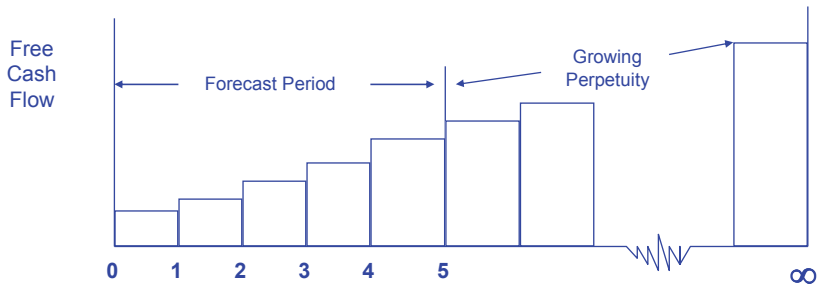
Free Cash Flow Valuation: Forecast Period Plus "Growing Perpetuity"



- Company continues growing
- FCF after working capital, growth capex

$$TV = \frac{FCF_5 \times (1 + \text{Growth Rate})}{\text{Discount Rate} - \text{Growth Rate}}$$

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Stable Growth and Terminal Value

- When a firm's cash flows grow at a "constant" rate forever, the present value of those cash flows can be written as:
  Value = Expected Cash Flow Next Period / (r - g)
  where,
  r = Discount rate (Cost of Equity or Cost of Capital)
  g = Expected growth rate
- This "constant" growth rate is called a stable growth rate and cannot be higher than the growth rate of the economy in which the firm operates.
- While companies can maintain high growth rates for extended periods, they will all approach "stable growth" at some point in time.
- When they do approach stable growth, the valuation formula above can be used to estimate the "terminal value" of all cash flows beyond.

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Choosing a Growth Pattern: Examples

Company	Valuation in	Growth Period	Stable Growth
PWC	Nominal U.S. $ Firm	10 years (3-stage)	6%(long term nominal growth rate in the world economy
DirecTV	Nominal US$ Equity: FCFE	5 years (2-stage)	4%: based upon expected long term US growth rate
Allianz	Nominal Euro Equity: Dividends	0 years	3%: set equal to nominal growth rate in the European economy

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The Building Blocks of Valuation

Choose a			
Cash Flow	*Dividends* Expected Dividends to Stockholders	*Cashflows to Equity* Net Income - (1- δ) (Capital Exp. - Deprec'n) - (1- δ) Change in Work. Capital = Free Cash flow to Equity (FCFE) [δ = Debt Ratio]	*Cashflows to Firm* EBIT (1- tax rate) - (Capital Exp. - Deprec'n) - Change in Work. Capital = Free Cash flow to Firm (FCFF)
& A Discount Rate	*Cost of Equity* • *Basis*: The riskier the investment, the greater is the cost of equity. • *Models:* CAPM: Riskfree Rate + Beta (Risk Premium) APM: Riskfree Rate + Σ $Beta_j$ ($Risk\ Premium_j$): *n factors*		*Cost of Capital* WACC = k_e (E/ (D+E)) + k_d (D/(D+E)) k_d = Current Borrowing Rate (1-t) E,D: Mkt Val of Equity and Debt
& a growth pattern	**Stable Growth** g t	**Two-Stage Growth** g High Growth Stable	**Three-Stage Growth** g High Growth Transition Stable

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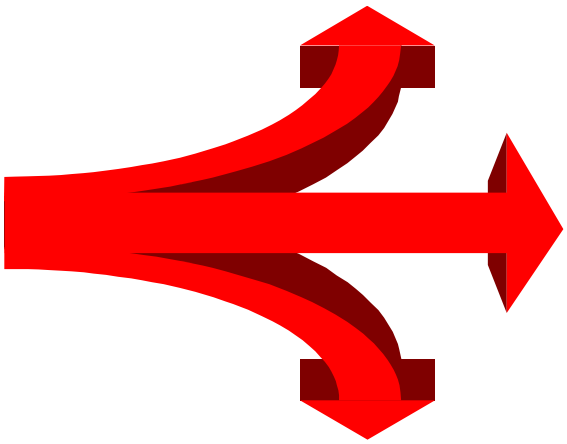
Estimating Future Cash Flows



- Dividends?
- Free cash flows to equity?
- Free cash flows to firm?

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Better Than Dividends: Free Cash Flows

Revenue
- Expenses
- Depreciation

= EBIT

Adjust for tax: EBIT(1-T)
- + Depreciation
- Capex
- Ch working capital

= Free Cash Flows to Firm

Revenue		81.20
-Expenses		(67.99)
-Depreciation		(4.95)
EBIT		8.26
EBIT(1-t)		5.90
+Depreciation		4.95
-CapEx		(4.31)
-Change in WC		(0.90)
FCFF		5.64

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Deriving IBM's Free Cash Flows

Data		4Q02ttm		
Sales, ttm		$ 81.20	billion	
Operating costs		$ 67.99	billion	84%
Depreciation		$ 4.95	billion	
EBIT		$ 8.26	billion	
Tax		$ 2.36	billion	29%
Cap Ex		$ 4.31	billion	
Change in WC		$ 0.90	billion	
Interest expense		$ 0.15	billion	
Free Cash Flows		$b		
Revenue		81.20		
-Expenses		(67.99)		
-Depreciation		(4.95)		
EBIT		8.26		
EBIT(1-t)		5.90		
+Depreciation		4.95		
-CapEx		(4.31)		
-Change in WC		(0.90)		
FCFF		5.64		
Interest		$ 0.15		
FCFE		$ 5.49		

IBMvaluation.xls

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Corporate Cash Flow Valuation: Summary

- Estimate the **discount rate** or rates to use in the valuation
  - Discount rate can be either a cost of equity (if doing equity valuation) or a cost of capital (if valuing the firm)
- 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 asset 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.

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Equity Valuation: Two Applications

Equity Valuation in Practice

- Estimating discount rate
- Estimating cash flows
- Estimating growth
- *Application with constant growth: Optika*
- *Application with shifting growth: Fong*

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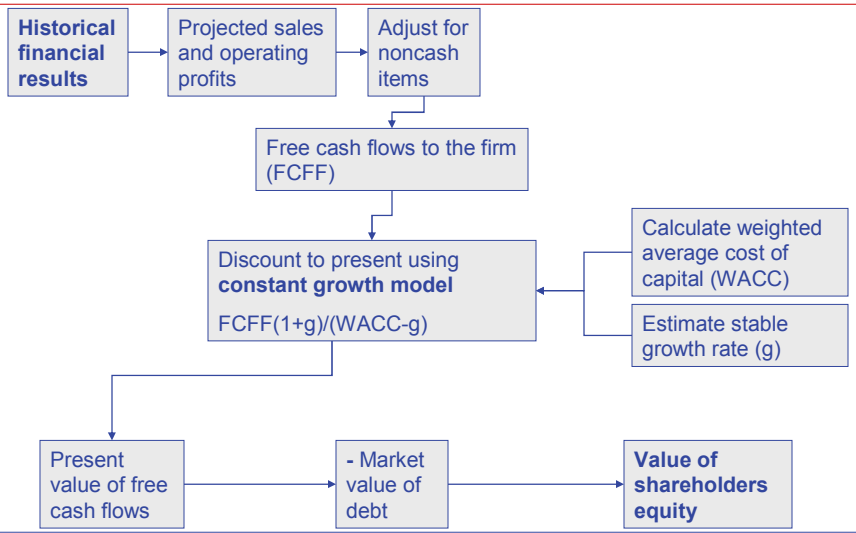
Valuing a Firm with DCF: The Short Version



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Optika: Facts

- The firm has revenues of €3.125b, growing at 5% per annum. Costs are estimated at 89%, and working capital at 10%, of sales. The depreciation expense next year is calculated to be €74m.
- Optika's marginal tax rate is 35%, and the interest on its €250m of debt is 8.5%.
- The market value of equity is €1.3b.
- *Is this firm fairly valued in the market? What assumptions might be changed?*

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Optika

Growth	5%
Tax rate	35%
Initial Revenues	3125
COGS	89%
WC	10%
Equity Market Value	1300
Debt Market Value	250
Beta	1
Treasury bond rate	7%
Debt Spread	1.50%
Market risk premium	5.50%
	T+1
Revenues next year	3281
-COGS	2920
-Depreciation	74
=EBIT	287
EBIT(1-Tax)	187
+Depreciation	74
-Capital Expenditures	-74
-Change in WC	-16
-Free Cash Flow to Firm	171
Cost of Equity (from CAPM)	12.50%
Cost of Debt (after tax)	5.53%
WACC	11.38%
Firm Value	**2681**
Equity Value	2431

optika.xls

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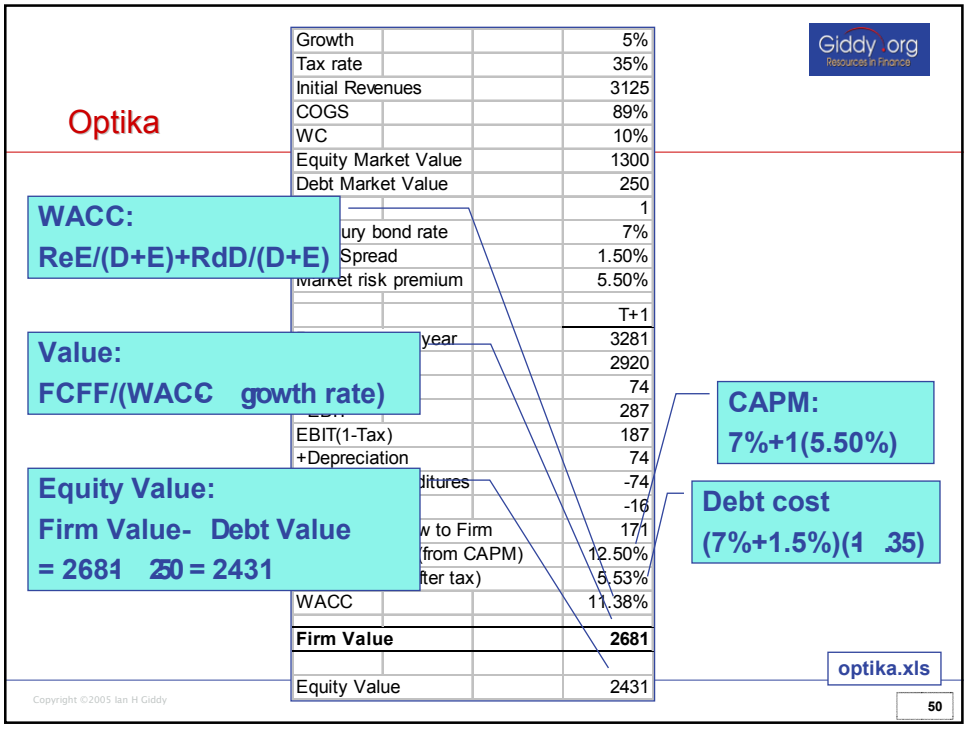
Optika
Growth 5%
Tax rate 35%
Initial Revenues 3125
COGS 89%
WC 10%
Equity Market Value 1300
Debt Market Value 250
1
ury bond rate 7%
Spread 1.50%
Market risk premium 5.50%
T+1
year 3281
2920
74
287
EBIT(1-Tax) 187
+Depreciation 74
ditures -74
-16
w to Firm 171
(from CAPM) 12.50%
fter tax) 5.53%
WACC 11.38%
Firm Value 2681
Equity Value 2431
WACC: ReE/(D+E)+RdD/(D+E)
Value: FCFF/(WACC growth rate)
Equity Value: Firm Value- Debt Value = 2681 250 = 2431
CAPM: 7%+1(5.50%)
Debt cost (7%+1.5%)(1 .35)
optika.xls
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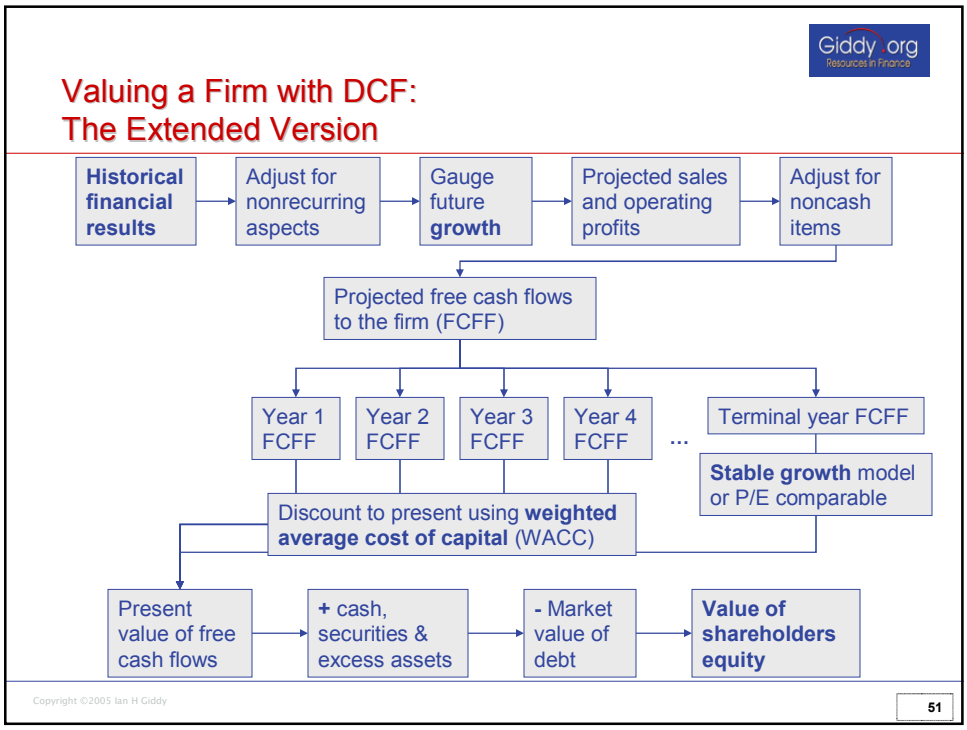
Valuing a Firm with DCF: The Extended Version
Historical financial results
Adjust for nonrecurring aspects
Gauge future growth
Projected sales and operating profits
Adjust for noncash items
Projected free cash flows to the firm (FCFF)
Year 1 FCFF
Year 2 FCFF
Year 3 FCFF
Year 4 FCFF
...
Terminal year FCFF
Stable growth model or P/E comparable
Discount to present using weighted average cost of capital (WACC)
Present value of free cash flows
+ cash, securities & excess assets
- Market value of debt
Value of shareholders equity
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Valuation Example: Shifting Growth

Fong Industries (Pte) Ltd Singapore

Profit & Loss (S$'000) *FYE 30 Jun*	1994		1995		1996		1997		1998		1999
Turnover	9,651		57,888		125,010		120,323		136,003		134,813
Directors' Fees & Rem	107		249		368		820		961		964
Amortisation	0		269		279		280		35		39
Depreciation	639		1,041		1,277		3,812		4,673		4,494
Interest Expense	227		445		615		1,002		1,078		697
Bad Debts W/O									100		
Fixed Assets W/O	4								543		27
FX loss							85		282		
Profit b/f Tax	933		1,990		838		1,250		3,774		6,897
Assoc Co							(74)		37		(14)
	933		1,990		838		1,176		3,811		6,883
Tax	3				96		292		929		178
Profit a/f Tax	930		1,990		742		884		2,882		6,705
Effective Tax Rate	0.32%		0.00%		11.46%		24.83%		24.38%		2.59%
EOI					7,292		(768)		(7)		(156)
EBITDA	**1,799**		**3,745**	108.17%	**3,009**	-19.65%	**6,270**	108.37%	**9,597**	####	**12,113**
ISC	**792.51%**		**841.57%**		**489.27%**		**625.75%**		**890.26%**		**1737.88%**

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Valuation Example: Shifting Growth

Fong Industries				
Growth1	25%	for 3 years		
Growth2	5%	thereafter		
Tax	25%	effective		
Revenue	134,813	(S$'000); T_0		
Expenses	91.01%	of Revenue		
EBIT	7,580	(S$'000)		
WC	10%	of Revenue		
β (unlevered)	1.06			
β (levered)	1.09			
K_d	5.50%			
MV_e	218,993	(S$'000)	PER_{Mkt}	32.66
MV_d	7,379	(S$'000)		
Combined	226,372	(S$'000)		
R_m	12.00%			
R_f	4.00%			
K_e	12.69%			
WACC	12.41%			

		T_1	T_2	T_3	T_4
Revenue		168,516	210,645	263,307	276,472
-Expenses		153,375	191,719	239,648	251,631
-Depreciation		4,533	4,533	4,533	4,533
EBIT		10,608	14,394	19,125	20,308
EBIT(1-t)		7,956	10,795	14,344	15,231
+Depreciation		4,533	4,533	4,533	4,533
-CapEx		4,533	4,533	4,533	4,533
-Change in WC		3,370	4,213	5,266	1,317
FCFF		**4,586**	**6,582**	**9,078**	13,915
				187,655	
		4,586	6,582	196,733	
Firm Value	**147,773**				
Equity Value	140,394	$0.65			
$PER_{computed}$	20.94				

fong.xls

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Case Study: IBM

Constant growth model valuation:								
FCFF		5.64						
WACC		9.77%						
Growth rate		5.70%						
Firm Value		146.51	billion					
less debt		-61.86	billion					
Equity value		84.65	billion	divided by	1.69	gives	$ 50.09	per share
2-stage growth model valuation								
Stage 1	10%							
Stage 2	5.70%							
End of year		2002	2003	2004	2005	2006	2007	2008
Revenue		81.20	89.32	98.25	108.08	118.88	130.77	138.23
-Expenses		-67.99	-74.79	-82.27	-90.49	-99.54	-109.50	-115.74
-Depreciation		-4.95	-5.45	-5.99	-6.59	-7.25	-7.97	-6.94
EBIT		8.26	9.09	9.99	10.99	12.09	13.30	15.55
EBIT(1-t)		5.90	6.49	7.14	7.85	8.64	9.50	11.10
+Depreciation		4.95	5.45	5.99	6.59	7.25	7.97	6.94
-CapEx		-4.31	-4.74	-5.22	-5.74	-6.31	-6.94	-6.94
-Change in WC		-0.90	-0.99	-1.09	-1.20	-1.32	-1.45	-1.53
FCFF		5.64	6.20	6.82	7.51	8.26	9.08	9.57
							235.25	
Total			6.20	6.82	7.51	8.26	244.34	
PV			5.65	5.66	5.68	5.69	153.32	
Total PV		176.00						
less debt		-61.86	billion					
Equity value		114.13	billion	divided by	1.69	gives	$ 67.53	per share

IBMvaluation.xls

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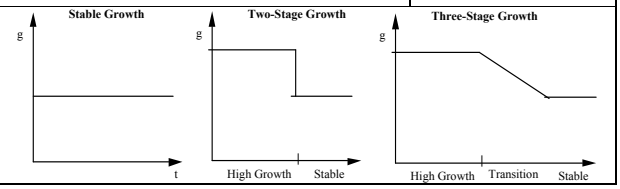
Summary: The Building Blocks of Valuation

Choose a			
Cash Flow	*Dividends* Expected Dividends to Stockholders	*Cashflows to Equity* Net Income - (1- δ) (Capital Exp. - Deprec'n) - (1- δ) Change in Work. Capital = Free Cash flow to Equity (FCFE) [δ = Debt Ratio]	*Cashflows to Firm* EBIT (1- tax rate) - (Capital Exp. - Deprec'n) - Change in Work. Capital = Free Cash flow to Firm (FCFF)
& A Discount Rate	*Cost of Equity* • *Basis*: The riskier the investment, the greater is the cost of equity. • *Models:* CAPM: Riskfree Rate + Beta (Risk Premium) APM: Riskfree Rate + Σ $Beta_j$ ($Risk\ Premium_j$): *n factors*		*Cost of Capital* WACC = k_e (E/ (D+E)) + k_d (D/(D+E)) k_d = Current Borrowing Rate (1-t) E, D: Mkt Val of Equity and Debt
& a growth pattern			

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Equity Valuation: Alternatives

What's a Company Worth? Alternative Models

- The options approach
  - Option to expand
  - Option to abandon
- Creation of key resources that another company would pay for
  - Patents or trademarks
  - Teams of employees
  - Customers
- *Examples?*

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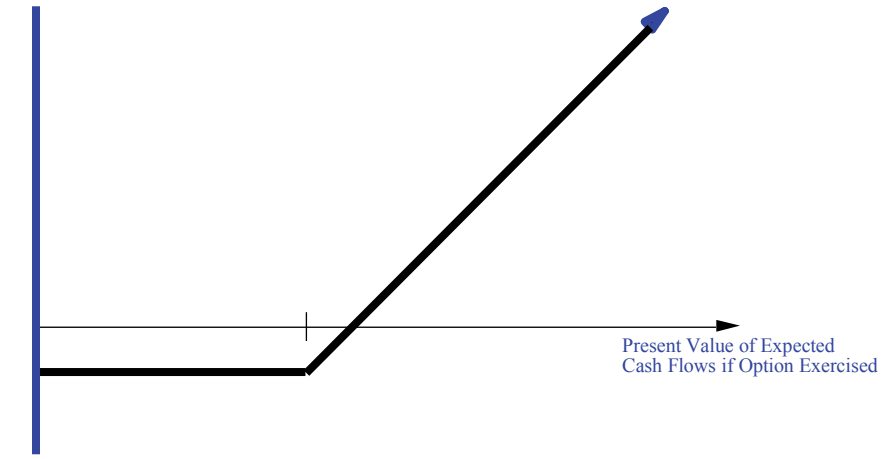
What's a Company Worth? The Options Approach



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The Value of a Corporate Option

- Having the exclusive rights to a product or project is valuable, even if the product or project is not viable today.
- The value of these rights increases with the volatility of the underlying business.
- The cost of acquiring these rights (by buying them or spending money on development - R&D, for instance) has to be weighed off against these benefits.

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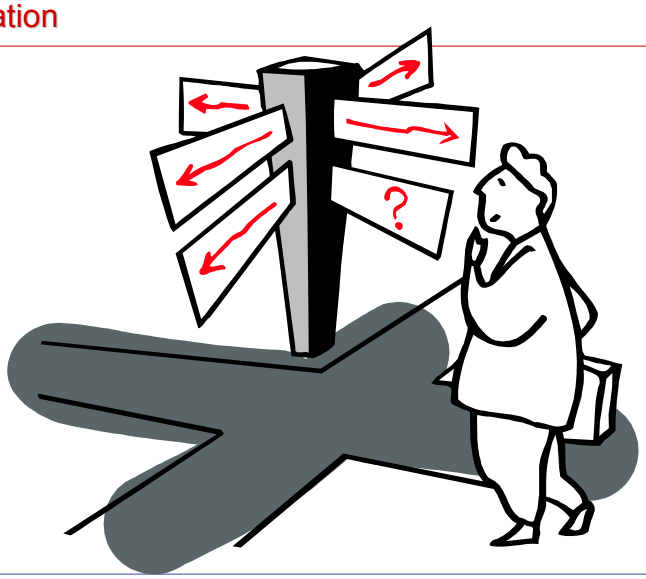
Application



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An Example of a Corporate Option

- J&J is considering investing $110 million to purchase an internet distribution company to serve the growing on-line market.
- A conventional NPV financial analysis of the cash flows from this investment suggests that the present value of the cash flows from this investment to J&J will be only $95 million. Thus, by itself, the corporate venture has a **negative NPV of $15 million**.
- If the on-line market turns out to be more lucrative than currently anticipated, J&J **could expand** its reach a global on-line market with **an additional investment of $125 million** any time over the next 2 years. While the current expectation is that the PV of cash flows from having a worldwide on-line distribution channel is only **$100 million** (still negative NPV), there is considerable uncertainty about both the potential for such an channel and the shape of the market itself, leading to significant variance in this estimate.
- ***This uncertainty is what makes the corporate venture valuable!***

Johnson&Johnson

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Valuing the Corporate Venture Option

- *The corporate option would cost an expected $15 million. But what is it worth to J&J?*
- Value of the underlying asset (S) = PV of cash flows from purchase of on-line selling venture, if done now =$100 Million
- Strike Price (K) = cost of expansion into global on-line selling = $125 Million
- We estimate the variance in the estimate of the project value by using the annualized volatility (standard deviation) in firm value of publicly traded on-line marketing firms in the global markets, which is approximately 50%.
  - Variance in Underlying Asset's Value = SD^2=.25
- Time to expiration = Period for which "venture option" applies = 2 years
- 2-year interest rate: 6.5%

Johnson&Johnson

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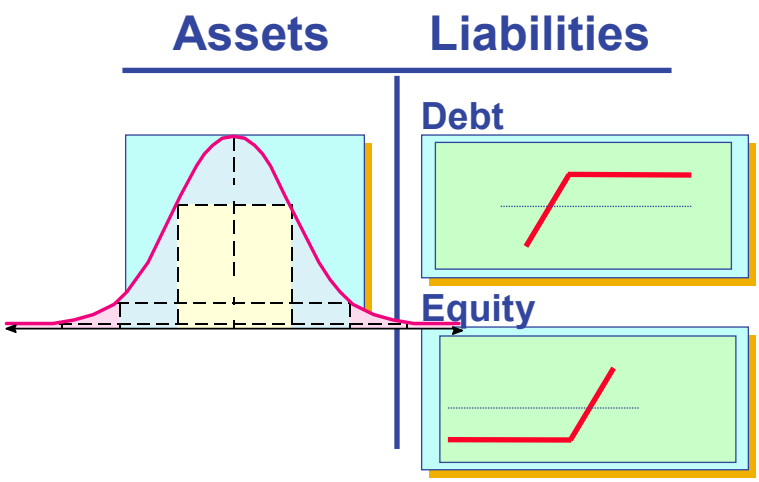
Extreme Situations: Equity as an Option



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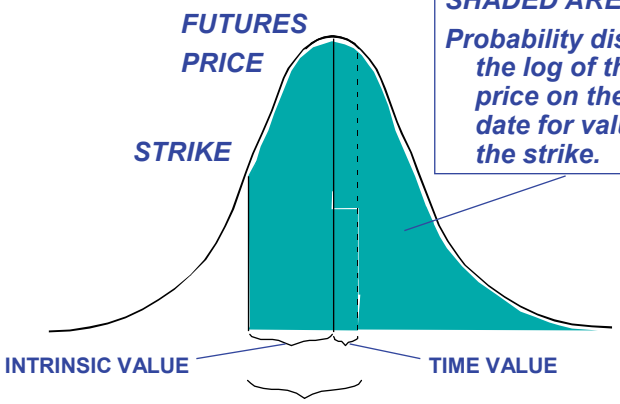
Value of Call Option



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Black-Scholes Option Valuation

Call value = $S_o N(d_1) - Xe^{-rT} N(d_2)$

$d_1 = [\ln(S_o/X) + (r + \sigma^2/2)T] / (\sigma T^{1/2})$

$d_2 = d_1 - (\sigma T^{1/2})$

where

S_o = Current stock price

X = Strike price, T = time, r = interest rate

N(d) = probability that a random draw from a normal distribution will be less than d.

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Valuing the Corporate Venture Option

- Value of the underlying asset (S) = PV of cash flows from purchase of on-line selling venture, if done now =$100 Million
- Strike Price (X) = cost of expansion into global on-line selling = $125 Million
- We estimate the variance in the estimate of the project value by using the annualized standard deviation in firm value of publicly traded on-line marketing firms in the global markets, which is approximately 50%.
  - Variance in Underlying Asset's Value = SD^2=0.25
- Time to expiration = Period for which "venture option" applies = 2 years
- 2-year interest rate: 6.5%

Call Value = 100 $N(d_1)$ -125 (exp(-0.065)(2)) $N(d_2)$
= $ 24.2 Million

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Conclusion?

- Johnson & Johnson should go ahead and invest in the venture - the value of the option ($24 million) exceeds the cost ($15 million).
- Can this approach be used to value
  - Technology companies?
  - Highly speculative ventures?
  - Bankrupt companies?

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Equity in Distress as an Option

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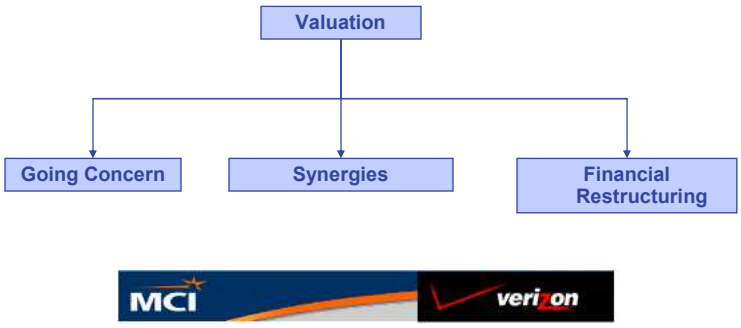
Next: Valuation and M&A



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