

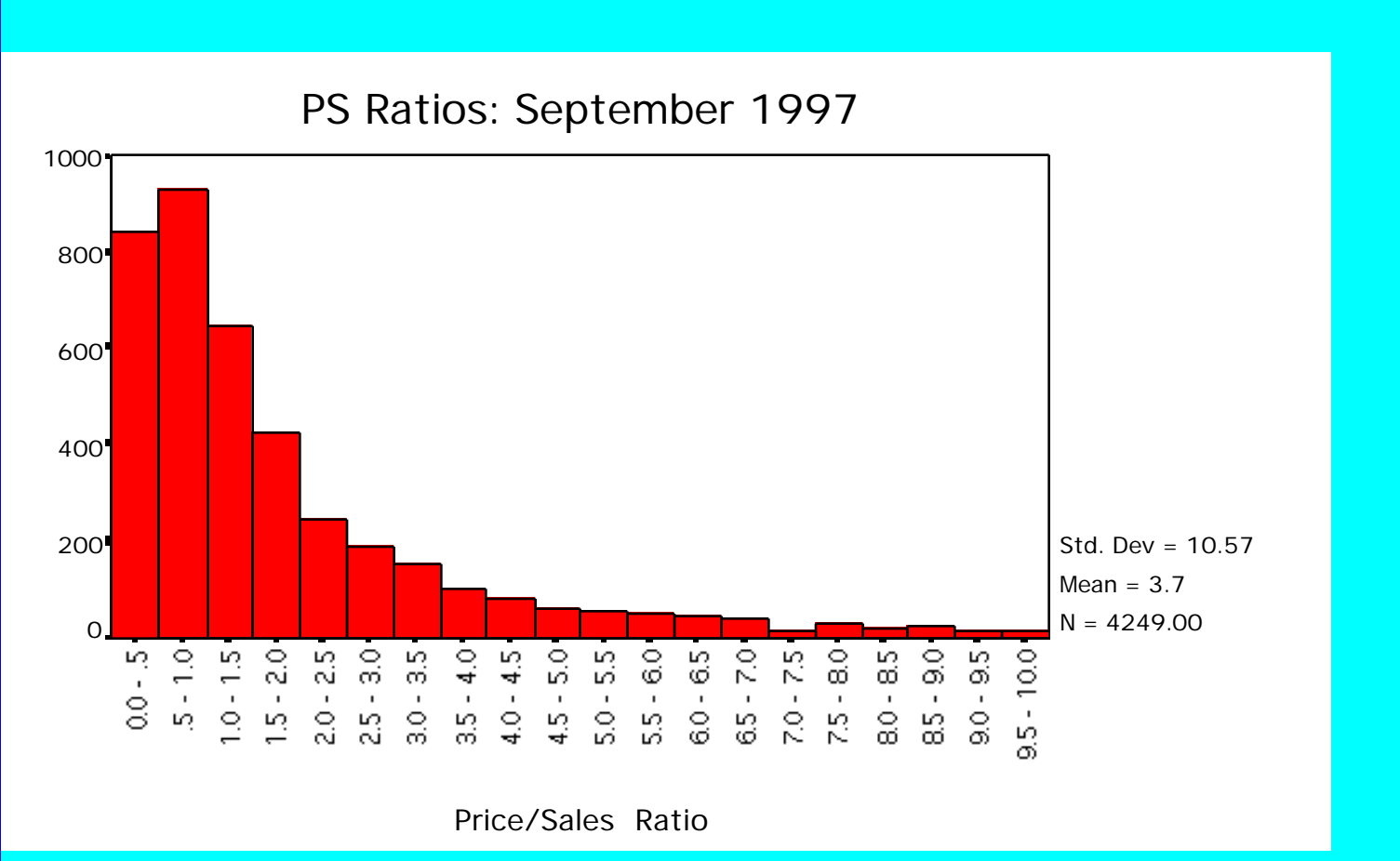
Price Sales Ratio: Definition

- 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: A Test on Brazilian Consumer Products

Company	Market Value	Sales	P/S
DHB Industria	0.45	114	0
Teka-Tecelagem	15	260	0.06
Viacao	313	3310	0.09
Lojas Arapua	171	1711	0.1
Cia TExtil	12	109	0.11
Lohas Brasileiras	37	318	0.12
Multibras	358	2588	0.14
lochpe	86	579	0.15
Sao Paulo Alpargatas	89	546	0.16
Electrolux Do Brasil	154	846	0.18
Sharp S.A.	197	971	0.2
Makro	257	1224	0.21
Brasmotor	595	2774	0.21
Gradiente Eletronica	145	611	0.24
Cofap-CIA Fabric	163	606	0.27
Lohas Americanas	591	1952	0.3
Globex Utilidades	986	1918	0.51
Marcopolo	158	293	0.54
Pirelli	431	672	0.64
Fiacao Tecidos	114	143	0.8
Arno	252	306	0.82
Lohas Renner	222	193	1.15
Confeccoes	372	300	1.24
Cia Tecidos	730	162	4.51
Average			0.53

Price/Sales Ratio: Is DHB cheap?

- Based upon the price/sales ratios, the cheap firms are DHB, Viacao and Lojas Arapua. The expensive firms are firms like Confecoos, Cia Tecidos and Lohas Renner. Do you agree?
 - Yes
 - No
- If not, what might explain why there are such big differences across these firms?

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:

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

- 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.

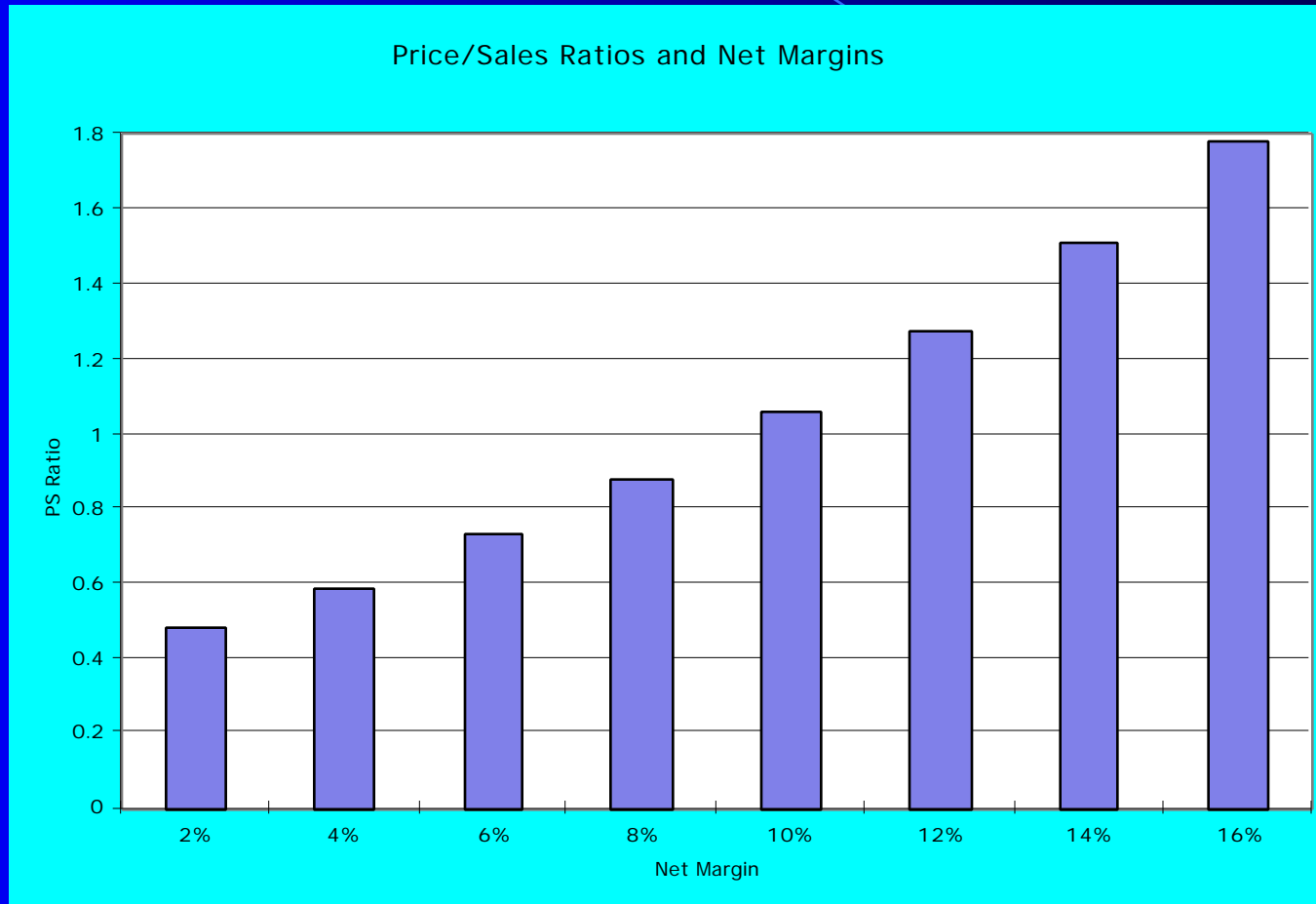
$$\begin{aligned}\text{Expected growth rate} &= \text{Retention ratio} * \text{Return on Equity} \\ &= \text{Retention Ratio} * (\text{Net Profit} / \text{Sales}) * (\text{Sales} / \text{BV of Equity}) \\ &= \text{Retention Ratio} * \text{Profit Margin} * \text{Sales/BV of Equity}\end{aligned}$$

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



PS/Margins: Brazilian Consumer Products

Company	Market Value	Sales	P/S	Net Margin
DHB Industria	0.45	114	0	-17.37
Teka-Tecelagem	15	260	0.06	-4.46
Viacao	313	3310	0.09	-0.22
Lojas Arapua	171	1711	0.1	2.49
Cia TExtil	12	109	0.11	5.09
Lohas Brasileiras	37	318	0.12	0.72
Multibras	358	2588	0.14	4.37
lochpe	86	579	0.15	-15.26
Sao Paulo Alpargatas	89	546	0.16	4.9
Electrolux Do Brasil	154	846	0.18	1.76
Sharp S.A.	197	971	0.2	-0.04
Makro	257	1224	0.21	-2.02
Brasmotor	595	2774	0.21	1.65
Gradiente Eletronica	145	611	0.24	2.98
Cofap-CIA Fabric	163	606	0.27	3.2
Lohas Americanas	591	1952	0.3	2.58
Globex Utilidades	986	1918	0.51	5.54
Marcopolo	158	293	0.54	4.61
Pirelli	431	672	0.64	6.2
Fiacao Tecidos	114	143	0.8	10.16
Arno	252	306	0.82	8.11
Lohas Renner	222	193	1.15	9.18
Confeccoes	372	300	1.24	10.63
Cia Tecidos	730	162	4.51	32.31
Average			0.53	3.21

Regression Results: PS Ratios and Margins

- Regressing PS ratios against net margins,

$$PS = 0.27 + 8.06 (\text{Net Margin}) \quad R^2 = 65.09\%$$

- Thus, a 1% increase in the margin results in an increase of 0.08 in the price sales ratios.
- The regression also allows us to get predicted PS ratios for these firms

PS Ratios: Actual versus Predicted Values

Company	P/S	Predicted PS	PS / Predicted
DHB Industria	0.00	-1.13	NMF
Teka-Tecelagem	0.06	-0.09	NMF
Viacao	0.09	0.25	-62.52%
Lojas Arapua	0.10	0.47	-78.77%
Cia TExtil	0.11	0.68	-83.82%
Lohas Brasileiras	0.12	0.33	-64.53%
Multibras	0.14	0.62	-77.77%
lochpe	0.15	-0.96	NMF
Sao Paulo Alpargatas	0.16	0.66	-75.49%
Electrolux Do Brasil	0.18	0.41	-55.80%
Sharp S.A.	0.20	0.27	-23.95%
Makro	0.21	0.11	95.89%
Brasmotor	0.21	0.40	-46.77%
Gradiente Eletronica	0.24	0.51	-53.48%
Cofap-CIA Fabric	0.27	0.53	-49.05%
Lohas Americanas	0.30	0.48	-36.65%
Globex Utilidades	0.51	0.72	-28.25%
Marcopolo	0.54	0.64	-15.95%
Pirelli	0.64	0.77	-16.68%
Fiacao Tecidos	0.80	1.09	-26.79%
Arno	0.82	0.92	-10.84%
Lohas Renner	1.15	1.01	13.90%
Confeccoes	1.24	1.13	10.05%
Cia Tecidos	4.51	2.87	56.78%

Price-Sales Ratios and Cross-sectional Data

<i>Year</i>	<i>Regression</i>	<i>R squared</i>
1987	PS = 0.7894 + .0008 - 0.2734 + 0.5022 EGR + 6.46 MARGIN	0.4434
1988	PS = 0.1660 + .0006 - 0.0692 + 0.5504 EGR + 10.31 MARGIN	0.7856
1989	PS = 0.4911 + .0393 - 0.0282 + 0.2836 EGR + 10.25 MARGIN	0.4601
1990	PS = 0.0826 + .0105 - 0.1073 + 0.5449 EGR + 10.36 MARGIN	0.8885
1991	PS = 0.5189 + 0.2749 - 0.2485 + 0.4948 EGR + 8.17 MARGIN	0.4853

PS = Price /Sales Ratio at the end of the year

MARGIN = Profit Margin for the year = Net Income / Sales for the year (in %)

= Payout Ratio = Dividends / Earnings ... at the end of the year

= Beta of the stock

Price/Sales Ratio Regression: September 1997

Multiple R .80216
 R Square .64345
 Adjusted R Square .64230
 Standard Error 1.19995

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	3201.39678	800.34920
Residual	1232	1773.93319	1.43988

F = 555.84405 Si gnif F = .0000

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
PROJGR	5.3453	.3502	.276328	15.265	.0000
PAYOUT	.006203	.008683	.012185	.714	.4751
BETA	.629887	.130628	.087896	4.822	.0000
NETMGN	23.343261	.544341	.741183	42.884	.0000
(Constant)	-1.406990	.125383		-11.222	.0000

Cross Sectional Regression for Brazil in 1997

- Using data on 148 Brazilian companies from 1997, we regressed PS ratios against profit margins:

$$\text{PS} = 0.95 + 2.26 \text{ Margin} \quad R^2 = 15.17\%$$

(8.91) (2.82)

Cross Sectional Regression for India: November 1997

- With the sample of the 50 Indian firms which have GDRs listed on them, and regressing PS against Pre-tax Margin for these firms yields:

$$PS = -0.51 + 12.74 \text{ Margin} \quad (\text{R squared}=54.22\%)$$

- Hindalco is an Indian firm with one of the highest profit margins in the sample (30.08%). This is often used as a rationale for its current high price/sales ratio of 4.97. Plugging in Hindalco's Margin into this equation would yield:

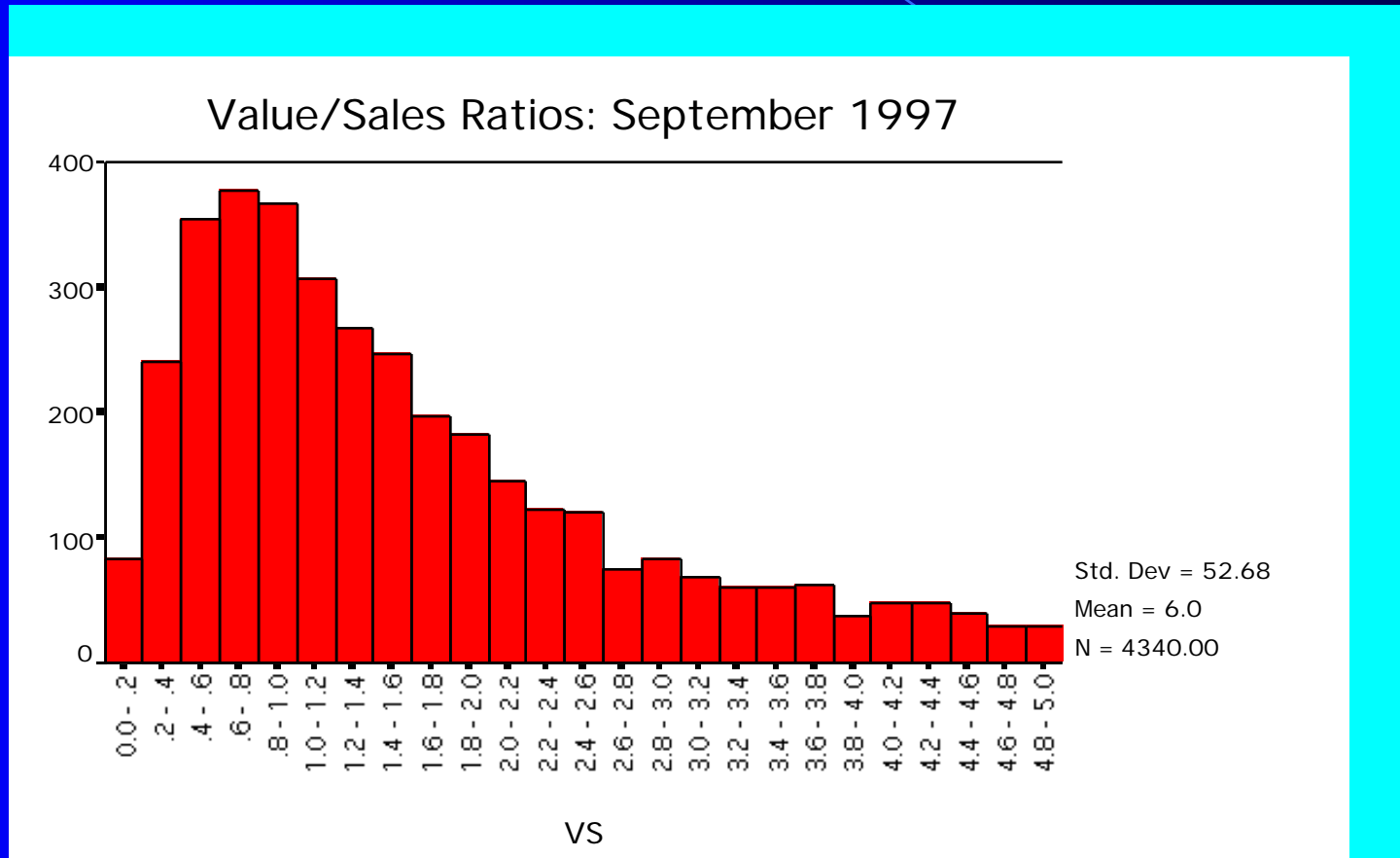
$$\text{Predicted PS for Hindalco} = -0.51 + 12.74 (.3008) = 3.31$$

On a relative basis, Hindalco is over valued.

Value/Sales Ratio: Definition

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

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): Net Capital expenditures and working capital requirements are zero.
- Then the Value of the Firm can be written as a function of the after-tax operating margin = (EBIT (1-t)/Sales

$$\frac{\text{Value of Firm}_0}{\text{Sales}_0} = \text{After -tax Operating Margin} * \frac{(1+g)^n * \left(1 - \frac{(1+g)^n}{(1+WACC)^n}\right)}{WACC - g} + \frac{(1+g)^n * (1+g_n)}{(WACC - g_n)(1+WACC)^n}$$

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)

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%

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

Length of High Growth Period = 10 years

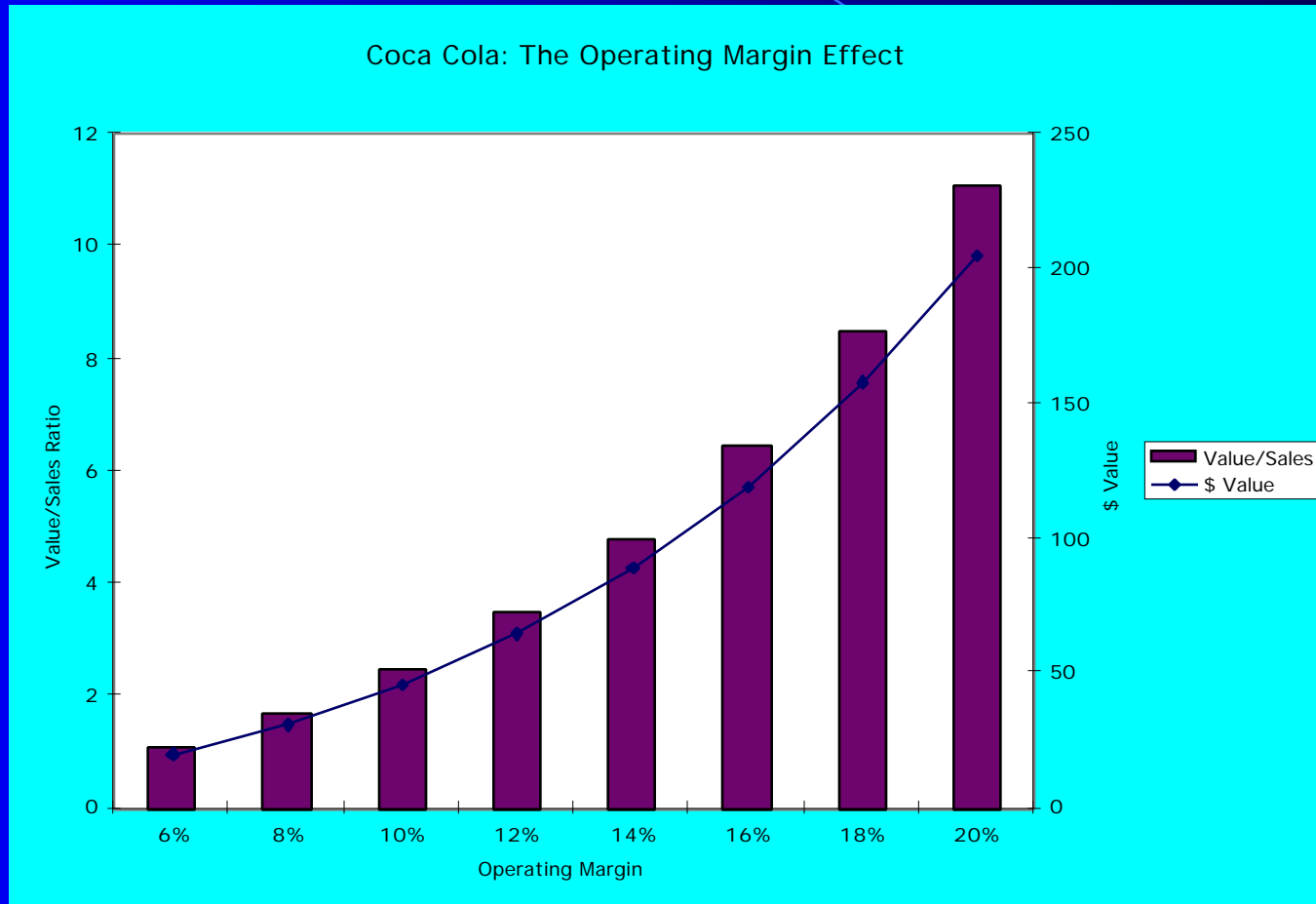
Cost of Equity = 12.33% E/(D+E) = 97.65%

After-tax Cost of Debt = 4.16% D/(D+E) = 2.35%

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

$$\frac{\text{Value of Firm}_0}{\text{Sales}_0} = .1856 * \frac{(1.2016) * 1 - \frac{(1.2016)^{10}}{(1.1213)^{10}}}{.1213 - .2016} + \frac{(1.2016)^{10} * (1.06)}{(.1213 - .06)(1.1213)^{10}} = 9.17$$

Value Sales Ratios and Operating Margins



Brand Name Premiums in Valuation

- You have been hired to value Coca Cola for an analyst reports and you have valued the firm at 9.17 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:

$$\text{Value of brand name} = \{(V/S)_b - (V/S)_g\} * \text{Sales}$$

$(V/S)_b$ = 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%	65.00%
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	9.17331395	1.52054428

Value of Coca Cola's Brand Name

- Value of Coke's Brand Name = $(9.17 - 1.52) (\$18,546 \text{ million}) = \141.93 billion
- Value of Coke as a company = $9.17 (\$18,546 \text{ million}) = 170.13 \text{ Billion}$
- Approximately 83.42% of the value of the company can be traced to brand name value

Value/Sales Ratio: Regression in September 1997

Multiple R .39804
 R Square .15844
 Adjusted R Square .15763
 Standard Error 171.12160

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	17222250.77441	5740750.25814
Residual	3124	91478850.12221	29282.60247

F = 196.04645 Signif F = .0000

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
REINV	.574553	.141653	.066989	4.056	.0001
OPERMGN	9.515007	.431111	.364273	22.071	.0000
STDDEV	5.4205	.4859	.184718	11.156	.0000
(Constant)	-.463821	.177223		-2.617	.0089

Reviewing: The Four Steps to Understanding Multiples

- Define the multiple
- Describe the multiple
- Analyze the multiple
- Apply the multiple