



Revenue Multiples

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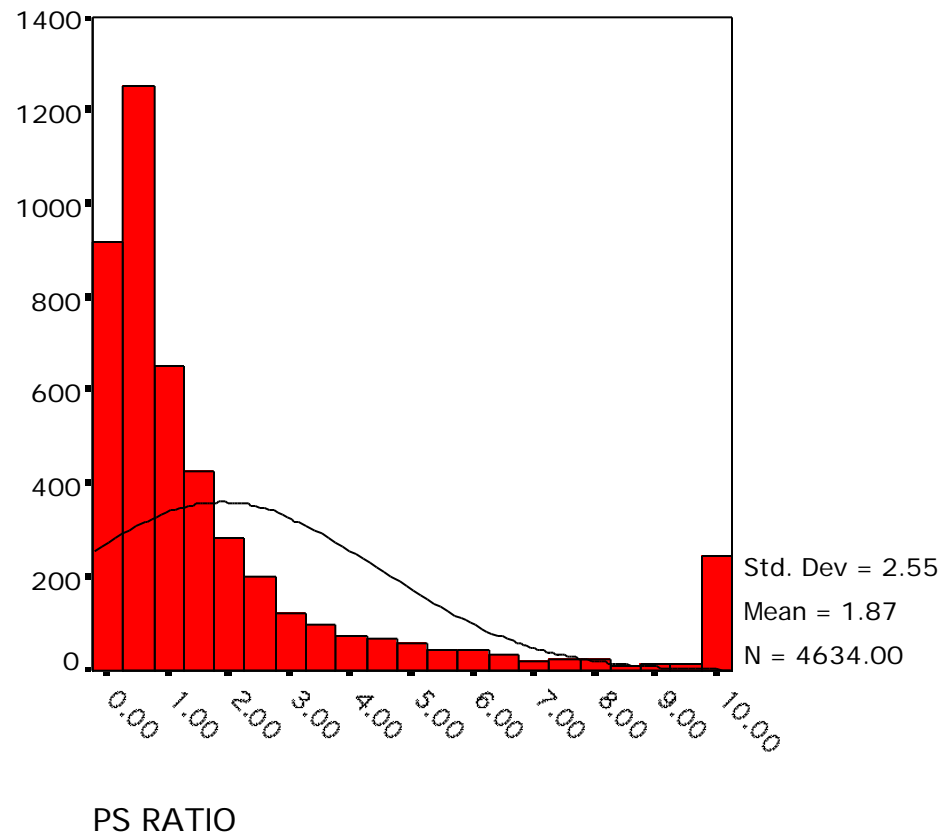
Price Sales Ratio: Definition

- The price/sales ratio is the ratio of the market value of equity to the sales.
- Price/ Sales= $\frac{\text{Market Value of Equity}}{\text{Total Revenues}}$
- Consistency Tests
 - The price/sales ratio is internally inconsistent, since the market value of equity is divided by the total revenues of the firm.

PS Ratios: The Inconsistency Test

- Assume that you are comparing price/sales ratios across firms in a sector, and that there are differences in financial leverage across firms. What type of firms will emerge with the lowest price/sales ratios?
 - Low Leverage Firms
 - Average Leverage Firms
 - High Leverage Firms

Price/Sales Ratio: Cross Sectional Distribution



Price/Sales Ratio: Determinants

- The price/sales ratio of a stable growth firm can be estimated beginning with a 2-stage equity valuation model:

$$P_0 = \frac{DPS_1}{r - g_n}$$

- Dividing both sides by the sales per share:

$$\frac{P_0}{Sales_0} = PS = \frac{\text{Net Profit Margin} * \text{Payout Ratio} * (1 + g_n)}{r - g_n}$$

Price/Sales Ratio for High Growth Firm

- When the growth rate is assumed to be high for a future period, the dividend discount model can be written as follows:

$$P_0 = \frac{\text{EPS}_0 * \text{Payout Ratio} * (1 + g) * \left(1 - \frac{(1 + g)^n}{(1 + r)^n}\right)}{r - g} + \frac{\text{EPS}_0 * \text{Payout Ratio}_n * (1 + g)^n * (1 + g)}{(r - g_n)(1 + r)^n}$$

- Dividing both sides by the sales per share:

$$\frac{P_0}{\text{Sales}_0} = \frac{\text{Net Margin} * \text{Payout Ratio} * (1 + g) * \left(1 - \frac{(1 + g)^n}{(1 + r)^n}\right)}{r - g} + \frac{\text{Net Margin}_n * \text{Payout Ratio}_n * (1 + g)^n * (1 + g_n)}{(r - g_n)(1 + r)^n}$$

where $\text{Net Margin}_n = \text{Net Margin}$ in stable growth phase

Price Sales Ratios and Profit Margins

- The key determinant of price-sales ratios is the profit margin.
- A decline in profit margins has a two-fold effect.
 - First, the reduction in profit margins reduces the price-sales ratio directly.
 - Second, the lower profit margin can lead to lower growth and hence lower price-sales ratios.

$$\begin{aligned}\text{Expected growth rate} &= \text{Retention ratio} * \text{Return on Equity} \\ &= \text{Retention Ratio} * (\text{Net Profit} / \text{Sales}) * (\text{Sales} / \text{BV of Equity}) \\ &= \text{Retention Ratio} * \text{Profit Margin} * \text{Sales/BV of Equity}\end{aligned}$$

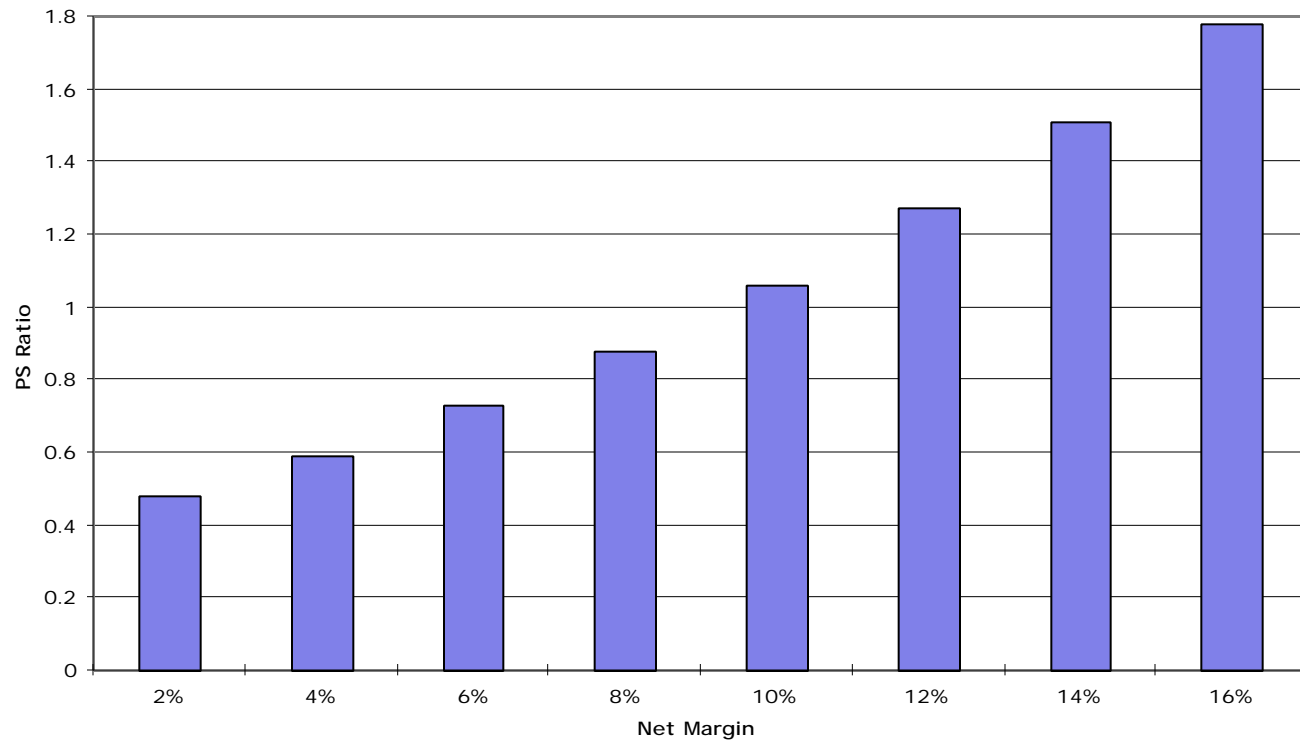
Price/Sales Ratio: An Example

	High Growth Phase	Stable Growth
Length of Period	5 years	Forever after year 5
Net Margin	10%	6%
Sales/BV of Equity	2.5	2.5
Beta	1.25	1.00
Payout Ratio	20%	60%
Expected Growth	$(.1)(2.5)(.8)=20\%$	$(.06)(2.5)(.4)=.06$
Riskless Rate =6%		

$$PS = \frac{0.10 * 0.2 * (1.20) * \left(1 - \frac{(1.20)^5}{(1.12875)^5}\right)}{(.12875 - .20)} + \frac{0.06 * 0.60 * (1.20)^5 * (1.06)}{(.115 - .06) (1.12875)^5} = 1.06$$

Effect of Margin Changes

Price/Sales Ratios and Net Margins



PS/Margins: Greek Retailers

<i>Company</i>	<i>PS</i>	<i>Net Margin</i>
SPAKIANAKIS SA	0.25	2.88%
KOTSOVOLOS SA	0.48	1.91%
SANYO HELLAS	1.12	5.07%
IMAGE-SOV2VD SA	1.31	2.86%
GERMANOS	1.49	6.94%
ELEKTRONIKI	1.61	6.29%
JUMBO	1.68	6.08%
PHILIPPOS NAKAS	1.71	5.04%
GOODY'S	2.24	6.77%
HELLENIC DUTY	5.60	19.49%
AS COMPANY	7.02	8.23%
FOLLI-FOLLIE	10.82	29.08%

Regression Results: PS Ratios and Margins

- Regressing PS ratios against net margins,
$$PS = -.10 + 36.29 (\text{Net Margin}) \quad R^2 = 78\%$$
- Thus, a 1% increase in the margin results in an increase of 0.36 in the price sales ratios.
- The regression also allows us to get predicted PS ratios for these firms

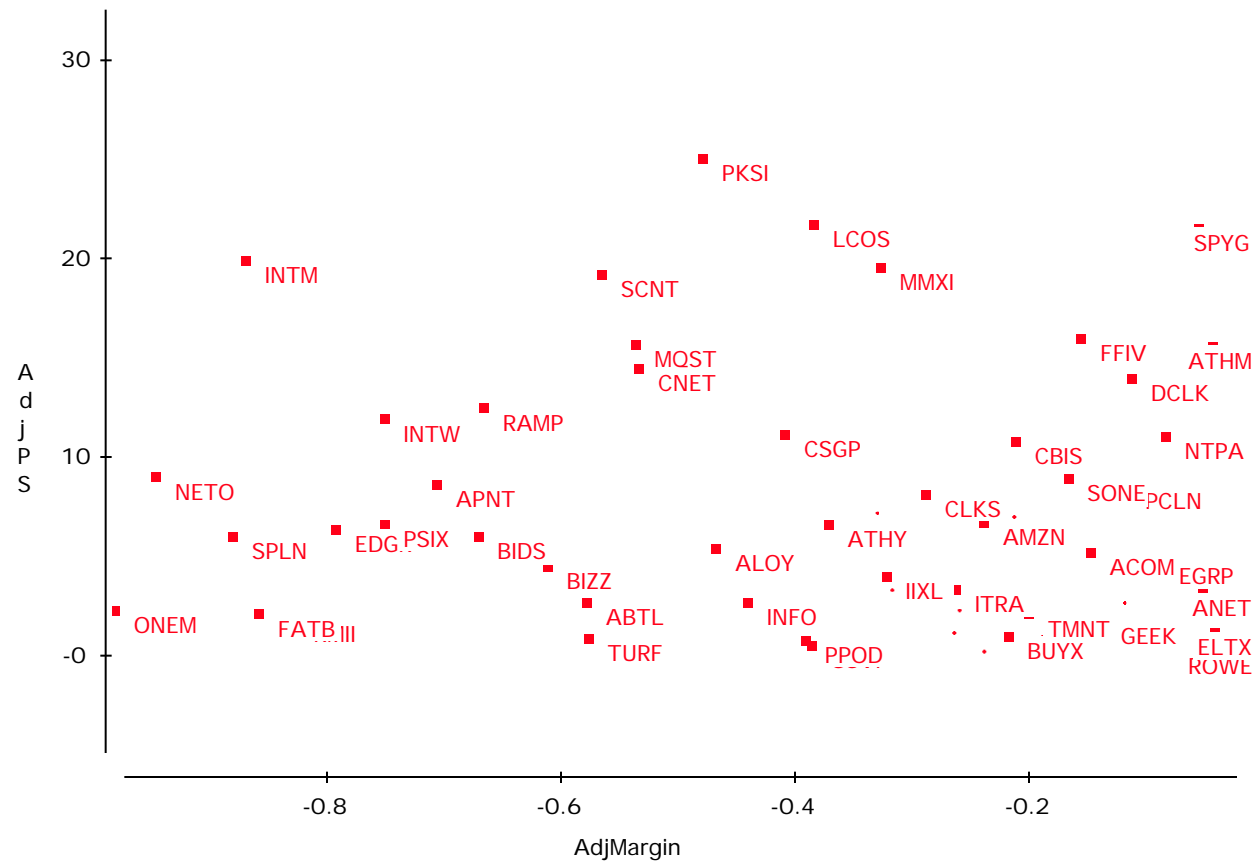
Predicted PS Ratios

<i>Symbol</i>	<i>Company</i>	<i>PS</i>	<i>Predicted PS</i>	<i>Under or Over</i>
SFA	SPAKIANAKIS	0.25	0.94	-73.28%
KOTSV	KOTSOVOLOS	0.48	0.59	-18.47%
SANYO	SANYO HELLA	1.12	1.74	-35.37%
IKONA	IMAGE-SOV2V	1.31	0.94	39.82%
GERM	GERMANOS	1.49	2.42	-38.41%
ELATH	ELEKTRONIKI	1.61	2.18	-26.47%
BABY	JUMBO	1.68	2.11	-20.39%
NAKAS	PHXLXPPOS N/	1.71	1.73	-1.38%
GOODY	GOODY'S	2.24	2.36	-5.01%
HDF	HELLENIC DUT	5.60	6.97	-19.72%
ASCO	AS COMPANY	7.02	2.89	143.07%
FOLLI	FOLLX-FOLLXE	10.82	10.45	3.51%

Current versus Predicted Margins

- One of the limitations of the analysis we did in these last few pages is the focus on current margins. Stocks are priced based upon expected margins rather than current margins.
- For most firms, current margins and predicted margins are highly correlated, making the analysis still relevant.
- For firms where current margins have little or no correlation with expected margins, regressions of price to sales ratios against current margins (or price to book against current return on equity) will not provide much explanatory power.
- In these cases, it makes more sense to run the regression using either predicted margins or some proxy for predicted margins.

A Case Study: The Internet Stocks



PS Ratios and Margins are not highly correlated

- Regressing PS ratios against current margins yields the following
$$\text{PS} = 81.36 - 7.54(\text{Net Margin}) \quad R^2 = 0.04$$

(0.49)
- This is not surprising. These firms are priced based upon expected margins, rather than current margins.

Solution 1: Use proxies for survival and growth: Amazon in early 2000

- Hypothesizing that firms with higher revenue growth and higher cash balances should have a greater chance of surviving and becoming profitable, we ran the following regression: (The level of revenues was used to control for size)

$$PS = 30.61 - 2.77 \ln(\text{Rev}) + 6.42 (\text{Rev Growth}) + 5.11 (\text{Cash/Rev})$$

(0.66) (2.63) (3.49)

R squared = 31.8%

$$\text{Predicted PS} = 30.61 - 2.77(7.1039) + 6.42(1.9946) + 5.11 (.3069) = 30.42$$

Actual PS = 25.63

Stock is undervalued, relative to other internet stocks.

Solution 2: Use forward multiples

- You can always estimate price (or value) as a multiple of revenues, earnings or book value in a future year. These multiples are called forward multiples.
- For young and evolving firms, the values of fundamentals in future years may provide a much better picture of the true value potential of the firm. There are two ways in which you can use forward multiples:
 - Look at value today as a multiple of revenues or earnings in the future (say 5 years from now) for all firms in the comparable firm list. Use the average of this multiple in conjunction with your firm's earnings or revenues to estimate the value of your firm today.
 - Estimate value as a multiple of current revenues or earnings for more mature firms in the group and apply this multiple to the forward earnings or revenues to the forward earnings for your firm. This will yield the expected value for your firm in the forward year and will have to be discounted back to the present to get current value.

An Example of Forward Multiples: Amazon in early 2000

- Amazon.com lost \$0.63 per share in 2000 but is expected to earn \$ 1.50 per share in 2005. At its current price of \$ 49 per share, this would translate into a price/future earnings per share of 32.67.
- In the first approach, this multiple of earnings can be compared to the price/future earnings ratios of comparable firms. If you define comparable firms to be e-tailers, Amazon looks reasonably attractive since the average price/future earnings per share of e-tailers is 65. If, on the other hand, you compared Amazon's price to future earnings per share to the average price to future earnings per share (in 2004) of specialty retailers, the picture is bleaker. The average price to future earnings for these firms is 12, which would lead to a conclusion that Amazon is over valued.
- In the second approach, the current price to earnings ratio for specialty retailers, which is estimated to be 20.31 to the earnings per share of Amazon in 2004 (which is estimated to be \$1.50). This would yield a target price of \$30.46. Discounting this price back to the present using Amazon's cost of equity of 12.94% results in a value per share:

$$\begin{aligned}\text{Value per share} &= \text{Target price in five years} / (1 + \text{Cost of equity})^5 \\ &= \$30.46 / 1.1294^5 = \$16.58.\end{aligned}$$

PS Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.851 ^a	.723	.723	88.1869

a. Predictors: (Constant), Beta, MARGIN, PAYOUT, Expected Growth in EPS: next 5 y

Coefficients ^{a,b,c}

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Expected Growth in EPS: next 5 y	4.392E-02	.005	.199	9.210	.000
	PAYOUT	.807	.115	.087	7.007	.000
	MARGIN	23.747	.466	.876	50.955	.000
	Beta	-.607	.085	-.187	-7.110	.000

- a. Dependent Variable: PS RATIO
- b. Linear Regression through the Origin
- c. Weighted Least Squares Regression - Weighted by Market Cap

Cross Sectional Regression for Portugal in June 1999

- Using data on 74 Portuguese companies from 1999, we regressed PS ratios against profit margins:

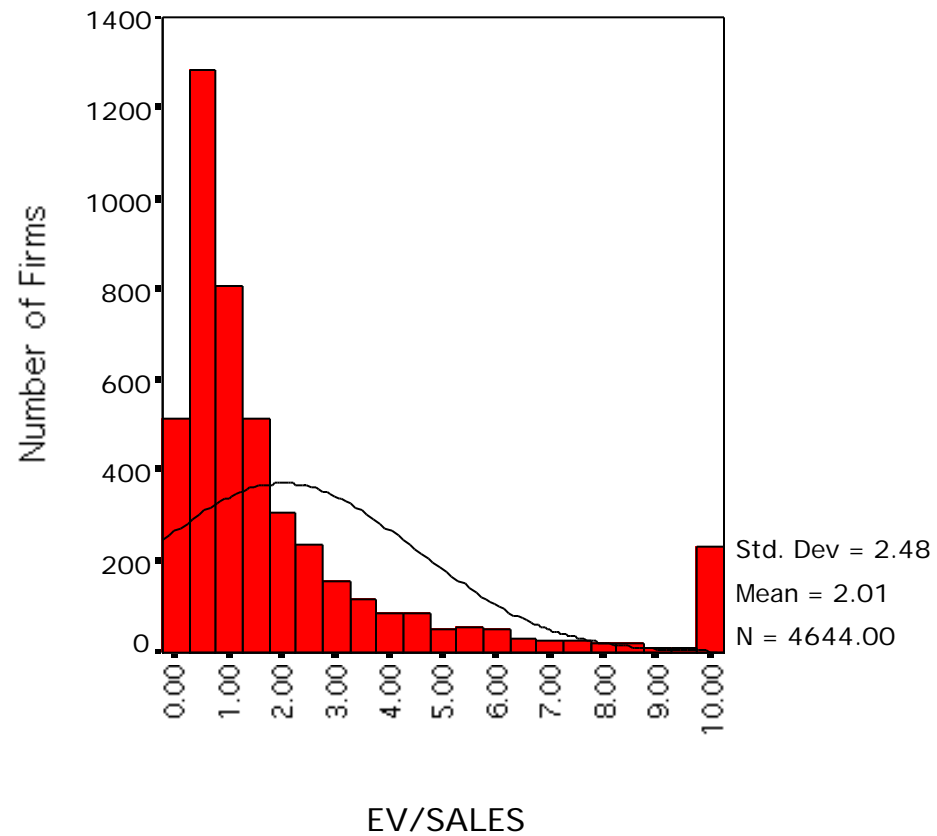
$$\text{PS} = 0.98 + 6.96 \text{ Margin}$$

(4.34) (3.07) $R^2 = 45.29\%$

Value/Sales Ratio: Definition

- The value/sales ratio is the ratio of the market value of the firm to the sales.
- Value/ Sales = $\frac{\text{Market Value of Equity} + \text{Market Value of Debt-Cash}}{\text{Total Revenues}}$

Value/Sales Ratio: Cross Sectional Distribution



Value/Sales Ratios: Analysis of Determinants

- If pre-tax operating margins are used, the appropriate value estimate is that of the firm. In particular, if one makes the assumption that
 - Free Cash Flow to the Firm = EBIT (1 - tax rate) (1 - Reinvestment Rate)
- Then the Value of the Firm can be written as a function of the after-tax operating margin = (EBIT (1-t)/Sales

$$\frac{\text{Value}}{\text{Sales}_0} = \text{After - tax Oper. Margin} * \frac{(1 - \text{RIR}_{\text{growth}})(1 + g)^n * 1 - \frac{(1 + g)^n}{(1 + \text{WACC})^n}}{\text{WACC} - g} + \frac{(1 - \text{RIR}_{\text{stable}})(1 + g)^n * (1 + g_n)}{(\text{WACC} - g_n)(1 + \text{WACC})^n}$$

g = Growth rate in after-tax operating income for the first n years

g_n = Growth rate in after-tax operating income after n years forever (Stable growth rate)

$\text{RIR}_{\text{Growth, Stable}}$ = Reinvestment rate in high growth and stable periods

WACC = Weighted average cost of capital

Value/Sales Ratio: An Example

- Consider, for example, the Value/Sales ratio of Coca Cola. The company had the following characteristics:

After-tax Operating Margin = 18.56% Sales/BV of Capital = 1.67

Return on Capital = 1.67 * 18.56% = 31.02%

Reinvestment Rate = 65.00% in high growth; 20% in stable growth;

Expected Growth = 31.02% * 0.65 = 20.16% (Stable Growth Rate = 6%)

Length of High Growth Period = 10 years

Cost of Equity = 12.33%

E/(D+E) = 97.65%

After-tax Cost of Debt = 4.16%

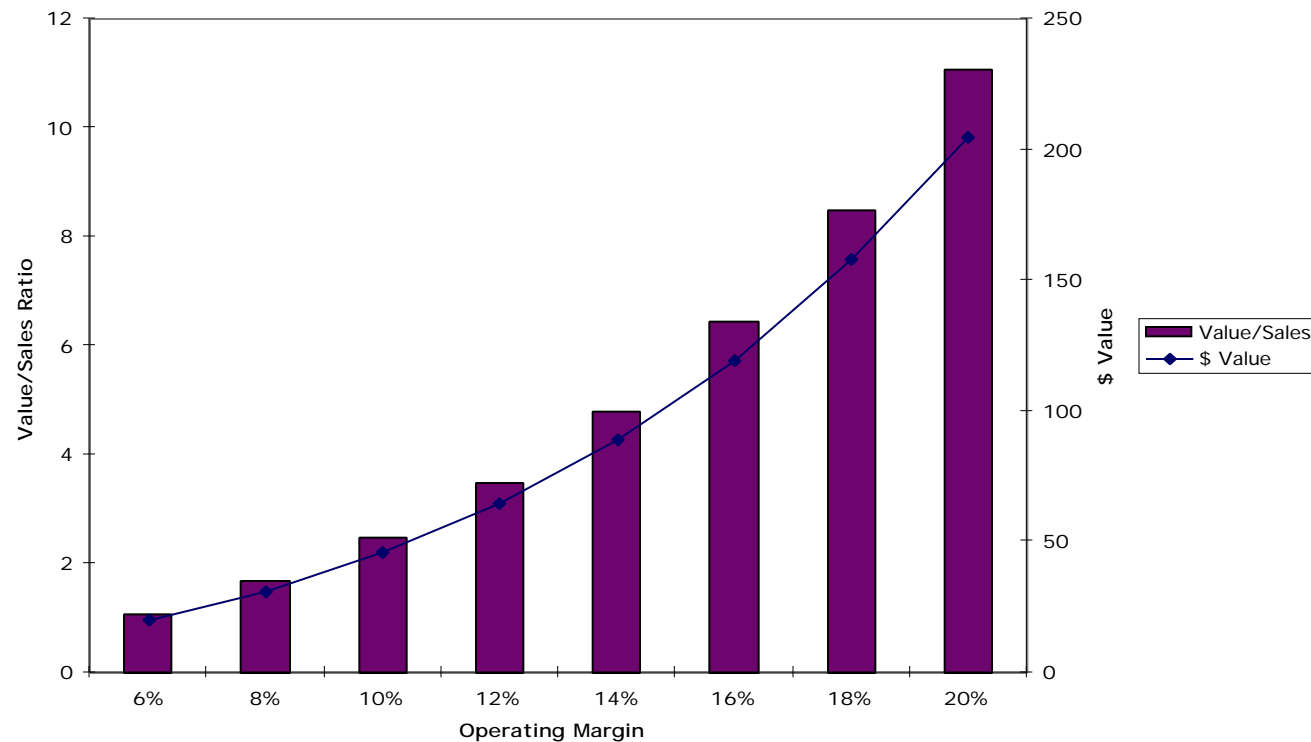
D/(D+E) = 2.35%

Cost of Capital = 12.33% (.9765) + 4.16% (.0235) = 12.13%

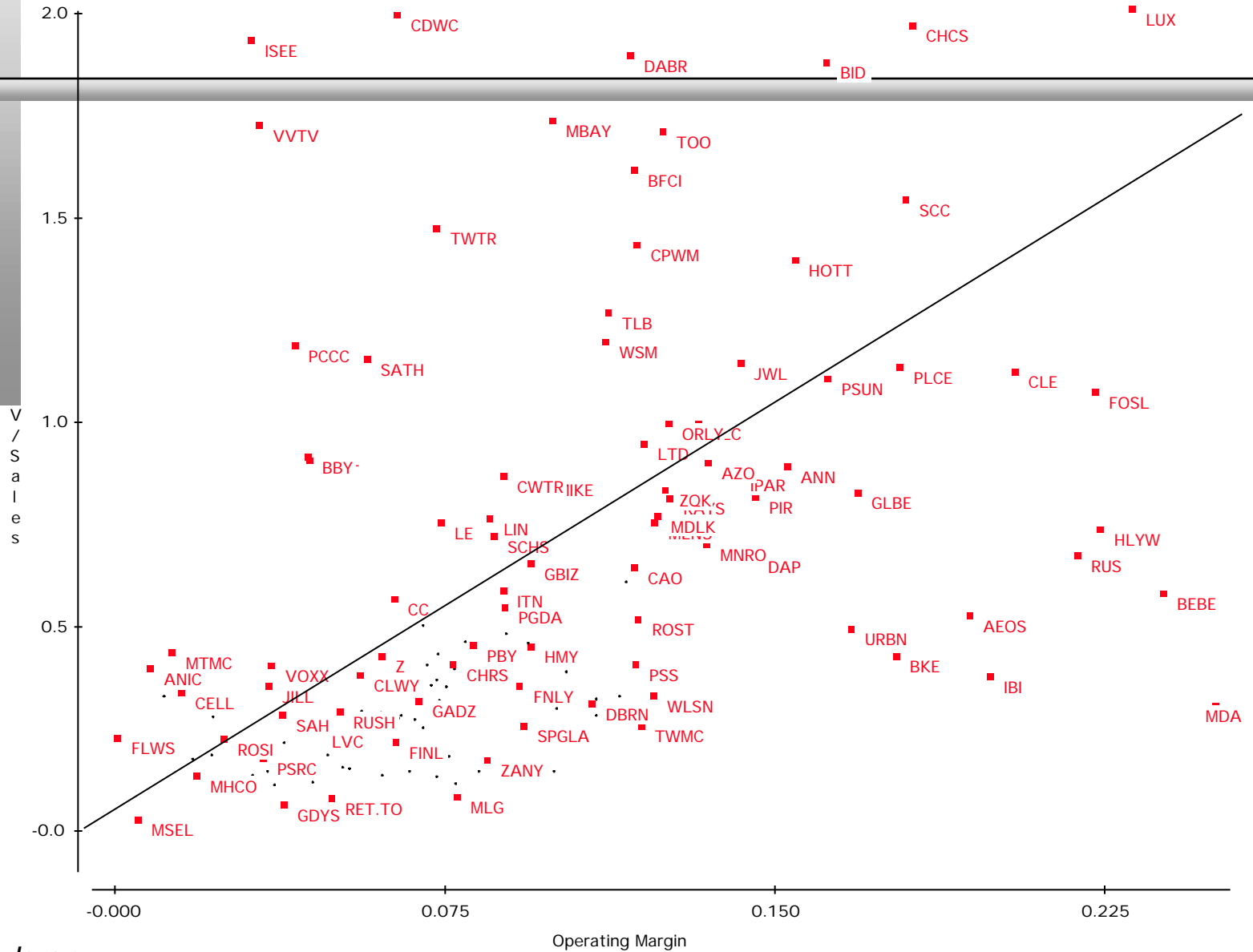
$$\frac{\text{Value of Firm}_0}{\text{Sales}_0} = .1856 * \frac{(1-.65)(1.2016)^* \left[1 - \frac{(1.2016)^{10}}{(1.1213)^{10}} \right]}{.1213 - .2016} + \frac{(1-.20)(1.2016)^{10} * (1.06)}{(.1213 - .06)(1.1213)^{10}} = 6.10$$

Value Sales Ratios and Operating Margins

Coca Cola: The Operating Margin Effect



U.S. Specialty Retailers: V/S vs Operating Margin



Brand Name Premiums in Valuation

- You have been hired to value Coca Cola for an analyst reports and you have valued the firm at 6.10 times revenues, using the model described in the last few pages. Another analyst is arguing that there should be a premium added on to reflect the value of the brand name. Do you agree?
 - Yes
 - No
 - Explain.

The value of a brand name

- One of the critiques of traditional valuation is that it fails to consider the value of brand names and other intangibles.
- The approaches used by analysts to value brand names are often ad-hoc and may significantly overstate or understate their value.
- One of the benefits of having a well-known and respected brand name is that firms can charge higher prices for the same products, leading to higher profit margins and hence to higher price-sales ratios and firm value. The larger the price premium that a firm can charge, the greater is the value of the brand name.
- In general, the value of a brand name can be written as:
Value of brand name = $\{(V/S)_b - (V/S)_g\} * \text{Sales}$
 $(V/S)_b$ = Value of Firm/Sales ratio with the benefit of the brand name
 $(V/S)_g$ = Value of Firm/Sales ratio of the firm with the generic product

Illustration: Valuing a brand name: Coca Cola

	Coca Cola	Generic Cola Company
AT Operating Margin	18.56%	7.50%
Sales/BV of Capital	1.67	1.67
ROC	31.02%	12.53%
Reinvestment Rate	65.00% (19.35%)	65.00% (47.90%)
Expected Growth	20.16%	8.15%
Length	10 years	10 yea
Cost of Equity	12.33%	12.33%
E/(D+E)	97.65%	97.65%
AT Cost of Debt	4.16%	4.16%
D/(D+E)	2.35%	2.35%
Cost of Capital	12.13%	12.13%
Value/Sales Ratio	6.10	0.69

Value of Coca Cola's Brand Name

- Value of Coke's Brand Name = $(6.10 - 0.69) (\$18,868 \text{ million}) = \102 billion
- Value of Coke as a company = $6.10 (\$18,868) \text{ million} = \$ 115 \text{ Billion}$
- Approximately 88.69% of the value of the company can be traced to brand name value

Value/Sales Ratio Regression: Market

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.615 ^a	.379	.378	110.8277

a. Predictors: (Constant), Expected Growth in EPS: next 5 y, OPMGN

Coefficients^{a,b}

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.107	.090		1.196	.232
	OPMGN	11.854	.340	.583	34.903	.000
	Expected Growth in EPS: next 5 y	6.041E-02	.004	.238	14.274	.000

a. Dependent Variable: EV/SALES

b. Weighted Least Squares Regression - Weighted by Market Cap