REVAAM MODEL TO DETERMINE A COMPANY'S VALUE BY MULTIPLE VALUATION AND LINEAR REGRESSION ANALYSIS

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Abstract

This paper shows an alternative model to the widely used method of multiple valuation (or relative valuation) in order to calculate the value of a company by using either the Price Earnings (PE) and/or the Enterprise Value to Earnings Before Interest, Taxes, Depreciation and Amortization (EV/EBITDA). When calculating multiples, analysts tend to consider average multiples within an industry and apply them directly to the target company; however, we believe that this practice is not considering differences among the companies being compared, although they belong to the same sector or industry. REVAAM Model uses linear regression to calculate adjusted PE and EV/EBITDA multiples by taking into consideration profitability factors for each multiple in order to differentiate companies in the samples. Calculations are based on public data for US companies, but could be further expanded to other markets. Not only REVAAM Model provides a better estimate to relative valuation analysis than simply using average multiples, but it could be used to compare under/overvalued companies or sectors, and also analyze multiple value changes over time as the intrinsic fundamentals change.

Introduction

In financial analysis and company valuation, it is common to use multiple valuation (or relative valuation) as a method to determine the value or a range of values for a specific company. Relative valuation calculates the value of an asset (in our case companies) from the value of other "comparable" assets (for example, companies in the same sector). Although this method gives us a quick reference of the company's possible "fair" value, based on the industry or on the comparable companies, we believe that the best way to determine a company's "true" value is by using the Discount Free Cash Flow (DCF) method (either using Firm or Equity free cash flows), despite there exists controversy in choosing the adequate discount rates. The reason behind this is that there are big differences among companies even in the same sector; a company with sales of 100 whose operating earnings have been growing at 10% for the last five years and is expected to continue growing at that rate for the following five years, should be worth more than a company with sales of 100, ceteris paribus, but with an operating earnings growth of 3%.

When comparing companies in the same industry, we do obtain a reference of how the sector is behaving and what the overall risk could be or to obtain parameters for that specific sector, but companies within the sample do not present the same operating parameters, and therefore are not priced equally. Despite these arguments, relative valuation can be a powerful tool if we introduce some adjustment for the differences in those companies.

There are several multiples used in relative valuation: Price Earnings[1] (PE), Enterprise Value to Earnings Before Interest, Taxes, Depreciation and Amortization[2] (EV/EBITDA), Price to Sales[3] (PS), Price to Book Value of Equity[4] (PBV), and variations to these. Each multiple is measured at different levels of the income statement; multiples using sales ratios are based on the top line, whereas multiples using net earnings are bottom line ratios.

Sectors such as the Pharmaceutical tend to use multiples based on sales, such as the PS, however PE and EV/EBITDA are the most widely used multiples. The main reason is that sales multiples do not consider margins and costs, misleading the final value of "comparable" companies. Then we would prefer using the PE ratio, as it is based on the bottom line of the Income Statement, however, a) not all companies have the same amount of financial income and expenses and b) the value for this ratio is the equity value of our company which may be also misleading due to the debt amount for our company. Therefore, we prefer using the EV/EBITDA ratio because the value we obtain is an "Enterprise Value" or the value of the operating assets, which is also obtained using the DCF from the free cash flows to the firm (FCFF). The EBITDA is a proxy to obtain the FCFF as it adds depreciation and amortization, non-cash expenses, to the operating earnings of the companies before any financial expenses and taxes.

Then, if the use of multiples lacks accuracy and therefore confidence in determining a value for our company, we need to establish a method that takes into consideration the differences among the companies in our sample. For our analyses,

[1] Price Earnings ratio is calculated as the market price per share divided by net earnings per share

[2] Enterprise Value to Earnings Before Interest, Taxes, Depreciation and Amortization ratio is calculated as the value of operating assets divided by operating earnings before interests and taxes plus depreciation and amortization

[3] Price to Sales ratio is calculated as the market price per share divided by sales per share

[4] Price to Book Value of Equity is calculated as the market price per share divided by the book value per share

we will consider the use of the PE and EV/EBITDA multiples.

Design

As we said before, the best way to determine a company's value is by using the DCF method, and in order to do so we need to forecast the free cash flow, either to the firm or to the equity shareholders. This process has to be detailed and requires knowledge of the company's financials and the expected growth. In consequence, we propose to adjust the PE multiple by using the Return on Equity[5] (ROE) and the Net Margin[6] as the indicators of profitability for equity shareholders of the companies being analyzed. In contrast, for the EV/EBITDA multiple we propose adjusting by using the Return on Capital[7] (ROC) and the Pre-tax Operating Margin[8]. These adjustments should be made using multiple regression analysis, in order to minimize errors, where the independent variables are the multiples and the other factors are the dependent variables. These relationships are shown in the equations below:

Equation 1

$$P/E = \alpha_{PE} + \beta_{ROE} * ROE + \beta_{NM} * Net\ M\arg in + \varepsilon$$

Where,

$P/E =$ the price earnings ratio calculated as the price per share divided by net earnings per share

$\alpha_{PE} =$ the value of the intercept calculated by the regression analysis

$\beta_{ROE} =$ the value of the coefficient for ROE

$ROE =$ the return on equity, calculated as the net income divided by the company's beginning equity value

$\beta_{NM} =$ the value of the coefficient for Net Margin

$Net\ M\arg in =$ calculated as the net income of year t divided by the sales of year

$\varepsilon =$ the sum of errors derived from the regression analysis

Equation 2

$$EV/EBITDA = \alpha_{EVEBITDA} + \beta_{ROC} * ROC + \beta_{OM} * Pre-tax\ Operating\ M\arg in + \varepsilon$$

Where

$EV/EBITDA =$ the EBITDA multiple calculated as the Enterprise Value or Value of the Net Operating Assets divided by the Earnings before Interests, Taxes, Depreciation and Amortization

$\alpha_{EVEBITDA} =$ is the value of the intercept calculated by the regression analysis

$\beta_{ROC} =$ the value of the coefficient for ROC

$ROC =$ the return on capital, calculated as the after-tax operating income (EBIT*(1-tax)) divided by the company's beginning equity value plus the debt balance

$\beta_{OM} =$ the value of the coefficient for Net Margin

$Pre-tax\ Operating\ M\arg in =$ calculated as the pre-tax operating income of year t divided by the sales of year

$\varepsilon =$ the sum of errors derived from the regression analysis

[5] Return on Equity measures the rate of return on shareholders' equity and is calculated as the Net Income divided by the book value of equity

[6] Net Margin measures the profitability and is calculated as the net income divided by revenues

[7] Return on Capital measures the rate of return on the company's capital and is calculated as operating earnings after taxes divided by the book value of equity plus the book value of debt

[8] Pre-tax Operating Margin or EBIT measures profitability before interests and taxes and is calculated as operating revenues less operating expenses plus non-operating income

We extracted information for public companies in the United States for the ending of the years 2000 to 2009. The following table shows the number of companies, divided by sector, that were analyzed each year.

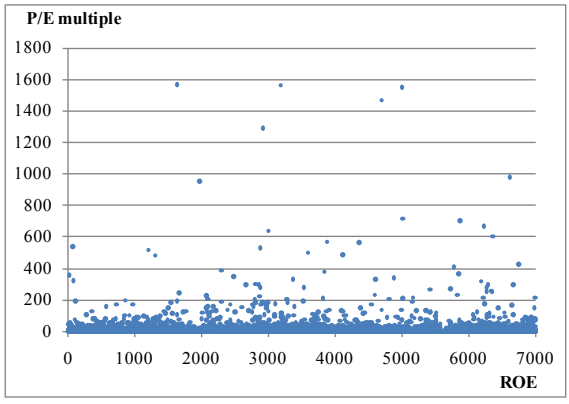
Table 1. Number of companies by sector

Industries	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Advertising	30	33	37	32	34	32	36	39	28	36
Aerospace/Defense	39	64	76	72	66	70	73	68	65	67
Air Transport	36	44	42	43	45	45	56	48	43	44
Auto & Truck	19	20	22	21	24	29	31	27	19	22
Auto Parts	55	64	61	62	59	58	64	55	53	54
Bank	211	489	505	558	546	537	598	551	521	527
Beverage	32	41	43	41	37	41	48	43	40	41
Biotechnology	0	75	90	84	89	87	105	102	107	121
Building Materials	50	65	68	62	60	57	60	59	64	67
Chemical	125	141	149	144	136	143	154	143	137	145
Coal	0	5	7	8	10	12	16	17	17	21
Computers	399	467	630	535	530	533	572	518	445	462
Diversified Co.	92	102	105	103	117	118	134	106	117	126
Drug	286	285	288	276	304	306	334	367	341	337
Educational Services	27	35	36	34	37	38	37	38	33	38
Electric Utility	88	82	75	77	74	74	75	71	67	66
Electrical Equipment	81	91	94	86	91	91	94	85	82	87
Electronics	150	208	211	194	189	186	196	187	181	192
Entertainment	91	106	126	116	117	118	132	129	115	130
Environmental	50	79	85	77	84	91	96	88	78	91
Financial Svcs.	184	223	238	231	232	244	269	294	295	296
Food Processing	86	115	114	104	103	110	123	122	108	121
Furniture and Furnishings	33	32	35	36	37	36	38	38	33	35
Healthcare Information	32	32	35	35	31	35	34	37	28	33
Homebuilding	54	56	48	44	33	34	41	35	31	28
Hotel/Gaming	52	84	94	80	76	76	84	74	67	74
Household Products	29	32	32	32	29	26	31	27	25	23
Human Resources	0	21	28	27	27	30	35	34	30	30
Industrial Services	173	211	205	190	199	207	230	194	166	168
Information Services	0	18	30	29	32	36	41	37	33	29
Insurance	86	84	96	115	120	127	137	135	121	124
Internet	315	446	422	330	346	365	389	320	260	295
Investment Co.	45	41	39	39	36	36	35	31	41	44
Machinery	134	167	172	153	147	149	153	135	123	130
Manuf. Housing/RV	20	19	20	18	18	16	19	17	17	15
Maritime	14	19	19	23	27	39	46	51	55	53

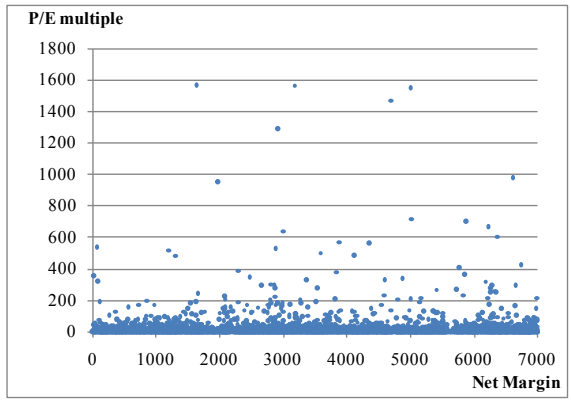
Industries	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Medical Services	156	207	226	197	194	184	186	177	159	162
Medical Supplies	182	224	244	236	261	261	279	273	251	264
Metal Fabricating	38	45	45	37	37	41	37	36	34	36
Metals & Mining	36	44	55	54	75	77	82	77	77	79
Natural Gas	71	72	72	70	66	65	64	69	75	75
Newspaper	18	20	19	20	19	19	18	17	15	15
Office Equip/Supplies	28	33	33	31	27	27	26	24	25	25
Oilfield Svcs/Equip.	71	87	87	88	92	98	110	112	111	113
Packaging & Container	36	42	41	34	34	37	36	34	32	31
Paper/Forest Products	48	47	43	40	38	40	42	38	37	39
Petroleum	134	175	170	162	177	178	208	210	211	222
Pharmacy Services	10	14	15	15	13	15	20	18	18	21
Power	15	30	33	29	33	36	55	69	76	87
Precious Metals	30	37	42	48	60	62	67	83	74	78
Precision Instrument	85	108	114	102	103	104	104	102	89	98
Property Management	0	0	0	0	0	0	0	11	16	20
Publishing	43	44	42	40	42	47	50	39	26	30
R.E.I.T.	143	152	151	144	134	122	143	146	143	143
Railroad	16	15	15	16	17	18	20	15	14	15
Recreation	81	86	88	73	77	74	84	72	63	65
Restaurant	90	93	94	85	83	82	81	74	67	68
Retail (Special Lines)	232	240	255	255	238	237	227	219	206	213
Retail Automotive	10	18	17	12	26	27	25	15	15	15
Retail Building Supply	11	10	10	8	8	10	9	8	7	7
Retail Store	80	117	119	90	89	90	91	72	67	75
Securities Brokerage	27	27	24	27	25	31	32	30	31	30
Semiconductor	113	126	123	128	138	135	138	152	136	139
Shoe	26	26	27	24	23	22	24	19	18	19
Steel	48	48	45	41	36	40	46	38	32	35
Telecom. Equipment	112	140	146	124	119	122	136	123	109	115
Telecom. Services	200	252	234	180	176	188	196	173	163	164
Thrift	124	116	146	242	221	221	248	233	233	227
Tobacco	11	12	12	11	12	11	11	10	11	12
Toiletries/Cosmetics	17	20	24	21	22	20	21	20	22	19
Trucking	45	42	40	39	35	37	38	31	32	33
Water Utility	13	15	16	16	16	16	16	15	15	15
Wireless Networking	69	79	76	63	65	66	73	73	56	60
Total	**5587**	**6959**	**7320**	**6913**	**6973**	**7092**	**7659**	**7249**	**6752**	**7036**

The following graphs show the relationships between P/E and ROE and Net Margin and between EV/EVITDA and ROC and Pre-tax Operating Margin for the year 2009 of all the companies analyzed. At first glance, it appears to be no linear relationship at all.

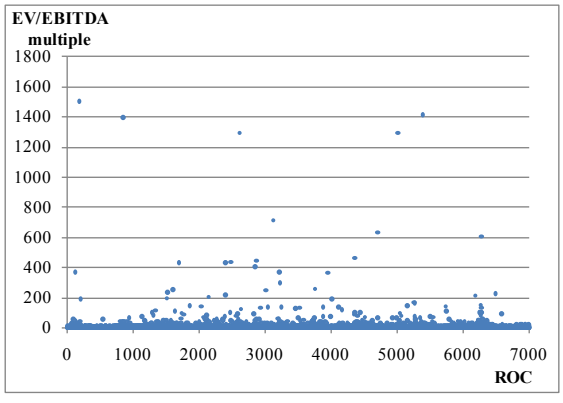
Graph 1. P/E vs ROE



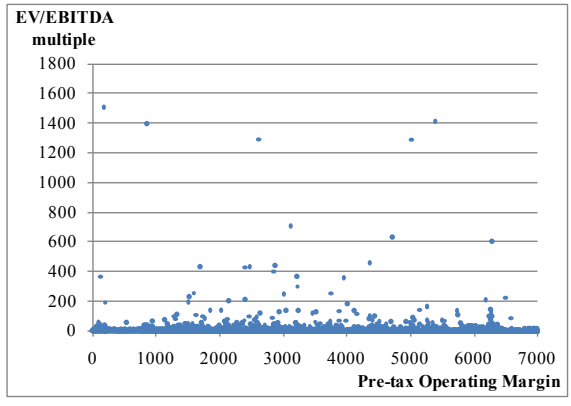
Graph 2. P/E vs Net Margin



Graph 3. EV/EBITDA vs ROC



Graph 4. EV/EBITDA vs Pre-tax Operating Margin



The basic linear regression model assumes that the contributions of the different independent variables to the prediction of the dependent variable are additive and they tend to follow normal distributions. In our case, the relationships between our variables may be multiplicative and also they have highly skewed distributions (positive values). Hence it may be possible to make their distributions more normal-looking by applying the logarithm transformation, as shown in the following equations:

From equations 1 and 2, we apply natural logarithms to obtain:

Equation 3

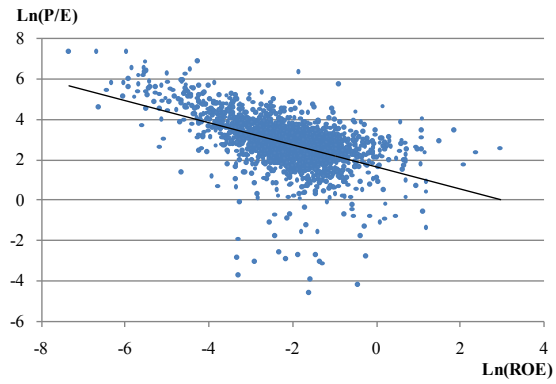
$$Ln(P/E) = \alpha_{PE} + \beta_{ROE} * Ln(ROE) + \beta_{NM} * Ln(Net\ Margin) + \varepsilon$$

Equation 4

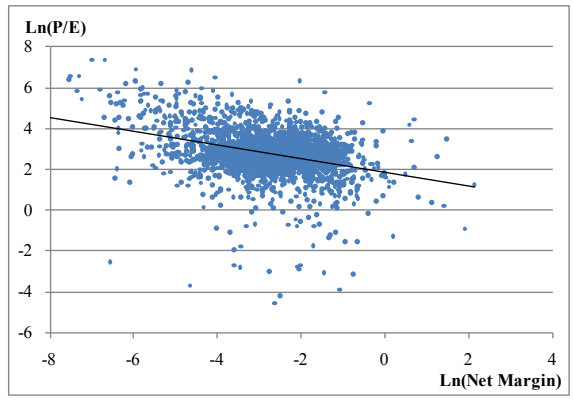
$$Ln(EV/EBITDA) = \alpha_{EVEBITDA} + \beta_{ROC} * Ln(ROC) + \beta_{OM} * Ln(Pre-tax\ Operating\ Margin) + \varepsilon$$

Now, scatter plots for the relationships between the variables transformed to natural logarithms show a linear relationship.

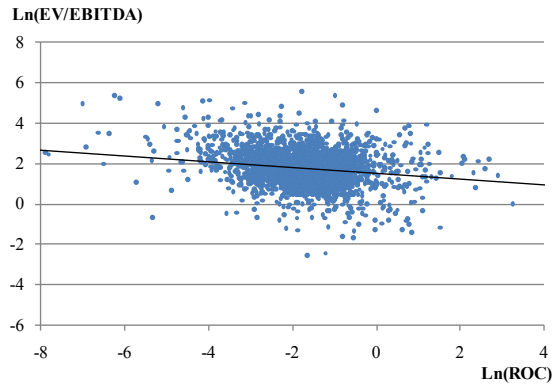
Graph 5. Ln(P/E) vs Ln(ROE)



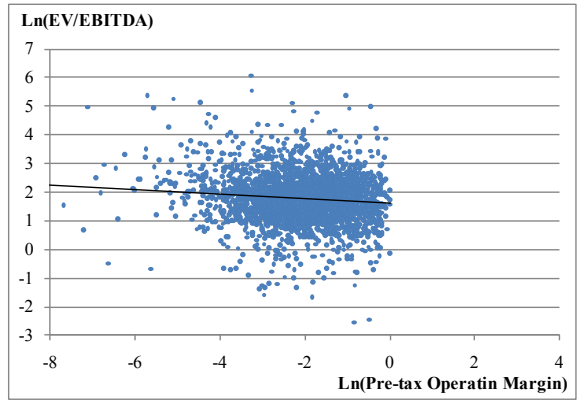
Graph 6. Ln(P/E) vs Ln(Net Margin)



Graph 7. Ln(EV/EBITDA) vs Ln(ROC)



Graph 8. Ln(EV/EBITDA) vs Ln(Pre-tax Operating Margin)



It has to be noted, that the number of companies that can be used is reduced by transforming variables to natural logarithms due to the fact that negative values for our variables cannot be transformed to natural logarithms. This is a limitation for the model.

Results

We calculated equation (3) for years 2000 to 2009 to determine the relationship for the P/E ratio. Although the R2 coefficients do not present high values, the F-test shows that we can use the linear model. For all years, ROE is a significant variable (not equal to zero), but that is not the case for Net Margin in years 2004, 2007 and 2008. For purposes of comparison we will use both factors in all years.

Table 2. Regression results for equation (3) - P/E

Concept	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Multiple correlation factor	0.2715	0.4975	0.5090	0.5882	0.6216	0.5984	0.5673	0.5344	0.4400	0.5324
R-square coefficient	0.0737	0.2475	0.2591	0.3459	0.3864	0.3581	0.3218	0.2856	0.1936	0.2834
F test value	111.064	545.417	503.213	800.975	964.306	890.183	799.74	622.593	367.977	543.500
Critical F value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Intercept	3.2672	1.7281	1.6491	2.0136	1.9820	1.9316	1.8731	1.9007	1.2959	1.5055
Prob Intercepción	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ln(ROE)	-0.2856	-0.5912	-0.5763	-0.5552	-0.5558	-0.6222	-0.5305	-0.5242	-0.4720	-0.4952
Prob ln(ROE)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ln(Net Margin)	0.3490	0.0744	0.0406	0.0297	-0.0212	0.0436	-0.0652	-0.0242	0.0066	-0.0841
Prob (Net Margin)	0.0000	0.0000	0.0444	0.0449	0.1424	0.0051	0.0000	0.1398	0.7257	0.0000

In the case of the EV/EBITDA relationship established in equation (4), we obtained the results in the table below. The F-test also indicates that the linear regression model is adequate. R^2 values are smaller than for equation (3); this may mean that there are other factors that need to be considered in our analysis. As with the Net Margin for equation (3), there are some years (2003, 2005 and 2007) in which Pre-tax Operating Margin is not significant.

Table 3. Regression results for equation (4) – EV/EBITDA

Concept	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Multiple correlation factor	0.1125	0.2354	0.2566	0.2196	0.2201	0.1790	0.1844	0.2308	0.2535	0.2192
R-square coefficient	0.0127	0.0554	0.0658	0.0482	0.0485	0.0321	0.0340	0.0533	0.0643	0.0481
F test value	22.458	113.001	127.863	93.823	95.170	61.088	68.194	98.852	116.734	86.831
Critical F value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Intercept	1.9749	1.4948	1.3906	1.6710	1.7411	1.8215	1.8645	1.7209	1.0705	1.5180
Prob Intercepción	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ln(ROC)	-0.1282	-0.2349	-0.2316	-0.1768	-0.1377	-0.1462	-0.1260	-0.1995	-0.2607	-0.1388
Prob ln(ROC)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ln(Pre-tax Op Margin)	0.0795	0.0649	0.0566	-0.0042	-0.0682	-0.0023	-0.0334	-0.0016	0.0597	-0.0141
Prob (Pre-tax Op Margin)	0.0001	0.0001	0.0001	0.7744	0.0000	0.8795	0.0143	0.9147	0.0004	0.2998

Now that we have established our regression parameters for equations (3) and (4) by year, we now calculate for each year the P/E and EV/EBITDA and compare them to arithmetic averages.

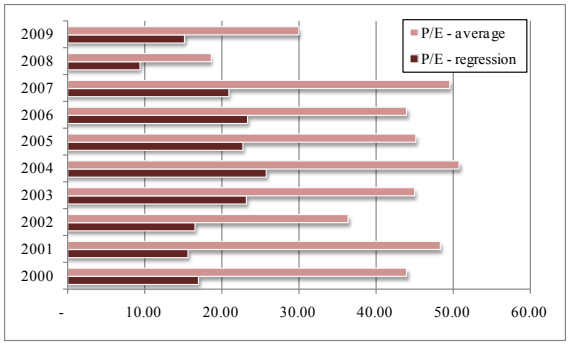
Table 4. Average multiples vs REVAAM multiples

Year	ROE	Net Margin	ln(P/E)	P/E - regression	P/E - average	ROC	Pre-tax OM	ln(EV/ EVITDA)	EV/EVITDA- regression	EV/EVITDA- average
2000	23.0%	8.9%	2.8417	17.14	44.08	14.4%	12.8%	2.0596	7.84	14.64
2001	17.2%	10.5%	2.5995	13.46	48.35	14.8%	9.6%	1.7916	6.00	9.71

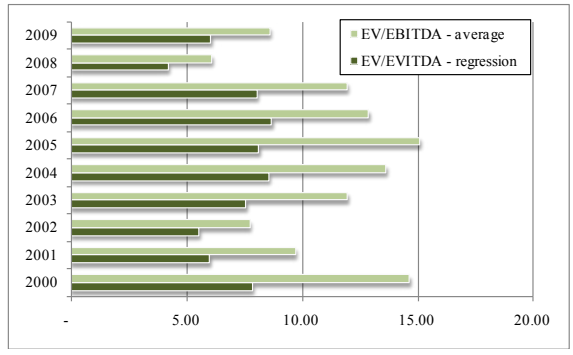
Year	ROE	Net Margin	ln(P/E)	P/E - regression	P/E - average	ROC	Pre-tax OM	ln(EV/ EVITDA)	EV/EVITDA- regression	EV/EVITDA- average
2002	19.8%	9.3%	2.4848	12.00	36.46	13.9%	9.2%	1.7120	5.54	7.74
2003	18.9%	11.6%	2.8738	17.71	45.02	14.3%	13.0%	2.0239	7.57	11.96
2004	17.6%	9.6%	2.9976	20.04	50.85	14.5%	13.0%	2.1458	8.55	13.62
2005	25.8%	11.0%	2.6783	14.56	45.20	15.8%	13.5%	2.0955	8.13	15.07
2006	18.5%	15.7%	2.8883	17.96	44.05	16.1%	13.8%	2.1612	8.68	12.88
2007	22.9%	15.4%	2.7195	15.17	49.59	16.4%	14.1%	2.0852	8.05	11.94
2008	22.2%	11.7%	1.9913	7.33	18.64	15.7%	14.7%	1.4383	4.21	6.10
2009	21.6%	11.9%	2.4441	11.52	30.04	15.9%	14.1%	1.8008	6.05	8.61

As can be seen in the numbers and in the following graphs simple average values for P/E and EV/EBITDA in each year are above those calculated from the regressions.

Graph 9. P/E regression vs P/E average



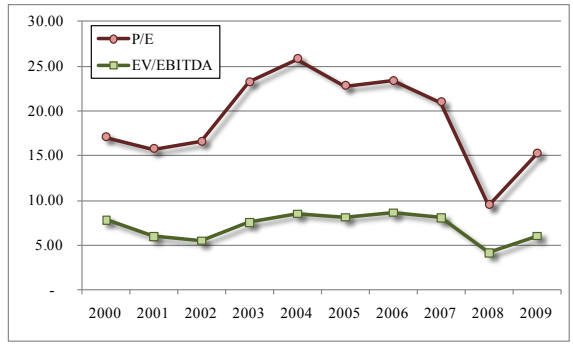
Graph 10. EV/EBITDA regression vs EV/EBITDA average



In the case of P/E ratios, average values are about 2.2 times the values obtained from regression analysis, and for EV/EBITDA average values are 1.57 times the regression values.

Another important aspect can be derived from the year to year comparison of our multiples. As shown on Graph 11, P/E multiple tends to be more volatile over time than the EV/EBITDA multiple. For the former, the average from 2000 to 2009 has been 19.04 with a standard deviation of 5.02, whereas for the latter the average has been 7.06 with a standard deviation of 1.5. Crises of 2001 and 2008 contributed to these deviations. Then, at first glance, it would be a better idea to use an EV/EBITDA multiple and then subtract all financial debt in order to obtain an equity value for the company being analyzed.

Graph 11. Regression Multiples over time



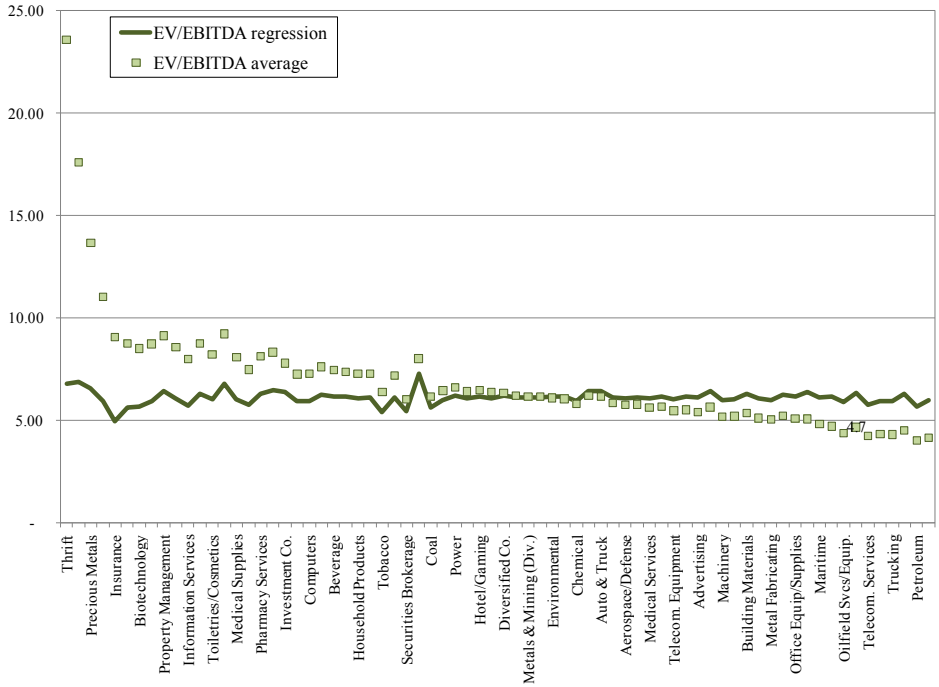
Further Applications

REVAAM Model provides adjusted multiples that should be more accurate than using simple average multiples. So far we have applied the model to the entire market, without distinguishing among different sectors.

There are several analysts that support the idea that companies in different sectors should not be priced equally even they have the same characteristics. This would imply that company A and company B should have a different EV/EBITDA multiple even though they have exactly the same ROC and Pre-tax Operating Margin. Others suggest that since DCF valuation involves discounting future cash flows, then both companies should have the same resulting multiples since their margins are the same (not the same value because cash flows amount depend on the company size). Common use suggests taking multiples by industry, and the two important supporting arguments for this are differences in risk and potential growth (technological sectors tend to have bigger growths than utility sectors, for example).

We used REVAAM model to calculate the corresponding EV/EBITDA and P/E multiples for all sectors for year end 2009 (each year should be calculated depending on prevailing factor values), as shown in Graphs 12 and 13

Graph 12. EV/EBITDA calculation by sector for 2009

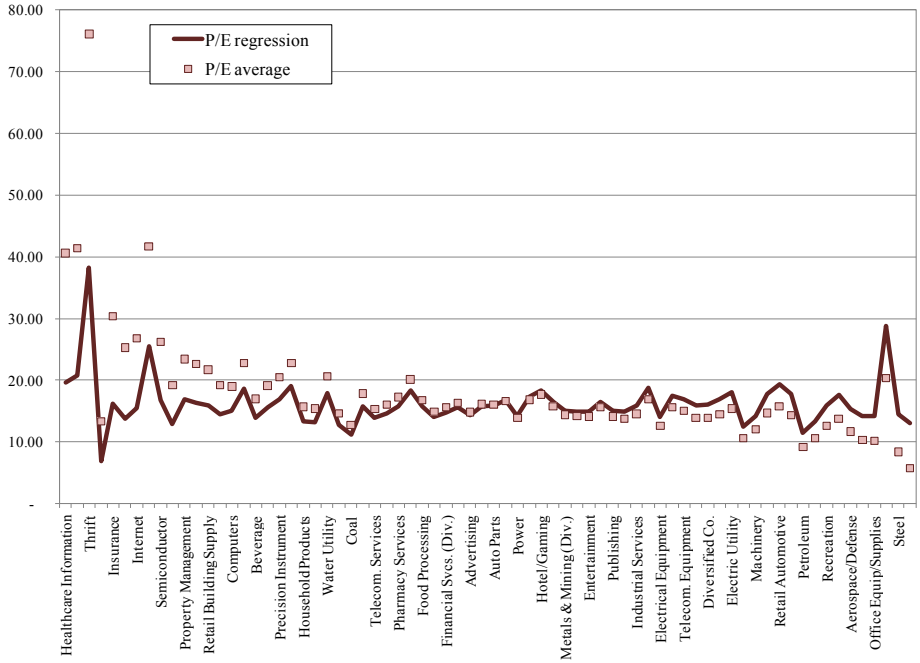


The solid line in Graph 12 is the calculated EV/EBITDA for each sector using the corresponding average ROC and average Pre-tax Operating Margin in 2009. Dots represent the simple EV/EBITDA average multiple that analysts use when doing relative valuation.

Sectors whose average EV/EBITDAs are above the REVAAM's EV/EBITDAs are considered to be overvalued, whereas

those below are considered undervalued. Looking at Graph 12, we can observe that 25 sectors are undervalued, 10 sectors are within a ± 5% range of fair price, and 37 are overvalued. Thrift/Banking, Precious Metals, Homebuilding, Healthcare Information and Educational Services are the most overvalued sectors, while Steel, Petroleum, Air Transport and Trucking are the most undervalued.

Graph 13. P/E calculation by sector for 2009



Similar to Graph 12, the solid line in Graph 13 is the calculated P/E for each sector using the corresponding average ROE and average Net Margin in 2009, and dots represent the arithmetic average of P/E multiples in each sector.

Comparing average P/Es to REVAAM's P/Es, we can observe in Graph 13 that 27 sectors are undervalued, 13 sectors are within a ± 5% range of fair price, and 32 are overvalued. Thrift/Banking, Precious Metals, Tobacco, Healthcare Information, Insurance and Educational Services are the most overvalued sectors, while Maritime, Steel, Manufacturing Housing/RV, Office Equipment and Supplies and Metal Fabricating are the most undervalued.

Taking into consideration results from both graphics 12 and 13, we find common sectors that have the same results. However, there are sectors that show opposite results in both analysis, such as the Electric Utility, Retail Automotive, REIT, Manufacturing Housing/RV, Trucking and Telecom Services sectors.

We have used the REVAAM Model in comparing market-wide multiples in specific years and through time, and also by comparing different sectors. Now we will apply the model to a specific company that belongs to the Drug sector (Pharmaceutical Laboratories), and we will use a US based company called Perrigo Co. (Ticker PRGO).

The table below shows the parameters

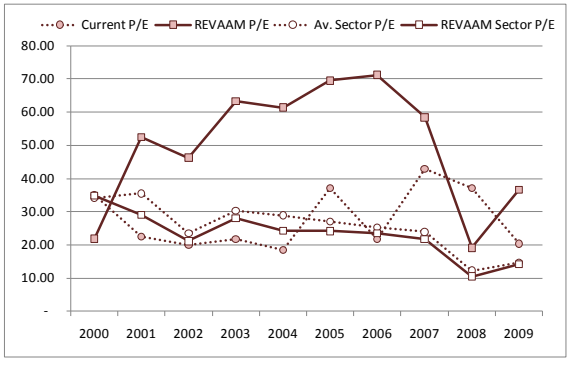
for Perrigo Co. at the end of each year and the actual P/E and EV/EBITDA multiples that the company is trading at, and then we calculate these multiples by using the REVAAM Model in the specific Drug sector. The same is done to the multiples of the whole Drug sector.

Table 5. Perrigo's and Drug sector multiples (REVAAM and averages)

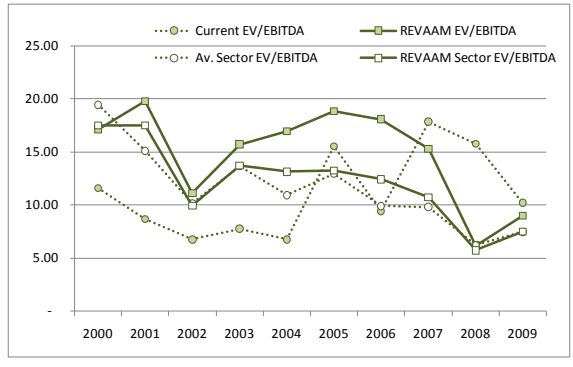
Perrigo Co.	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ROC	10.33%	13.80%	17.11%	18.58%	22.35%	4.78%	9.62%	9.84%	9.84%	16.40%
Pre-tax OM	7.99%	7.10%	7.20%	13.10%	14.62%	9.52%	12.94%	11.39%	11.39%	16.79%
ROE	5.63%	10.68%	10.69%	11.57%	12.59%	6.42%	11.57%	10.42%	10.42%	19.05%
Net Margin	2.74%	5.47%	5.39%	6.28%	7.52%	3.70%	5.42%	5.43%	5.43%	8.75%
Current P/E	35.11	22.58	20.05	21.74	18.41	37.10	21.70	42.96	37.15	20.40
Current EV/EBITDA	11.57	8.70	6.76	7.77	6.76	15.52	9.44	17.84	15.79	10.22
REVAAM P/E	21.86	52.42	46.29	63.25	61.39	69.50	71.20	58.42	19.11	36.61
REVAAM EV/EBITDA	17.13	19.76	11.14	15.72	16.97	18.83	18.09	15.28	6.19	8.98
Av. Sector ROC	18.20%	15.80%	20.10%	21.06%	19.96%	19.17%	22.46%	19.10%	22.93%	22.10%
Av. Sector Pre-tax OM	16.05%	12.90%	18.02%	25.35%	22.90%	21.38%	23.02%	22.93%	23.49%	23.80%
Av. Sector ROE	18.25%	11.43%	13.49%	14.54%	12.06%	12.42%	13.01%	13.44%	15.46%	16.64%
Av. Sector Net Margin	15.68%	14.59%	15.51%	14.40%	12.27%	12.03%	11.16%	12.84%	15.14%	16.62%
Av. Sector P/E	34.1	35.5	23.5	30.3	28.9	27.0	25.2	23.9	12.3	14.7
Av. Sector EV/EBITDA	19.4	15.1	10.2	13.6	10.9	12.9	9.9	9.8	6.2	7.5
REVAAM Sector P/E	34.85	29.09	21.16	28.04	24.23	24.16	23.57	21.82	10.53	14.22
REVAAM Sector EV/EBITDA	17.50	17.49	9.96	13.71	13.14	13.24	12.43	10.72	5.74	7.49

The following graphs (14 and 15) show the REVAAM calculations for the P/E and EV/EBITDA multiples respectively and the comparison against the current multiples Perrigo was trading at the end of year 2009, and simple average multiples for the Drug sector at the same date.

Graph 14. Perrigo's and Drug sector P/E calculation



Graph 15. Perrigo's and Drug sector EV/EBITDA calculation



As it can be seen, in both graphs the REVAAM multiples (both P/E and EV/EBITDA) for the Drug sector are very close to the simple averages of those multiples. However, when looking at the multiples at which Perrigo was trading compared to calculated REVAAM multiples for the company, it seems that Perrigo was trading at lower multiples than it should had been or it was undervalued. In the case of the P/E multiple this is true for all years except for 2000 and 2008, and for the EV/EBITDA multiple Perrigo was undervalued for all years except for 2007, 2008 and barely 2009.

Another important conclusion is that, in general, Perrigo is a company whose REVAAM multiples are over the sector REVAAM multiples, suggesting that it outperforms other companies in the sector, and may be a good investment in the long run.

Conclusions

REVAAM Model does present several limitations: such as a) it considers few factors to define the multiples, b) due to logarithms transformation it cannot consider companies with negative values for the factors, c) it is based on historical data and does not take into consideration future growth, d) it requires at least 30 companies for the linear regressions to be significant, and some sectors do not include that number of companies, e) is applied to public companies because of information availability and f) may not apply to markets where there are few public companies in order to be statically significant.

However, we believe that it provides a better estimate to relative valuation analysis than simply using average multiples. We have seen that even for sector analysis some valuations could be 50% percent off (both positive and negative), and when valuing individual companies, such as the one used as example, we may be understating its value if we use only the average sector multiple. In our experience most (over 60%) Mergers and Acquisitions are valued using simple average multiples.

As stated initially, the preferred valuation method for the authors is the use of DCF analysis, however relative valuation may give a quick insight of the intrinsic value. Just considering one, two or more financial factors that differentiate companies' valuations, is a better proxy to what a DCF analysis will show for different companies. The model also lets us compare market valuations to those derived from the REVAAM Model. As seen in the recent crises the market sometimes is not rational, and this model let us take into consideration objective financial and operational factors without the inertia of bull or bear markets. Additionally, the REVAAM Model provides different depth levels of analysis, from the whole market to sector and company specific calculations, and allows for time comparison based on the prevailing factors at each period.

Further work in this model may include determining other significant factors that may affect valuations to be included in the regression analyses, also developing a version for "mature" markets and markets "in development", that take into consideration risk differences among countries.

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