

Relative valuation

Relative valuation: Using market information about comparable assets to estimate values.

Market prices contain information:

- ▶ How much one is willing to pay for an asset
- ▶ Equals the value that trader puts on the asset.

Theoretical basis for relative valuation

The law of one price: In a competitive market, if two assets are equivalent, they have the same price.

If not, market participants and arbitrageurs will immediately pounce on this, buy the relatively cheaper asset and sell the relatively more expensive asset. Since they are equivalent, the difference will go straight into the pocket of the arbitrageur. Show an example of an arbitrage strategy.

Exercise

You are given the following prices P_t today for receiving risk free payments t periods from now.

t	=	1	2	3
P_t	=	0.95	0.9	0.95

There are traded securities that offer \$1 at any future date, available at these prices.

1. How would you make a lot of money?

This data implies an arbitrage opportunity.

The price of the risk free security offering \$1 in period 3 is higher than the price of the risk free security offering \$1 in period 2.

You have to pay less today for receiving money sooner!

	Period			
	0	1	2	3
Sell 3 period security	0.95			-1
Buy 2 period security	-0.90		1 →	
Net	0.05	-	-	-

Valuation using comparables

The law of one price leads to a simple way of doing valuation: Can we find assets which are comparable to those we want to value?

Example: Valuation of a house in Stavanger.

Ways to evaluate value:

1. Look at average of prices of “similar” houses transacted in last year.
2. Take price of the house when last it was transacted and adjust with an (time series) index for house prices (preferably in region).
3. Replacement value: How much would it cost to build a similar house today?

Exercise—Valuing residential real estate

Sarah Fluggel is considering the purchase of a home located at 2121 Tarter Circle in Frisco, Texas. The home has 3,000 square feet of heated and cooled living area, and the current owners are asking a price of \$375,000 for it.

You have collected the following information about other house sales in the area

	Comp # 1	Comp # 2
Sale Price	\$240,000	\$265,000
Square footage	2,240	2,145
Selling price/sq.ft.	\$107.14	\$123.54
Time on the market	61 days	32 days

Valuing residential real estate - Sarah Fluggel

- ▶ What is your initial estimate of the value of the home Sarah is considering?
- ▶ After making her initial estimate of the value of the home, Sarah decided to investigate whether the owner's asking price of \$375,000 might be justified based on unique attributes of the home. What types of details might you recommend Sarah look for trying to justify the price of the home?
- ▶ What if the house Sarah is considering had an asking price of \$315,000? What would you recommend Sarah do then?

Valuing residential real estate - Sarah Fluggel - Solution

The obvious way to estimate this is to multiply the square footage of the house Sarah is considering with an estimate of the typical price/square foot, which is the average of the two comparables, 115.34.

Multiplying this with the 3,000 square feet get an estimate of 346,020.

The asking price seems high relative to the comparables, don't buy

Valuing residential real estate - Sarah Fluggel - Solution

However, need to check that these houses *really* are comparable.

Obvious things to check

- ▶ Comparable upkeep/age of house
- ▶ Size/quality of garden/yard
- ▶ Neighborhood (noisy streets/neighbors)
- ▶ ...

Valuing residential real estate - Sarah Fluggel - Solution

What if the house Sarah is considering had an asking price of \$315,000?

This is lower than the value estimate of 346,020, buy

Pricing stocks using comparables

A simplistic valuation of stocks: *P/E multiple method*:

Stock Price = Earnings per Share (EPS) \times Industry average P/E multiple.

Illustrate how this method works:

Exercise

We want to find the stock price of a firm in the software industry. Currently, the P/E ratio for the industry is 24.

We are valuing a firm that projects earnings of 10 per share next year.

1. Estimate the value of one share.

Exercise Solution

Given a projected earning of say 10 NOK per share next year, we would predict that the price should be such that it matches the average P/E in the industry.

$$24 = \frac{P}{10}$$

$$P = 240$$

Theoretical justification of valuation using ratios

One can justify the use of the P/E method

Exercise

In valuation of companies one often uses the so called “P/E method” which says that the value can be found as an estimate of next year’s net earnings multiplied by a “P/E multiple”, ie

$$\text{Value}_t = E_t[X_{t+1}] \times \text{P/E multiple}$$

where X_{t+1} is the expected earnings of the firm. The “P/E multiple” is usually found by looking at industry averages.

1. How can such a procedure be reconciled with the standard stock valuation formula

$$P_t = \frac{E_t[D_{t+1}]}{r - g}?$$

2. Within this framework, is the application of industry standard “P/E factors” sensible?

Exercise

Well, first lets transform the per stock number to firm value by multiplying with the number of shares outstanding, lets call it n_t :

$$\text{Value}_t = n_t P_t = \frac{n_t E_t[D_{t+1}]}{r - g}$$

If the firm pays out all earnings as dividends, total dividend payout ($n \times D$) equals earnings (X).

$$n_t E_t[D_{t+1}] = E_t[X_{t+1}]$$

and we can write

$$\text{Value}_t = \frac{E[X_{t+1}]}{r - g}$$

rewrite as:

$$\text{Value}_t = E[X_{t+1}] \left(\frac{1}{r - g} \right)$$

If we let the “P/E multiple” equal $\left(\frac{1}{r-g} \right)$, the two formulas are consistent.

Exercise

Is it sensible to apply an industry standard “P/E multiple”?

Assuming that $\left(\frac{1}{r-g}\right)$ is constant across firms in the same industry...

Both r and g are company specific.

Are they likely to be similar across firms in the same industry?

If so this rough approximation may be ok.

ExxonMobil Chemical Division

ExxonMobil – energy company.

Accounts for 2004:

Net Income for ExxonMobil	25.3 billion
Earnings in	
Upstream	16.7 billion
Downstream	5.7 billion
Chemical Division	3.4 billion

Suppose ExxonMobil consider selling Chemical Division.

What would be a reasonable estimate for the price of the Chemical Division?

ExxonMobil Chemical Division

Since we have the earnings for the chemical division, can estimate the value using the *Price/Earnings* ratio of comparable companies.
Chemical Company Price/Earnings Ratios (August 16, 2005)

	Share Price	/	EPS	=	P/E Ratio
BASF AG (BF)	70.47		4.243		13.44
Bayer AG (BAY)	35.64		1.511		23.59
Dow Chemical (DOW)	47.40		4.401		10.77
E I DuPont (DD)	41.00		2.572		15.94
Eastman Chemical (EMN)	51.69		5.75		8,99
FMC (FMC)	59.52		5.729		10.39
Rohm & Hass (ROH)	45.02		2.678		16.81
			Average		14.28

Estimate value of chemical division as

$$14.28 * \text{Earnings} = 14.28 \times 3.4 \text{ bill} = 48.6 \text{ bill}$$

ExxonMobil Chemical Division

How comparable are the comparables?

Typical issue: Firm size.

	P/E Ratio	Market Cap (bill)
BASF AG (BF)	13.44	38.25
Bayer AG (BAY)	23.59	25.63
Dow Chemical (DOW)	10.77	45.25
E I DuPont (DD)	15.94	40.61
Eastman Chemical (EMN)	8.99	4.10
FMC (FMC)	10.39	2.20
Rohm & Hass (ROH)	16.81	10.01
Average all	14.28	
Average big 4	15.94	
Average small 3	12.06	

How about average of big 4?

estimate value of Chemical division as

$$15.94 \times 3.4 \text{ bill} = 54.2 \text{ bill}$$

ExxonMobil Chemical Division

Issue: Do comparables have comparable leverage?

	Debt/Value	Debt/Equity
Exxon	≈ 0	
BASF AG (BF)	17%	
Bayer AG (BAY)		2.43
Dow Chemical (DOW)	39%	
E I DuPont (DD)	14%	
Eastman Chemical (EMN)		
FMC (FMC)		
Rohm & Hass (ROH)		

Source: Annual reports

Bayer in particular has very high indebtedness.

Consider average of BASF, Dow and DuPont: P/E ratio 13.83.

Estimate value of Chemical division as

$$13.83 \times 3.4 \text{ bill} = 47.0 \text{ bill}$$

ExxonMobil Chemical Division

Another issue: Which earnings?

Market reflect *expectations* of future earnings.

Consider using *analysts forecasts* of earnings (*forward P/E ratio*)

	Share Price	Current EPS	Current/ Trailing P/E Ratio	Forecast EPS	Forward P/E Ratio
BASF AG	70.47	4.243	13.44	7.27	9.69
Bayer AG	35.64	1.511	23.59	2.69	13.27
Dow Chemical	47.40	4.401	10.77	5.71	8.30
E I DuPont	41.00	2.572	15.94	3.04	13.84
Eastman	51.69	5.75	8,99	5.93	8.71
FMC	59.52	5.729	10.39	5.66	10.51
Rohm & Hass	45.02	2.678	16.81	3.12	14.44
		Average	14.28		11.20

Estimate value of Chemical division as

$$11.20 \times 3.4 \text{ bill} = 38.1 \text{ bill}$$

ExxonMobil Chemical Division

Under different assumptions, different estimates of the value of the Chemical Division

Average all comparables: 48.6 bill

Average big four: 54.2 bill

Large companies with reasonably similar D/E: 47.0 bill

Forward P/E: 38.1 bill

Which to choose?

ExxonMobil Chemical Division

Tackle the problem that the comparables have different D/E ratios.
(The comparable companies really are not that comparable)

Case for: instead working with a ratio involving the company value.

Pull, for comparable companies, 2004 values of

- ▶ stock prices
- ▶ long term debt
- ▶ earnings.

ExxonMobil Chemical Division

	Debt/ Value	Share Price	Number Shares	Long term debt	Earnings	Company value	Value/ Earnings
EXXON	≈ zero		6401				
BASF	17.00%	72	541	6391	4856	45360	9.3
Bayer	70.85%	23.3	730	13646	4130	30684	7.4
Dow Chem	39.00%	47.4	940	11629	2797	56189	20.1
E I DuPont	14.00%	41.1	998	5548	2053	46466	22.6
Eastman Chem		51.7					
FMC		59.5					
Rohm & Hass		45.0					
						Average	14.87

Note that the numbers for BASF and Bayer are in €

ExxonMobil Chemical Division

Average Value/Earnings: 14.87.

With that number, since Exxon essentially has no debt, will estimate the value of Exxon's chemical division as

$$14.87 \times 3.4 \text{ bill} = 50.6 \text{ bill}$$

Company Valuation by multiples

1. To value assets relatively, must be standardized (multiples of earnings/book values/sales)
2. Find similar firms

Use of relative valuation – widespread

Why so popular?

1. Can be done quickly, with few assumptions
2. simple to understand and present
3. more likely reflect current mood in the market

Company Valuation by multiples

Potential pitfalls

1. Simplicity lets one apply the method inconsistently, ignoring important differences between ratios/firms
2. Reflecting the market mood not necessarily correct (irrational exuberance)

Sequence of application

Often used term: “Market approach” to distinguish from Discounted Cash Flow valuation

Three part process

1. Search and select
2. Adjust and compute
3. Apply and conclude

Search and select - companies

Selection of group of comparable companies:

Matching by business attributes, e.g.

- ▶ industry SIC/GICS code
- ▶ size
- ▶ geographical location

Search and select - multiples

Selection of multiples to calculate
Relevance for particular company?

Standard:

- ▶ Value/Revenue
- ▶ Value/EBIT
- ▶ Value/EBITDA

Industry specialities

- ▶ Value/Building size
- ▶ Value/Subscriber base

Examples of market multiples

Enterprise value divided by

- ▶ EBIT
- ▶ EBITDA
- ▶ Sales
- ▶ Gross profit
- ▶ Total assets
- ▶ Net fixed assets

Examples of market multiples ctd

Market Capitalization divided by

- ▶ Net Income
- ▶ Dividends
- ▶ Net Cash Flow
- ▶ Earnings before taxes
- ▶ Assets less liabilities

Examples of market multiples ctd

Stock Price divided by

- ▶ Earnings per share
- ▶ Dividends per share
- ▶ Cash flow per share
- ▶ Book value per share

Examples of market multiples ctd

Industry-specific multiples

- ▶ Cable TV: MVIC/subscribers
- ▶ Retailers: MVIC/square foot
- ▶ HMOs: MVIC/covered members
- ▶ Bottlers: MVIC/case
- ▶ Technology: MVIC/patents
- ▶ Technology: MVIC/scientists

Consider

Equity value or enterprise value?

Need for consistency

If enterprise value, numbers for firm.

If equity: Stock prices – market cap, Income figures after interest, after tax

How large a sample? The larger the better (statistical power)

Adjust and compute

- ▶ Estimate enterprise value:
Market values of debt and equity and other hybrid securities may need to settle for book values of debt
Calculate values of hybrid securities, convertible debt, warrants, etc, may need to use option pricing methods to set value.
- ▶ Operating metrics (EBIT, EBITDA, etc) for comparable companies
May need to adjust to obtain comparable metrics
 - ▶ LIFO/FIFO accounting
 - ▶ nonrecurring items
 - ▶ nonoperating items

Common adjustments

- ▶ Inventory accounting (e.g. LIFO vs FIFO)
- ▶ Extraordinary items (e.g. litigation settlements)
- ▶ Non-recurring items (e.g. discontinued operations, asset sales)
- ▶ Owner's compensation
- ▶ Capitalization of intangibles (from prior acquisitions)
- ▶ non-operating assets
- ▶ construction in progress
- ▶ NOL carryforwards
- ▶ Special tax items
- ▶ Treatment of leases (operating vs. capital)

Source: HBS note on Corporate Valuation and Market Multiples.

Apply and conclude

- ▶ Ensure consistency of basis in subject company.
- ▶ Calculate.

Evaluate:

- ▶ Applicability
- ▶ Liquidity differences.

Practical issues

- ▶ Sample size – small samples – lower confidence
- ▶ Seasonality?
- ▶ Leverage.
Safest to calculate enterprise value and then subtract value of debt to estimate equity values.
Problem: Equity multiples sensitive to leverage. Need to “unlever” ratios to make them comparable across companies, similar to unlevering of beta.
- ▶ Unreliable market data?
- ▶ Regression/Factor analysis.
May be better to use several ratios, estimate relationship between value and the different ratios by regressions/factor analysis.
However, only as good as the data

Value the equity of a non-listed company with earnings \$2.3 mill, using the following set of comparable companies.

	Earnings per share	Stock price	PE
Firm A	\$1.00	\$10	10.0
Firm B	\$1.50	\$14	9.3
Firm C	\$1.25	\$13	10.4

Average PE ratio = 9.91

Value of equity

= 2.3 mill \times industry avg PE ratio

= 9.91 \times 2.3 = \$22.8 mill

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Firm A	\$1.00	\$10	10.0
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Firm C	\$1.25	\$13	10.4

Average PE ratio = 9.91

Value of equity

= 2.3 mill \times industry avg PE ratio

= 9.91 \times 2.3 = \$22.8 mill

You want to value company C, and find two comparable firms A and B.

Firm	Debt	Equity	Sales	Earnings	PS	PE
A	600	600	200	51	3	11.76
B	0	1200	200	100	6	12.00
Average					4.5	11.88
C	300	300	100	25	3	12.0

1. Value C using PS
2. Value C using PE

- ▶ Average PS multiple: $4.5 \times 100 = 450$
- ▶ Average PE ratio: $11.88 \times 25 = 297$