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BUSINESS VALUATION DIGEST

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Multiples Used to Estimate Corporate Value

IN THIS ISSUE

Multiples Used to Estimate Corporate Value1

Business Valuation and Damage Quantification Issues in Interlocutory Injunction applications14

What's Your Real Cost of Capital?18

Post-Mortem Analysis – Significant Issues and Findings in the Divestiture of Viper26

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We evaluated various multiples practitioners use to estimate company value. We found, first, that the asset multiple (market value to book value of assets) generally generates more precise and less biased estimates than do the sales and the earnings multiples. Second, although adjusting for companies' cash levels does not improve estimates of company value, using forecasted earnings rather than trailing earnings does. Third, the earnings before interest, taxes, depreciation, and amortization (EBITDA) multiple generally yields better estimates than does the EBIT multiple. Finally, the accuracy and bias of value estimates, as well as the relative performance of the multiples, vary greatly by company size, company profitability, and the extent of intangible value in the company.

The valuation of companies is a primary application of finance theory. The typical finance curriculum, therefore, devotes substantial time to this topic. The theoretical emphasis is usually on the discounted cash flow valuation (DCF) technique, but it is often cumbersome to use and is sensitive to a host of assumptions. Consequently, investment bankers and appraisers regularly use valuation by multiples, such as the P/E multiple, instead of or as a supplement to DCF analysis.

Despite the importance of valuation in a variety of contexts, surprisingly few studies have examined the accuracy of various valuation techniques. Alford (1992) studied the effect of the choice of matching (comparable) companies on valuation accuracy when the P/E multiple is used. Other studies, including Kaplan and Ruback (1995), Kim and Ritter (1999), and Gilson,

Hotchkiss, and Ruback (2000) applied DCF and various multiples to value rather narrow subsets of companies, such as those that operate in bankruptcy or carry out initial public offerings (IPOs). To our knowledge, no study has explicitly examined the overall performance of different multiples. Indeed, Kaplan and Ruback suggested that "there is no obvious method to determine which measure of performance . . . is the most appropriate for comparison" (p. 1067). Similarly, Kim and Ritter stated that "there is no clear-cut answer for which multiples should be used" (p. 416). The purpose of the study reported here was to examine the bias and valuation accuracy of multiples based on earnings, sales, or book value of assets for several categories of companies.

Our research is relevant to practitioners, such as investment bankers and analysts, who use multiples to value companies, as well as to academic researchers. For instance, the stream of literature on the effect corporate diversification has on corporate value uses multiples to value individual segments of a company and then compares the estimated aggregate value with the market value to determine "excess value" created by diversification (Berger and Ofek 1995, 1996, 1999; Denis, Denis, and Sarin 1997). The results presented here may help such researchers choose multiples that minimize the potential bias embedded in the value measures, especially if the companies or company segments exhibit certain irregularities.



Related Literature

In theory, the valuation of a company is a straight-forward matter accomplished via the DCF method. DCF analysis involves estimating the cash flows associated with the company and then discounting those cash flows by a discount rate commensurate with their risk level. Because accurately estimating the company's cash flows and choosing the appropriate discount rate are difficult, DCF analysis is often abandoned in favor of valuation by multiples. Valuation by multiples entails calculating particular multiples for a set of benchmark companies and then finding the implied value of the company of interest based on the benchmark multiples. Although many studies incorporate this approach, no multiple is uniformly accepted as the one on which to base valuation.

Alford used the P/E multiple to assess how the benchmark companies should be chosen. Using such criteria as industry, assets, return on equity, and combinations of these factors and a sample of 4,698 companies from 1978, 1982, and 1986, he examined seven potential sets of comparable companies. He found that choosing benchmark companies based on industry alone or in combination with ROE or total assets leads to the most accurate valuations and that the accuracy improves as the number of SIC digits used to define an industry is increased up to the third digit. Alford also found a positive relationship between company size and valuation accuracy. The median percentage errors in valuation ranged from 23.9 percent to 25.3 percent.

Kaplan and Ruback estimated valuations for a sample of highly leveraged transactions (HLTs) based on market value to EBITDA (earnings before interest, taxes, depreciation, and amortization). The benchmark multiples were the median multiples for companies in the same industry, companies that were involved in similar transactions, or companies in the same industry that were involved in similar transactions. For comparison, Kaplan and Ruback also computed valuations by using the DCF method. For their sample of 51 HLTs between 1983 and 1989, they found

both the DCF and multiple methods to be useful valuation tools with similar levels of precision. Depending on the benchmark multiple used, 37–58 percent of the valuations fell within 15 percent of the actual HLT transaction value.

To evaluate the value created in acquisitions of bankrupt companies relative to nonbankrupt companies, Hotchkiss and Mooradian (1998) first used valuation by multiples to estimate the value of bankrupt companies. They then compared these values with the acquisition prices to determine the degree of discounting associated with the bankrupt companies. The multiples they applied were the ratios of enterprise value to sales and of enterprise value to assets, in which “enterprise value” was defined as the transaction price minus fees and expenses plus liabilities. They reported that bankrupt companies are acquired at discounts of 40–70 percent.

Kim and Ritter used several measures for the matching companies in the valuation of IPO companies.¹ The multiples used in their study were P/E, market value to book value, price to sales, enterprise value to sales, and enterprise value to EBITDA. Kim and Ritter found that all of these multiples yield positively biased estimates but that the EBITDA multiple results in the most precise valuation, particularly for the more established IPO companies. They also showed that valuations improve when forecasted earnings rather than historical earnings are used and when the comparable companies are chosen by a specialist research firm rather than a mechanical algorithm.

Gilson et al. compared the DCF valuation method and the use of multiples for valuation of companies emerging from bankruptcy. When they used EBITDA multiples based on the median of companies in the same industry, about 21 percent of the valuations fell within 15 percent of market values.² Although the value estimates generated by the earnings multipliers in the Gilson et al. study were generally unbiased, they exhibited a wide degree of dispersion. Gilson et al. suggested two primary causes of this dispersion. First, in comparing their findings with the earlier work of Kaplan and Ruback, the authors concluded that the HLT valuations are more precise than the bankruptcy valuations because of a greater degree of market involvement and, therefore, greater

information availability in the case of HLTs. Second, the authors contended that valuation errors are greater when certain claimholders have incentives to incorrectly state company value so as to achieve better results from the bankruptcy process.

Data and Valuation Method

The companies in our analysis were all active (financial and nonfinancial) companies in the Compustat database at the time of the study. All of the financial data are from fiscal year 1998, whereas the earnings forecasts pertain to fiscal year 1999. The data were obtained from Standard & Poor's *Research Insight*, which includes data that are available in the conventional Compustat database as well as recent I/B/E/S earnings forecasts. Panel A of Table 1 presents descriptive statistics for the 8,621 companies in the sample. The median company had a book value of assets of \$136 million, sales of \$92 million, and total enterprise value (i.e., book value of assets less book value of equity plus market value of equity) of \$238 million. The median ratio of EBITDA to book value of assets was 0.077, and the median ratio of cash to book value of assets was 0.066. Note that the distributions for all of these financial characteristics are heavily skewed, as indicated by the large differences between the means and medians.

The Multiples. We estimated values on the basis of 10 multiples; the following 6 multiples were used unadjusted:

- P/E – price of the company's common equity at the end of the fiscal year scaled by earnings per share for the same year,³
- forecasted P/E – price of common equity scaled by the median forecast of next year's EPS from I/B/E/S,
- enterprise value/sales – enterprise value at the end of the fiscal year scaled by total revenues,
- enterprise value/book value – enterprise value scaled by book value of assets,
- enterprise value/EBITDA, and
- enterprise value/EBIT – enterprise value scaled by earnings before interest and taxes.

Unlike net income, both EBIT and EBITDA are independent of capital structure, so differences in

capital structure among companies should not introduce bias when one is using the EBIT and EBITDA multiples to estimate total enterprise value. What is not clear is whether one should subtract depreciation and amortization from the earnings measure, which is why we examined two different earnings multiples.

In their estimation of total value, Kaplan and Ruback and Kim and Ritter subtracted the cash and cash equivalents, which makes sense for two reasons. First, cash and cash equivalents are easy to value because the book and market values should be identical, so multiples are not needed to value these assets. Second, excess cash can often be paid out to shareholders without affecting normal operations. Multiples based on earnings and sales will yield the same value regardless of the cash level, however, so companies with a great deal of cash will be undervalued relative to companies with little cash. Consequently, we also reestimated the multiples involving enterprise value after adjusting for the cash and cash equivalents:

- adjusted enterprise value/sales,
- adjusted enterprise value/adjusted book value,
- adjusted enterprise value/EBITDA, and
- adjusted enterprise value/EBIT.

Panel B of Table 1 provides summary statistics for the 10 multiples. Note that the median P/E multiple based on current earnings is 16.5, whereas the median based on forecasted earnings is 15.6. Similarly, the median ratio of total enterprise value to EBITDA is 12.9, whereas for EBIT, the median ratio is 18.3. The multiples based on book value of assets and sales are naturally much lower. The median value-to-sales ratio is 2.1, and the median market-to-book ratio is 1.3. The multiples that use values adjusted for cash levels differ slightly from the multiples that use unadjusted values, as expected. All of the means are greater than the medians, suggesting that the distributions of multiples are positively skewed.

Table 1. Summary Statistics

Measure	Mean	Median	25th Percentile	75th Percentile
<i>A. Descriptive statistics</i>				
Book value of assets (\$ million)	3,047	136	27	716
Sales (\$ million)	1,259	92	19	449
Total enterprise value (\$ million)	4,728	238	51	1,182
EBITDA/book value of assets	-0.008	0.077	-0.010	0.149
EBIT/book value of assets	-0.055	0.042	-0.052	0.102
Cash/book value of assets	0.163	0.066	0.019	0.222
<i>B. Multiples used in later analyses</i>				
P/E	31.1	16.5	11.9	25.4
Forecasted P/E	25.6	15.6	11.5	23.1
Value/sales	21.8	2.1	1.0	6.0
Value/book value	2.0	1.3	1.0	2.0
Value/EBITDA	28.3	12.9	9.0	25.2
Value/EBIT	54.3	18.3	12.7	35.8
Adjusted value/sales	19.6	1.8	0.9	5.4
Adjusted value/adjusted book value	3.3	1.3	1.0	2.3
Adjusted value/EBITDA	25.5	11.9	8.4	23.0
Adjusted value/EBIT	50.5	17.2	11.8	33.1

Note: Total enterprise value was estimated as total assets less book value of equity plus the product of price per common share and number of common shares outstanding. For the multiples in Panel B, "value" is total enterprise value, "adjusted value" is total enterprise value less cash and cash equivalents, and "adjusted book value" is book value less cash and cash equivalents.

Identification of Comparable Companies.

Alford examined the effect of the choice of the companies to be used as matching companies and found that comparable companies chosen on the basis of industry yielded the smallest estimation errors when valuing companies by use of the P/E multiple. To minimize the estimation errors in our analysis, we thus chose matching companies on the basis of industry. In particular, for each company whose value we were trying to estimate, we identified all companies with the same three-digit primary SIC code with available data to estimate multiples. If fewer than five companies were identified, we relaxed the industry requirement to companies with the same two-digit SIC code, and then if necessary, to companies with the same one-digit SIC code.

To the extent that companies operate in several industries, our procedure for identifying matching companies is not optimal. Presumably, valuation accuracy could be improved if we could replicate a portfolio of each company's segments by using comparable companies from different industries. Although such replication can be done in practice, the procedure is

impractical in a study such as ours because of the subjectivity involved in choosing the matching companies and the tremendous labor needed for the large number of valuations we conducted. Furthermore, a refinement of our procedure for generating matching companies would not affect the *relative* performance of the various multiples.

Estimation of Value. We estimated value by multiplying the median multiple for comparable companies by the relevant financial figure for the company (e.g., EBIT in the case of the EBIT multiple). For the two P/E multiples, the result was estimates for the value per share of common equity; for the other multiples, this procedure yielded estimates for the total enterprise value. When the multiples were adjusted for cash levels, the resulting estimates of total enterprise value were net of cash. Therefore, to facilitate comparisons of the multiples that yielded total enterprise value estimates, we added back cash. Following Kaplan and Ruback, Kim and Ritter, and Gilson et al., we calculated the valuation error as the natural logarithm of the ratio of the estimated value to the market value.

Empirical Results

Statistics for the valuation errors for the whole sample are reported in Panel A of Table 2. The mean and median statistics indicate the extent to which the valuation estimates are biased (i.e., zero indicates no bias). The medians suggest that the various multiples do not yield biased estimates for the overall sample; the means suggest that all multiples yield negative biases. In the remainder of the analysis, we will focus on the medians as an indication of bias so as to mitigate the effect of outliers.

The other statistics describe the distribution of the valuation errors and will be used as measures of the accuracy of the estimates. All of these statistics (i.e., the mean and median absolute errors, the fraction of errors that are less than 15 percent, and the first and third quartiles) yield similar information. In particular, they all give the same rank order of the various valuation methods. Consequently, we will also focus on the fraction of errors that are less than 15 percent (the row "Fraction within 15%"). This approach allows our findings to be compared with those of Kaplan and Ruback, Kim and Ritter, and Gilson et al., who all used the same measure of accuracy.

The fraction within 15 percent in Panel A of Table 2 varies from about 0.23 to 0.35. The comparable data for Kaplan and Ruback (using the EBITDA multiple for a sample of highly leveraged transactions) were 0.37 to 0.58, for Kim and Ritter (using various multiples for a sample of IPOs), 0.12 to 0.27, and for Gilson et al. (using the EBITDA multiple for a sample of bankrupt companies), 0.21.

A direct comparison of the multiples that provide estimates of equity value versus those that provide estimates of total enterprise value may not be entirely fair, but several comparisons of these data in Panel A do provide valuable insights. First, the data for the fraction within 15 percent indicate that the P/E multiple based on forecasted earnings provides more accurate estimates than the P/E based on historical earnings. This finding is consistent with what Kim and Ritter found in the context of IPOs. Second, adjusting for the cash levels has an ambiguous and marginal effect on valuation accuracy. Thus, in the remainder of this article, we ignore the multiples with such

adjustments. Third, of the total enterprise value multiples, the asset multiple provides the most accurate and the sales multiple provides the least accurate estimates. The earnings-based multiples provide accuracy in-between, and the multiple based on EBITDA provides better estimates than that based on EBIT. Apparently, therefore, depreciation expenses distort the information value of earnings, perhaps because depreciation schedules do not accurately reflect the actual deterioration of asset value. This result is quite persistent throughout our analysis, which suggests that any earnings-based multiple generally should use EBITDA rather than EBIT.

Panel B pertains only to companies with positive earnings (i.e., all definitions of earnings had to be positive for both the companies for which we estimated value and any comparable companies). We carried out this analysis because we feared that the differences in accuracy among the multiples was attributable to different samples. In particular, earnings-based multiples require positive earnings, so the sample sizes in Panel A differ widely among the multiples. Panel B shows that, although restricting the sample to companies with positive earnings improved the accuracy of the estimates for all the multiples, the performance of the multiples vis-à-vis one another remained the same.

Because of the liquid nature of their assets, financial companies are likely to be easier to value than nonfinancial companies. Thus, combining financial and nonfinancial companies could cloud the results. Therefore, we separated the sample into nonfinancial and financial companies and examined the two company types separately.

Nonfinancial Companies. Within the category of nonfinancial companies, defined as those with a primary SIC code starting with a number other than 6, we broke down the group further by size and by level of earnings. The errors for the size categories are in Panels A–C of Table 3. Several results are noteworthy. First, consistent with Alford, based on the fraction within 15

Table 2. Valuation Errors for the Total Sample

Measure	Equity Valuation		Total Enterprise Valuation							
	P/ E	Forecasted P/ E	Unadjusted				Adjusted for Cash Levels			
			Value/ Sales	Value/ Book Value	Value/ EBITDA	Value/ EBIT	Value/ Sales	Value/ Book Value	Value/ EBITDA	Value/ EBIT
<i>A. All companies</i>										
Mean	-0.058	-0.063	-0.114	-0.079	-0.119	-0.135	-0.053	-0.086	-0.082	-0.089
Median	0.002	-0.001	0.001	0.000	-0.001	-0.001	0.000	0.001	0.000	0.000
Mean absolute error	0.507	0.457	0.637	0.387	0.456	0.485	0.554	0.408	0.411	0.435
Median absolute error	0.342	0.305	0.429	0.259	0.297	0.308	0.407	0.269	0.280	0.295
Fraction within 15%	0.250	0.289	0.225	0.351	0.285	0.269	0.232	0.341	0.295	0.280
25th percentile	-0.361	-0.323	-0.439	-0.301	-0.349	-0.369	-0.415	-0.312	-0.317	-0.334
75th percentile	0.324	0.285	0.418	0.228	0.262	0.270	0.400	0.237	0.254	0.267
Number of observations	5,418	4,171	7,820	7,959	5,932	5,696	7,794	7,925	5,930	5,695
<i>B. Companies with positive earnings</i>										
Mean	-0.049	-0.049	-0.014	-0.057	-0.053	-0.096	-0.003	-0.056	-0.038	-0.060
Median	0.002	-0.001	0.002	0.003	0.000	-0.001	0.003	0.002	0.001	-0.001
Mean absolute error	0.489	0.406	0.469	0.332	0.365	0.429	0.447	0.345	0.343	0.390
Median absolute error	0.334	0.283	0.344	0.224	0.258	0.285	0.332	0.226	0.248	0.277
Fraction within 15%	0.255	0.310	0.273	0.392	0.320	0.288	0.275	0.388	0.331	0.291
25th percentile	-0.358	-0.297	-0.338	-0.245	-0.282	-0.327	-0.319	-0.242	-0.271	-0.309
75th percentile	0.319	0.270	0.349	0.208	0.239	0.256	0.342	0.213	0.233	0.251
Number of observations	5,107	3,654	5,107	5,107	5,107	5,107	5,106	5,106	5,106	5,106

Note : Fraction within 15 percent is defined as the fraction of valuation errors whose absolute value is less than 0.15.

percent, the valuations were more accurate for large companies. This result might not be surprising, because small companies often have erratic earnings and their values are derived from a small set of projects. In contrast, large companies can be viewed as a large portfolio of projects; their values continuously fluctuate, but the fluctuations tend to offset each other in the aggregate, so the total value is reasonably stable. Second, the medians suggest that the valuation bias was positive for small companies and negative for large companies. In other words, our valuation procedures tended to overvalue small companies and undervalue large companies. Third, for all company sizes, the asset multiple yielded the most accurate assessments whereas the sales multiple yielded the least accurate. For example, for medium-sized companies (Panel B), the fraction within 15 percent gives this multiple as roughly 0.20 and 0.30 for, respectively, the sales and asset multiples. A minor exception is large companies, for which the EBITDA multiple provided marginally more accurate values than did the asset multiple.

Next, we examined the performance of the multiples for different levels of earnings. Panels D – G of Table 3 provide results for companies with, respectively, negative earnings, low earnings (EBITDA scaled by assets between 0.00 and 0.05), medium earnings (EBITDA scaled by assets between 0.05 and 0.15), and high earnings (EBITDA scaled by assets above 0.15). In Panel D, the numbers for the earnings-based multiples are, naturally, missing. For companies with low or medium earnings, the asset multiple provided the most precise estimates, although they tended to be positively biased. In contrast, the earnings-based multiples provided very poor estimates when earnings were low. For companies with low earnings, Panel E indicates the fraction within 15 percent was only 0.01 for the EBITDA multiple, compared with 0.24 for the asset multiple. Furthermore, the earnings-based multiples provided estimates that are severely negatively biased. Consequently, earnings-based multiples should be avoided when assessing the value for companies with low but positive earnings because these multiples generally give unrealistically low estimates. This problem probably arises because the multiple based on matching companies is multiplied by earnings that are

uncharacteristically and/or temporarily low. Consistent with this line of reasoning, using forecasted rather than trailing earnings is considerably more helpful when earnings are low, as indicated by the results for the P/E multiples.

For companies with high earnings (Panel G), the earnings-based multiples performed as well as or better than the other multiples. For example, the fraction within 15 percent was about 0.25 and 0.27, respectively, for the asset and the EBITDA multiples.

A concern with the earnings-based multiples, however, is that they yield estimates that are positively biased. Conversely, the sales and asset multiples are negatively biased. These opposite biases suggest that a combination of multiples would perform better than individual multiples. As a test of this conjecture, we estimated a new set of values by weighing equally the values generated by the asset and EBITDA multiples. Indeed, this hybrid performed better than the individual multiples. We found the mean and median valuation errors for the hybrid to be, respectively, -0.077 and -0.052 for companies with high earnings, which suggests that the hybrid's bias is smaller than for the other multiples. Moreover, we found the fraction within 15 percent for the hybrid to be 0.28, which is slightly higher than the fractions for the other multiples given in Panel G.

Financial Companies. The results for the financial companies (defined as companies whose primary SIC code starts with the number 6), grouped as in the previous section, are given in Table 4. In general, the valuations are more accurate for financial companies than for nonfinancial companies. The major trends are similar, however, for the two types of companies.

For all company sizes, Table 4 indicates that the asset multiple apparently provides the best estimates of value. The superior performance of this multiple is most pronounced for large companies (Panel C),

Table 3. Valuation Errors for Nonfinancial Companies

Measure	Equity Valuation		Total Enterprise Valuation			
	P/E	Forecasted P/E	Value/ Sales	Value/ Book Value	Value/ EBITDA	Value/ EBIT
<i>A. Small companies (book value of assets ≤ \$100 million)</i>						
Mean	0.025	0.053	-0.133	-0.053	-0.151	-0.152
Median	0.139	0.144	0.137	0.055	0.037	0.071
Fraction within 15%	0.148	0.178	0.113	0.208	0.178	0.171
Number of observations	1,384	754	3,033	3,143	1,692	1,455
<i>B. Medium companies (\$100 million < book value of assets ≤ \$1 billion)</i>						
Mean	-0.089	-0.079	-0.095	-0.089	-0.098	-0.120
Median	-0.001	0.004	-0.003	-0.007	0.023	0.019
Fraction within 15%	0.244	0.263	0.198	0.299	0.286	0.271
Number of observations	1,726	1,545	2,146	2,158	1,942	1,814
<i>C. Large companies (book value of assets > \$1 billion)</i>						
Mean	-0.143	-0.141	-0.205	-0.144	-0.150	-0.195
Median	-0.073	-0.069	-0.165	-0.061	-0.059	-0.090
Fraction within 15%	0.291	0.334	0.231	0.385	0.389	0.315
Number of observations	1,020	1,002	1,160	1,160	1,127	1,079
<i>D. Companies with negative earnings (EBITDA/book value of assets < 0)</i>						
Mean	-	-	-0.644	-0.122	-	-
Median	-	-	-0.304	0.013	-	-
Fraction within 15%	-	-	-0.100	0.185	-	-
Number of observations	-	-	1,546	1,659	-	-
<i>E. Companies with low earnings (0 < EBITDA/book value of assets ≤ 0.05)</i>						
Mean	-0.929	-0.281	0.101	0.196	-1.445	-1.896
Median	-0.691	-0.134	0.190	0.237	-1.254	-1.727
Fraction within 15%	0.114	0.198	0.116	0.244	0.012	0.010
Number of observations	175	162	491	491	491	208
<i>F. Companies with medium earnings (0.05 < EBITDA/book value of assets ≤ 0.15)</i>						
Mean	-0.126	-0.081	0.102	0.079	-0.091	-0.263
Median	-0.027	0.005	0.114	0.096	-0.030	-0.125
Fraction within 15%	0.229	0.284	0.198	0.352	0.330	0.273
Number of observations	2,081	1,532	2,409	2,409	2,409	2,275
<i>G. Companies with high earnings (EBITDA/book value of assets > 0.15)</i>						
Mean	0.111	-0.014	-0.072	-0.326	0.171	0.194
Median	0.090	0.010	-0.060	-0.271	0.184	0.204
Fraction within 15%	0.232	0.271	0.184	0.246	0.265	0.244
Number of observations	1,809	1,422	1,860	1,860	1,860	1,841

for which the fraction within 15 percent is a high 0.83 and the median valuation error is only -0.01. For medium-sized and large companies, the sales multiple provided better estimates than the earnings-based multiples did – a result that differs from the result for nonfinancial companies.

For companies with low or medium earnings (Panels E and F), the asset multiple provided the best estimates of value. For

companies with low earnings, more than 0.91 of the values derived from the asset multiple fell within 15 percent of the actual value; the corresponding figure for the sales multiple is roughly 0.69, but the figures for the earnings-based multiples are less than 0.40.

For companies with high earnings, the various multiples generated estimates that are roughly equally precise. The asset multiple provided negatively biased estimates, however, while the

Table 4. Valuation Errors for Financial Companies

Measure	Equity Valuation		Total Enterprise Valuation			
	P/E	Forecasted P/E	Value/ Sales	Value/ Book Value	Value/ EBITDA	Value/ EBIT
<i>A. Small companies (book value of assets ≤ \$100 million)</i>						
Mean	0.025	-0.154	0.046	-0.229	-0.055	-0.092
Median	0.037	-0.108	0.105	-0.026	0.019	0.121
Fraction within 15%	0.163	0.239	0.180	0.336	0.220	0.176
Number of observations	160	46	267	277	177	182
<i>B. Medium companies (\$100 million < book value of assets ≤ \$1 billion)</i>						
Mean	-0.035	-0.020	0.008	-0.037	-0.048	-0.052
Median	0.027	0.022	0.019	0.013	0.024	0.018
Fraction within 15%	0.322	0.327	0.575	0.741	0.378	0.362
Number of observations	574	349	633	640	519	603
<i>C. Large companies (book value of assets > \$1 billion)</i>						
Mean	-0.060	-0.058	-0.105	-0.037	-0.114	-0.129
Median	-0.043	-0.015	-0.037	-0.011	-0.029	-0.038
Fraction within 15%	0.399	0.434	0.540	0.831	0.341	0.355
Number of observations	554	475	581	581	475	563
<i>D. Companies with negative earnings (EBITDA/book value of assets < 0)</i>						
Mean	—	—	-0.477	-0.163	—	—
Median	—	—	-0.362	-0.028	—	—
Fraction within 15%	—	—	0.108	0.333	—	—
Number of observations	—	—	111	120	—	—
<i>E. Companies with low earnings (0 < EBITDA/book value of assets ≤ 0.05)</i>						
Mean	-0.085	-0.046	-0.053	0.002	-0.204	-0.222
Median	-0.008	-0.002	-0.009	0.004	-0.052	-0.066
Fraction within 15%	0.393	0.449	0.687	0.909	0.383	0.347
Number of observations	753	564	802	802	802	789
<i>F. Companies with medium earnings (0.05 < EBITDA/book value of assets ≤ 0.15)</i>						
Mean	0.035	-0.030	0.133	-0.042	0.117	0.107
Median	0.055	-0.012	0.089	-0.019	0.105	0.132
Fraction within 15%	0.238	0.273	0.223	0.470	0.271	0.257
Number of observations	235	154	251	251	251	249
<i>G. Companies with high earnings (EBITDA/book value of assets > 0.15)</i>						
Mean	0.195	-0.121	0.297	-0.685	0.387	0.388
Median	0.142	-0.103	0.153	-0.487	0.390	0.403
Fraction within 15%	0.190	0.203	0.195	0.178	0.186	0.169
Number of observations	116	74	118	118	118	118

other valuation measures provided positively biased estimates. This result suggests that, as for nonfinancial companies, a combination of multiples would yield the best estimates.

Companies with High Intangible Value.

Companies with a large part of their value in intangible “assets,” such as high-technology companies and companies with substantial research and development activities, may be particularly

hard to value because such a small portion of their value lies in assets in place whereas a large portion derives from uncertain future growth opportunities. A further complication with such companies is that their high R&D expenses reduce current earnings, even though R&D projects could be perceived as investments for the future; in such a case, current earnings may be a bad predictor of value.

To assess the performance of the valuation multiples for companies with high intangible value, we first identified companies in our sample whose names ended with “.com.” Dot-com companies are typically small companies that are associated with the Internet. They rarely report positive earnings, and most of their value is tied to their potential to become major players on the Internet in the future, in which case they will presumably generate massive earnings. The valuation errors for dot-coms are reported in Panel A of Table 5. The 27 dot-coms included in the analysis are spread among 14 three-digit industries. Because only two of the companies reported positive earnings, we report results for multiples based only on sales and book value of assets.

The valuation errors for dot-coms are severe. None of the estimated values is within 15 percent of the actual values. The median valuation error of -0.71 for the asset multiple suggests that the actual value is roughly twice

as large as the estimated value; the -1.51 median valuation error for the sales multiple suggests that the actual value is more than four times larger than the estimated value. The high actual values of dot-coms relative to estimated values are consistent with Cooper, Dimitrov, and Rau (2001), who reported that companies roughly double their value when they change their name to include a “.com.” Our results suggest that multiples are not suitable for valuing these companies. Instead, investors might have to resort to valuing the vast real options embedded in these companies’ assets (see, for example, Trigeorgis 1996).

As an alternative to using “.com” to identify companies with high intangible value, we identified those companies whose R&D expenses exceeded 10 percent of their book value. The valuation errors for these companies are reported in Panel B of Table 5. The results are similar to those for dot-coms, albeit not as extreme. The fraction within 15 percent varies from 0.11 to 0.17 – generally lower than the data for other nonfinancial companies reported in Table 3. All our methods generated

Table 5. Valuation Errors for Companies with High Intangible Value

Measure	Equity Valuation		Total Enterprise Valuation			
	P/E	Forecasted P/E	Value/ Sales	Value/ Book Value	Value/ EBITDA	Value/ EBIT
<i>A. Dot-com companies</i>						
Mean	—	—	-1.348	-0.503	—	—
Median	—	—	-1.511	-0.713	—	—
Fraction within 15%	—	—	0.000	0.000	—	—
Number of observations	—	—	25	27	—	—
<i>B. Companies with high R&D expenses (R&D/book value of assets > 0.10)</i>						
Mean	-0.260	-0.210	-0.400	-0.197	-0.302	-0.307
Median	-0.130	-0.127	-0.190	-0.094	-0.160	-0.147
Fraction within 15%	0.152	0.153	0.114	0.153	0.166	0.138
Number of observations	388	365	998	1,033	435	377
<i>C. Pharmaceutical companies with high R&D expenses (R&D/book value of assets > 0.10)</i>						
Mean	-0.445	-0.295	-0.695	-0.165	-0.499	-0.582
Median	-0.326	-0.202	-0.471	-0.202	-0.361	-0.272
Fraction within 15%	0.129	0.156	0.089	0.124	0.212	0.259
Number of observations	31	32	192	218	33	27
<i>D. Pharmaceutical companies with low R&D expenses (R&D/book value of assets ≤ 0.10)</i>						
Mean	0.174	0.067	0.617	0.190	0.168	0.053
Median	0.127	0.016	0.736	0.315	0.234	0.136
Fraction within 15%	0.298	0.314	0.103	0.115	0.183	0.193
Number of observations	57	51	78	78	60	57

estimates that tend to be lower than actual values, presumably because the valuation procedures fail to fully capture the value of future growth opportunities created by the R&D activities. The negative valuation bias is smallest for the asset multiple and largest for the sales multiple, although the valuation accuracy as determined by the fraction within 15 percent is actually best for the EBITDA multiple.

A potential problem with assessing the valuation procedure for companies with high R&D expenses is that these companies probably operate in R&D-intensive industries, so the matching companies on which the multiples are based have similarly high R&D expenses. Consequently, isolating the effect of R&D on the valuation errors is difficult. To alleviate this problem, we turned our attention to companies in the pharmaceutical industry. This industry consists of both generic producers and brand-name producers, which require different levels of R&D. We partitioned the companies in this industry into those with R&D scaled by assets more than 0.10 and those with R&D scaled by assets less than 0.10. The valuation errors for the two groups are reported in Panels C and D, respectively, of Table 5. For pharmaceutical companies with high R&D expenses (Panel C), the median valuation errors are negative for all multiples, which is consistent with the results in Panels A and B, and they range from about -0.20 for the asset multiple to -0.47 for the sales multiple. Valuation accuracy as measured by the fraction within 15 percent ranges from 0.09 for the sales multiple to 0.26 for the EBIT multiple. Note, however, that because of the substantial R&D expenses for these companies, earnings were usually negative, so we could obtain values based on earnings multiples for only about 15 percent of the companies. Thus, comparisons of earnings multiples with other multiples is difficult.

For pharmaceutical companies with low R&D expenses, the valuation bias is, not surprisingly, the opposite of that for companies with high R&D expenses. In particular, Panel D indicates that the estimated values tend to be higher than actual values for all multiples. This bias might arise because the comparison companies used to generate multiples often have substantial intangible value, thereby positively biasing the multiples. Another interesting observation for pharmaceutical companies is that the EBIT multiple generates more accurate and less

biased value estimates than the EBITDA multiple, which contradicts results for other categories of companies reported in this study.

Conclusion

Although practitioners and academic researchers frequently use multiples to assess company values, there is no consensus as to which multiple performs best. To our knowledge, this study is the first to compare the performance of various multiples.

From our estimates of the value for the universe of Compustat companies based on various multiples, we have documented several results that should be of great interest to practitioners and researchers. Our main results are as follows:

First, in general, all the multiples yield estimates that are somewhat negatively biased. That is, the mean valuation errors are slightly negative and the median valuation errors are roughly zero.

Second, the asset value multiple generally yields better (i.e., more precise and less biased) estimates of value than do sales and earnings multiples, especially for financial companies but also for nonfinancial companies.

Third, adjusting for companies' cash levels does not improve the value estimates.

Fourth, using forecasted earnings rather than trailing earnings improves the estimates of the P/E multiple.

Fifth, the EBITDA multiple generally yields better estimates than does the EBIT multiple, except for pharmaceutical companies.

Finally, the accuracy and bias of the value estimates varied greatly according to company size, profitability, and the extent of intangible value. For several company categories, we found that the asset multiple does not yield the best estimates.

Valuations were more precise for large companies, although the bias was also more negative than for medium and small companies. For all company sizes, the asset multiple performed the best and the sales multiple performed the worst. Valuations based

on the asset multiple seem most precise for companies with mediocre or low earnings and about equally as precise as valuations based on other multiples for companies with high earnings. The bias for the different earnings groups varied among the multiples. For companies with high earnings, earnings-based multiples produced positive valuation biases whereas the asset multiple yielded negative biases, and vice versa for companies with low earnings. These results suggest that, for some companies, a combination of multiples with opposite biases might perform better than individual multiples.

Valuations tend to be more accurate for financial than for nonfinancial companies, presumably because financial companies have substantial liquid assets that are easier to value. Finally, we found the valuation estimates to be generally worse for companies with high intangible assets, especially for the dot-coms. Presumably, the reason is that the estimates do not fully capture the growth opportunities and other intangibles associated with these companies.

Notes

1. The use of multiples is standard practice to value IPOs because the companies are typically so young that forecasting cash flows is difficult.
 2. The difference between the EBITDA multiple used by Kaplan and Ruback and that used by Gilson et al. is that the EBITDA was a historical figure in the Kaplan – Ruback study and a forecast in the Gilson et al. study.
 3. All of the market value figures were taken from the end of the fiscal year. It can be argued that the price at that point does not fully capture the financial information for that year because the fourth quarter results had not yet been released. Nonetheless, we believe that the capital market can fairly accurately estimate the revenues and earnings for the year, even if some figures are yet to be officially released. We considered using market values a few months after the end of the fiscal year to ensure that all of the financial information for the year was embedded in the market value, but we were concerned that consequential events or announcements might have occurred in the interim, thereby making these values less appropriate for our tests.
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Business Valuation and Damage Quantification Issues in Interlocutory Injunction applications

An interlocutory injunction is a court order that prohibits a party from pursuing a course of conduct such as selling a product alleged to infringe on a patent, or using a trade name alleged to cause confusion with an existing trade name. If granted, an interlocutory injunction is effective from the date it is issued until the dispute is resolved at trial (or otherwise). The granting of an interlocutory injunction is considered to be a very serious matter because it prevents a party from taking a course of action that they would otherwise be permitted to take.

In a recent example, Boston Pizza International Inc., the licensee of the "Boston Pizza" trademark, applied for an interlocutory injunction to prevent Boston Market Canada Company from using the "Boston Market" trade name. It was alleged that the use of this name was likely to cause confusion with the "Boston Pizza" trade name, resulting in harm to Boston Pizza International Inc., including depreciation of the goodwill associated with its trade name¹.

In determining whether to grant an interlocutory injunction courts generally apply the following three part test from the *R.J.R.-MacDonald Inc. v. Canada (Attorney General)*² case:

- i) There is a serious question to be tried;
- ii) The applicant will suffer irreparable harm if the injunction is not granted; and
- iii) An assessment of the balance of convenience.

Damage quantification issues frequently arise in interlocutory injunction applications in assessing whether the applicant is anticipated to suffer irreparable harm (i.e. the second test noted above) if an injunction is not granted and the applicant is ultimately

successful at trial. The damage quantification issues in this article will be discussed in the context of intellectual property rights, including patent, copyright or trademark infringement, as injunction applications are frequently made to enforce these intellectual property rights.

Definition of Irreparable Harm

Irreparable harm is defined based on the *R.J.R.-MacDonald Inc. v. Canada (Attorney General)* case as follows:

*"Irreparable" refers to the nature of the harm suffered rather than its magnitude. It is harm which either cannot be quantified in monetary terms or which cannot be cured, usually because one party cannot collect damages from the other.*¹⁶

Examples of the types of harm that may be considered irreparable to the plaintiff, if an injunction is not granted and the plaintiff is ultimately successful at trial, include:

- Where one party will be put out of business;
- Where one party will suffer permanent market loss or irrevocable damage to its business reputation; and
- Where a permanent loss of natural resources will result if the activity is not enjoined.

Role of the Expert in Business Valuation and Damage Quantification

An expert in business valuation and damage quantification may be able to assist the court by providing their opinion, generally in the form of affidavit evidence, as to whether damages can be adequately quantified in monetary terms if an injunction is not granted and the applicant is ultimately successful at trial.

At the interlocutory injunction stage, it is neither possible nor necessary to prepare a formal calculation of the damages suffered as there is insufficient information regarding actual sales and costs associated with the infringing product, and it

has not been established whether the defendant is liable. It is however very useful to describe the manner in which damages could be calculated and to provide preliminary figures and/or sample calculations based on information available at that time or estimated figures.

If the interlocutory injunction is not granted and the defendant is found to be liable at trial, damages would be calculated based on either (a) the plaintiff's damages or (b) the defendant's profits as appropriate.

In assessing whether the damages, if any, which may be suffered by the plaintiff can be adequately quantified in monetary terms, the following items should be considered:

1) Are Damages Attributable to the Conduct Alleged:

In evaluating whether damages can be adequately quantified in monetary terms it is important to consider whether damages would arise in the ordinary course if no injunction was granted, or whether damages can be attributed to the improper conduct alleged (i.e. patent, copyright or trademark infringement).

As an example, in the pharmaceutical industry, brand name drug products may experience a significant decrease in sales upon the release of a lower priced generic product. If a brand name company released its own lower priced generic product, the brand name product would experience a loss of sales irrespective of whether the allegedly infringing generic product was released. On this basis, the harm to the brand name company from the release of the allegedly infringing generic product would not be considered irreparable since these losses are not caused solely by the release of the allegedly infringing product.

This issue arose in the *Fournier Pharma Inc. v. Apotex Inc.* case in which the court found that "... the plaintiffs have entered into a licence agreement with Pharma, and, as a result, its brand name product would inevitably suffer loss of volume by reason of sales of the identical product by its licensee."¹ In this case, the harm anticipated by the plaintiffs (including the loss of sales and market share) was not found to be irreparable by the court.

2) Types of Damages:

In evaluating whether the plaintiff will suffer irreparable harm, it is necessary to consider the types of damages that the plaintiff is anticipated to suffer and whether those damages can be adequately quantified in monetary terms. The following types of damages should be considered:

a) Lost Revenue (and the Profits Thereon)

Lost revenue represents the difference between the actual revenue and the revenue which would have been earned if not for the infringement. While actual revenue will be known at trial it will be necessary to calculate the revenue which would have been earned if the defendant is found to be liable.

In considering the manner in which the revenues which would have been earned (if not for the infringement) can be calculated, the following issues should be considered and addressed, if appropriate:

- 1) Changes in the size of the market for the product at issue (i.e. increase or decrease in the market size);
- 2) Price erosion of the product at issue due to the availability of the allegedly infringing product;
- 3) Benefits from early entry (i.e. head start); and
- 4) Lost sales for products sold in conjunction with the product at issue (i.e. convoyed sales).

The effects of these items will need to be addressed for the full time period that the sales of the product are affected, which may extend beyond the trial date.

b) Potential Refinement of Lost Revenue Calculation

The damages calculation can be refined in cases where lost sales are attributed to specific attributes of the allegedly infringing product, such as the product name or appearance, by working with a market research firm that would perform a consumer survey.

As an example, in the *Mark Anthony Group Inc. v. Vincor International Inc.*⁵ case the plaintiff which produced and marketed "Mike's Hard Lemonade" applied for an interlocutory injunction to prevent the sale of "Joe Hard Alcoholic Lemonade" as it was alleged that the use of the name "Joe Hard Alcoholic Lemonade" infringed on its trademark and represented passing off. In this case, the use of a consumer survey to identify the portion of sales allocable to particular factors, such as the product appearance in order to assist in the calculation of damages. The court accepted that this was a potential method in which damages could be calculated and that damages could be adequately quantified in monetary terms.

There are many other circumstances in which surveys can be used. Sample selection and survey development are complex and involve reliance on a market research specialist.

c) Increased Costs

Damages may also arise from increased costs being incurred by the plaintiff as a result of the infringement, including:

- i) Increased production and distribution costs arising from a loss in bargaining power associated with lower sales volume;
- ii) Liability for severance packages related to downsizing; and
- iii) Loss of key employees.

These costs should be evaluated individually in order to consider whether they would occur as a result of the alleged infringement, their anticipated impact on the company and whether they can be adequately quantified in monetary terms.

d) Loss of Goodwill

The final area to be considered is the loss of goodwill that may be suffered if an injunction is not granted and the plaintiff is successful at trial. Loss of goodwill can include loss of customers, harm to reputation or loss of distinctiveness as a result of the alleged infringement.

There have been differing findings by the courts as to whether damages relating to loss of goodwill can be adequately quantified in monetary terms. In the *Boston Pizza International Inc. v. Boston Market Corp.* case, in respect of alleged losses due to decreased revenues from franchisees due to the weakened Boston Pizza brand, the court found that "... should the confusion cause harm, it would be possible for the applicants to make reasonable estimates of loss of value to the franchise operation."⁶

This can be contrasted with the decision in *Imax Corp. v. Showmax, Inc.* in which there was a finding of irreparable harm due to the loss of "name" goodwill and reputation. The court accepted the opinion of the expert that "Once a name loses its unique or distinctive quality, it is impossible to determine the value of what has been lost in terms of the company's ability to expand and market itself in the future."⁷

From a business valuation perspective, the value of a company (or brand) on a going concern basis represents the present value of the future profits that will be earned by the company (or brand). A decline or impairment in firm or product goodwill is equal to the present value of the future profits lost because of a specific act or conduct. To the extent that the future lost profits can be quantified, these lost profits will be equal to the lost goodwill.

Therefore, a claim of irreparable harm based on a loss of goodwill should be evaluated based on the types of harm anticipated to be suffered, whether that harm can be translated into either lost revenue (and the profits thereon) or increased costs, and if so, how those losses can be quantified.

3) Ability to Pay Damages

Irreparable harm can arise when one party cannot collect damages from another party. This situation would occur when one party does not have adequate financial resources to pay an anticipated damages award if an interlocutory injunction is not granted and the defendants are ultimately found to be liable at trial. The ability of the defendant to pay a damages award can be evaluated at the interlocutory injunction stage by comparing the estimated potential damages to the defendant's ability to fund a damages award.

In addition, the expert may be able to provide their opinion regarding the ability of the defendant to fund a damages award based on financial information for the defendant, including net assets and anticipated earnings.

Conclusion

In evaluating whether damages can be adequately quantified in monetary terms, it is important to carefully consider the circumstances associated with each case. Given that it is often necessary for an expert in business valuation and damage quantification to develop approaches to calculate damages in complex matters, it will frequently be the case that the expert will be able to assist the court by describing an appropriate method to calculate the damages which may arise.

- 1 *Boston Pizza International; Inc. V. Boston Market Group.*, [2003] F.C.J. No. 531 [hereinafter *Boston Piazza*].
- 2 *R.J.R. - MacDonald Inc. v. Canada (Attorney General)*, [1994] 1 S.C.R. 311 [hereinafter *R.J.R. - MacDonald*].
- 3 *R.J.R. - MacDonald*, *supra* at 341.
- 4 *Fournier Pharma Inc. v. Apotex Inc.*, [1999] F.C.J. No. 1689, Para. 69
- 5 *Mark Anthony Group Inc. v. Vincor International Inc.*, [1998] B.C.J. No. 716.
- 6 *Boston Piazza*, *supra* at Para. 41.
- 7 *Imax Corp. v. Showmax, Inc.*, [2000] F.C.J. No. 69 82, in which the statement contained in the affidavit of Dr. Pearce was accepted.

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What's Your Real Cost of Capital?

When executives evaluate a potential investment, whether it's to build a new plant, enter a new market, or acquire a company, they weigh its cost against the future cash flows they expect will spring from it. To make sure they're comparing apples to apples, they discount those future cash flows to arrive at their net present value. Estimating the rate at which to discount the cash flows – the cost of equity capital – is an integral part of the exercise, and the choice of rate has a significant effect on estimates of a project's or a company's value. For instance, if you had recently run a discounted cash flow, or DCF, valuation on the UK-based mobile phone giant Vodafone, you would have found that changing the discount rate from 12% to 11.6% – hardly a major change – would have increased the company's estimated value by 15%, or £13.4 billion.

Of course, not all companies or projects are as sensitive to discount rate changes, but even so, if a company routinely applies too high a cost of capital in its project valuations, then it will reject valuable opportunities that its competitors will happily snap up. Setting the rate too low, on the other hand, almost guarantees that the company will commit resources to projects that will erode profitability and destroy shareholder value. The fact that companies tend to settle on a discount rate and use it as their financial benchmark for long periods of time, regardless of changes that take place in the company or its markets, only compounds the likelihood of error.

The standard formula for estimating the cost of equity capital – or, depending on your perspective, an investor's required rate of return on equity – is the capital asset pricing model (CAPM). The formula, which has remained fundamentally unchanged for almost four decades, states that a company's

cost of capital is equal to the risk-free rate of return (typically the yield on a ten-year treasury bond) plus a premium to reflect the extra risk of the investment in question. The premium is the historical difference between the risk-free rate and the rate of return on the stock market as a whole (measured by an index such as the S&P 500) multiplied by an adjusting number to reflect the volatility of the stock and the degree to which it has historically moved up or down with the market.

The adjusting number is called the stock's beta, and its calculation has long been a source of frustration. A message that we hear repeated in hundreds of conversations with corporate executives and investment bankers is that they fudge their estimates of beta because experience and intuition tell them it is an unreliable measure of a stock's riskiness. Consequently, they believe the CAPM formula systematically produces appropriate discount rates. These practitioners are not alone in their doubts; a growing number of academics have also started to question the basic assumptions underlying CAPM and beta. And the practical implications of these reservations are clear: If beta-based measures of a company's cost of capital are unreliable, the usefulness of the valuation exercise itself is questionable.

As an alternative to CAPM and beta, we've developed a new forward-looking approach to calculating a company's cost of capital, called the market-derived capital pricing model (MCPM). This model is based on the traded prices of equity options on a company's shares, which means it incorporates the market's best estimates of the future price volatility of that company's shares rather than using historical data as in the case of CAPM. Our research shows that the discount rates given by MCPM are more realistic – especially from the perspective of the corporate investor – than the rates generated by CAPM.

What's Wrong with CAPM?

It's not hard to see why practitioners are suspicious of CAPM. Beta-based calculations regularly produce cost-of-capital estimates that defy common sense.

Take the case of Apple Computer in the mid-1990s. Before the return of founder and CEO Steve Jobs in 1998, Apple was a mess. Its market share was dwindling, its earnings were deteriorating, and its stock price had fallen into the single digits. Intuitively, you would think that investors at that time would have expected a fairly high rate of return on the money they put into the company.

According to CAPM calculations, however, Apple's cost of equity capital at the end of its five stormiest years (1993 through 1998) would have been just 8%, given the beta generated by that period's data. By contrast, IBM's equivalent cost of equity in 1998 would have been 12%, because its beta was twice as large as Apple's even though its stock price during the period had moved much less wildly and its business outlook was much brighter. What's more, Apple's theoretical cost of equity capital in 1998 was lower than the 8.5% yield that bond investors would have demanded from the company, which makes no sense since bondholders have a prior claim on a company's earnings in terms of interest payments and on its assets in the event of bankruptcy. Our research suggests that anomalies like these can be traced to one or more of three basic problems.

Conflict Between Volatility and Correlation. As in the case of Apple and IBM, perverse differences in cost-of-capital numbers are often a direct consequence of the fact that beta is a measure of both correlation and volatility. The specific calculation for beta is:

$$\frac{\text{stock volatility}}{\text{index volatility}} \times \text{correlation stock vs. index}$$

Although Apple's stock was almost twice as volatile as IBM's during the five years we looked at (52% share price volatility for Apple compared with 28% for IBM), its correlation with the market's movement was only one-fourth as great (0.105 for Apple versus 0.425 for IBM). The low correlation more than offset the high volatility, resulting in a beta of 0.47 for Apple compared with 1.09 for IBM. Given a risk-free rate of 5.2% and an historical equity-market risk premium of 6%, these betas produced the perverse results we noted.

Adjusting for correlation can distort estimates of risk, but there is a rationale for doing it. From the perspective of a professional, diversified investor – which financial theory assumes (somewhat

questionably) is the profile of all investors – a stock that has a low correlation with the market can serve as a diversifying hedge, a way to reduce the overall risk of the investor's equity portfolio. A portfolio that contains a low-correlated stock will be less volatile than one that doesn't because the low-correlated stock will be changing independently of the rest of the portfolio. It could be argued, therefore, that a low-correlated stock's hedge value to investors justifies a lower cost of equity capital.

But while that might be true for diversified investors, the hedge would certainly have no value to more focused corporate investors who expect total returns on their investments that compensate them for the total risks they are undertaking. In general, corporate investors do not try to reduce risk by diversifying it away; they control it through the good management of operations. The extra value they create by managing well differentiates their company's performance from that of others. Since they mitigate their investment risks through sound management rather than diversification, they require a higher return on their investments commensurate with their more demanding task. (See the working paper, "New Players, New Rules and New Incentives: Corporate Finance Requires New Metrics," by James J. McNulty and Tony D. Yeh [Pacifica Strategic Advisors, 2001] for more detail on acquisition and project return metrics for the corporate manager.)

Reliance on Historical Data. The second problem with beta is that the volatility of the stock and its correlation to the market are computed using data from some past period, which may go back as little as 150 trading days or as much as five years. Unfortunately, beta estimates are notoriously sensitive to minor changes in the time period used. For example, we recently acted as a referee in a dispute between the treasury and finance departments of a UK-based multinational, where the two departments' beta estimates differed greatly.

We demonstrated that even slight alterations, such as a two-day shift in the sampling day (using Friday's stock prices rather than Wednesday's) to calculate beta, generated quite different betas of 0.70 and 1.41. Both betas were equally valid in a computational sense, so how could either claim to be a useful predictor of the future?

The problem with using historical data can be avoided, in part, by plugging forecasts of future volatility into the beta formula. These are not that hard to find: Options traders, after all, earn their living by trading on volatility forecasts. But no one has yet devised a method to accurately predict the future correlation of a single stock to the market. Even for a diversified company like GE, past performance is not a useful indicator of correlation. The one-year rolling correlation of GE stock with the S&P 500, of which it is a major component, has ranged between 0.55 and 0.85 over the past four years. Indeed, many academics believe that a company's stock-to-market correlation is in constant flux, randomly varying between -1 (perfectly negatively correlated) and +1 (perfectly correlated). Since correlations are so variable, it clearly makes no sense to compute a discount rate using historical correlation data – yet this is exactly what you have to do if you base your cost of equity capital on beta.

Indifference to the Holding Period. A third source of problems with CAPM cost-of-equity numbers is that a company typically calculates just one estimate of its discount rate, which it applies to all future projects it may invest in, regardless of the life or horizon, be it two years or ten. Using a single term can gravely mislead corporate investors because the holding period of a capital investment has a powerful impact on its value.

Both options theory and options trading experience tell us that the marginal risk of an investment (the additional risk that a company takes on per unit of time) declines as a function of the square root of time. If an investment is expected to be worth \$100

in one year but has a projected volatility of 20%, then its expected price has a high likelihood of ranging between \$80 and \$120 (one standard deviation range in one year). But if an investment is expected to be worth \$100 in four years and has the same projected volatility, then its expected price will likely range between \$60 and \$140 (one standard deviation range in four years). In other words, increasing the holding period from one to four years reduces the per annum risk of the investment by 50% (that is, \$20 over one year compared with \$40 over four years).

The falling marginal risk serves to reduce the annual discount rate. An investor who requires a 21% cost of capital for a one-year equity investment, for example, would require a 13.5% annual rate on a five-year equity investment of a similar risk. The overall riskiness of the longer investment is certainly greater than that of the shorter one – five years of 13.5% is greater than one year of 21%. However, the riskiness increases at a declining rate over time, as reflected in the difference between the annualized rates for the different terms. Just as with interest rates on debt, term structures should be taken into account when calculating rates of return on equity.

Introducing MCPM

The market-derived capital pricing model completely avoids the problems that bedevil the CAPM formula. Our approach draws on information obtainable from the yields on government bonds, corporate bonds, and the traded prices of options. It does not incorporate any measure of historical stock-to-market correlation, relying instead on estimates of future volatility derived from the options market. What's more, the term of the investment is calculated into the rate, which means that MCPM is customized to fit the expected life of a capital investment.

MCPM is based on the premise that investors require compensation for three kinds of risk. The first type, which we call the national confiscation risk, measures the risk that an investor will lose the value of his or her investment because of a national policy – expropriation, for instance, or confiscatory taxes or a loose monetary policy leading to runaway inflation. The second type, the corporate default risk, reflects the additional risk that a company will default as a result of mismanagement independent

of macroeconomic considerations. The third type, the equity returns risk, reflects the extra risk that an equity investor bears because his residual claim on the company's earnings is secondary to debt holders' claims in bankruptcy or otherwise.

Putting a numerical value on the first two kinds of risk is fairly straightforward. Compensation for the national confiscation risk is the government bond rate for a given time period. The corporate default risk is the premium above the government bond rate that corporations pay to obtain funds. For companies that have actively traded corporate bonds, the yield on the bonds captures the national confiscation risk and the corporate default risk. Take GE, for example. The exhibit "GE's Term Structure of Bond Yields" shows how much of GE's default risk is national and how much is corporate over a ten-year period. The five-year yield for GE's bonds, for instance, is 4.72%, of which 4.49% is due to national confiscation risk and the remaining 0.23% is compensation for potential corporate default.

It is a bit more complicated to calculate the third kind of risk: the extra premium that shareholders require as compensation for their position at the end of the liquidation line. We've broken down the calculation into four steps, as described below. Once the excess equity return – the rate required to compensate investors for the equity return risk – for a particular period has been calculated as an annual percentage, you add it to the estimated yield on corporate bonds of matching maturity to obtain the market-derived cost of equity. We illustrate each step by calculating the cost of equity for GE's five-year term.

Step 1: Calculate the forward breakeven price. The first step is to find out just how well the share price must perform in order to compensate equity investors for their additional risk.

To do so, we begin by determining the minimal capital gains that equity investors will require. The standard definition of equity returns is the sum of the rate of capital gains and the dividend yield, more formally:

$$r_{equity} = r_{capital\ gains} + r_{dividends}$$

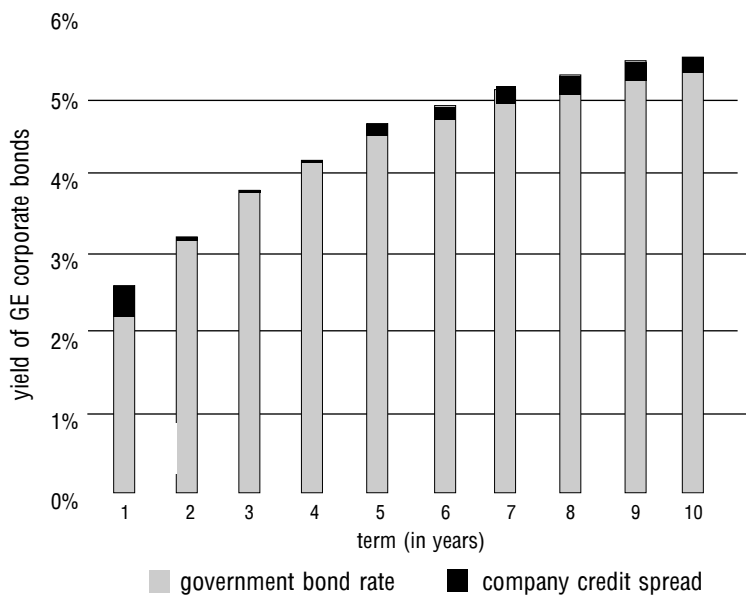
Since the return on equity should be greater than return on debt, it follows that the minimal rate of capital gain that equity investors require on a stock can be no less than the difference between the return on debt and the dividend yield:

$$r_{debt} - r_{dividends}$$

The rate of return on the debt is the same as the bond yield. The dividend yield can be obtained by dividing the company's expected current dividend payout by the share price. Research shows that the current dividend is a good predictor of a company's long-term

GE's Term Structure of Bond Yields

This chart shows the returns that bondholders expect from GE debt over a range of maturities. The light areas represent the yields on government bonds; the dark areas show the credit spread, or the premium above the government bond rate that GE pays to obtain the fund. The bulk of the returns to investors is to compensate for national confiscation risk (mainly inflation); the remaining returns are for risk of mismanagement and are relatively small. For companies that have no bonds outstanding, yields can be determined by looking at the debt of companies with equivalent credit ratings or by asking the debt syndicate desks of investment banks.



Information in this chart is based on data provided by Bloomberg on June 26, 2002

dividend stream, probably because companies make a conscious effort not to surprise the markets with unexpected changes in their financial distribution policies. Any such changes are usually signaled well in advance. For GE, therefore, we estimate that the current expected dividend yield is 2.44% given the company's forecast payout of 72 cents and the current share price of \$29.50 (as of June 26, 2002). Subtracting this from the five-year bond yield (4.72%, as determined above) tells us that the minimum required annual rate of capital gains for a five-year investment is 2.28%.

Once we have a number for the minimum required capital gains rate, we can calculate the price a stock must reach at the end of the period to make that rate of return, using the standard future value formula:

$$\text{future value} = \text{spot price} \times (1 + \text{interest rate})^n$$

where n is the length in years of the investor's holding period. Applying this formula to GE's current price of \$29.50 and the minimal capital gains rate of 2.28% (the interest rate in the formula), we find that the minimum acceptable stock price in five years is \$33.02. If investors expect that GE's shares will not reach \$33.02 in five years, they should buy five-year GE bonds instead.

Step 2: Estimate the stock's future volatility. Once we've worked out the minimum acceptable stock price, we determine how likely it is that a company will fail to reach the target price, because equity investors require compensation for the risk of underperformance. We do this by looking at the prices for options, which reflect the market's level of uncertainty about a company's ability to deliver the expected cash flows. If there is considerable uncertainty, then the shares will be very volatile until the actual cash flows prove otherwise.

We determine the degree of volatility using the Black-Scholes pricing model, which is the standard way to estimate option value. Black-Scholes is based on five ingredients: volatility, the current price of the stock, the strike price of the option, the length of time to expiration, and the prevailing interest

rate on the company's bonds for the remainder of the option's life (reflecting the risks of default). Given the price of an option, its terms, and the prevailing interest rate, we can use the formula to calculate the remaining variable — that is, the market's expectations on a stock's volatility between now and the option's maturity. Thus, if a GE five-year option has a price of \$7.37, a strike price of \$35, and the current price and the cost of funds to purchase the option are \$29.50 and 4.49% respectively, we can determine that the stock will have a volatility of 35%. (For more on options and the Black-Scholes model, see the sidebar "How Options Work.")

Step 3: Calculate the cost of downside insurance. In this step, we combine our estimate of volatility with the forward breakeven price to determine the price investors would be prepared to pay in order to insure against the chances that their shares will fall below the forward breakeven price. This is the premium that reflects the extra risk of equity overdebt.

Once again, that number can be obtained by using the Black-Scholes pricing model. This time, however, the objective is to calculate the value of a theoretical five-year put option (the right to sell in five years the shares an investor owns). The strike price of the option is the forward breakeven price (\$33.02), the volatility is that of the traded call option, and the interest rate is the corporate debt rate. For GE, the price of a five-year put option works out to be \$7.75, given a spot price of the share of \$29.50, a volatility of 35%, and a 4.72% corporate bond yield.

Step 4: Derive the annualized excess equity return. The final stage in calculating the excess equity return is to express the dollar cost of this "insurance" as an annual premium. To do this, we divide the theoretical put option price by the spot price of GE's stock and convert it into an annual percentage, using the following annuitizing formula:

$$\frac{\text{GE option price}}{\text{GE spot price}} = \frac{1}{\text{GE bond rate} - \frac{1}{\text{GE bond rate} \times (1 + \text{GE bond rate})^{\text{term}}}}$$

The term refers to the investment horizon, in this case five years. Applying this conversion formula to the theoretical put price we calculated for GE gives us a rate of excess equity return of 6.02%. (Strictly speaking, we should convert the GE bond rate into a zero-coupon rate, but for the purposes of simplicity, we have used the GE par-bond rate of 4.72%.)

Having obtained the equity risk premium for a particular period as an annualized percentage, we can derive the MCPM rate by adding the premium to the yield on the company's bonds of the appropriate maturity. In the case of GE, adding the five-year excess equity return of 6.02% to GE's five-year bond yield of 4.72% gives us a five-year cost of equity capital rate of 10.74%. The exhibit "GE's Term Structure of Equity Cost" shows GE's cost of equity across a range of investment horizons. The declining cost-of-equity structure reflects how time affects the impact of volatility on value.

Although it is easier to calculate MCPMs for large companies such as GE, which have many options and futures traded on their stocks across a broad range of maturities, it is possible to derive meaningful rates for smaller companies as well. We usually impute missing data by looking at options written either on comparable companies for the

time period involved or by extrapolating from shorter or longer-dated options, or both.

How Is MCPM Better?

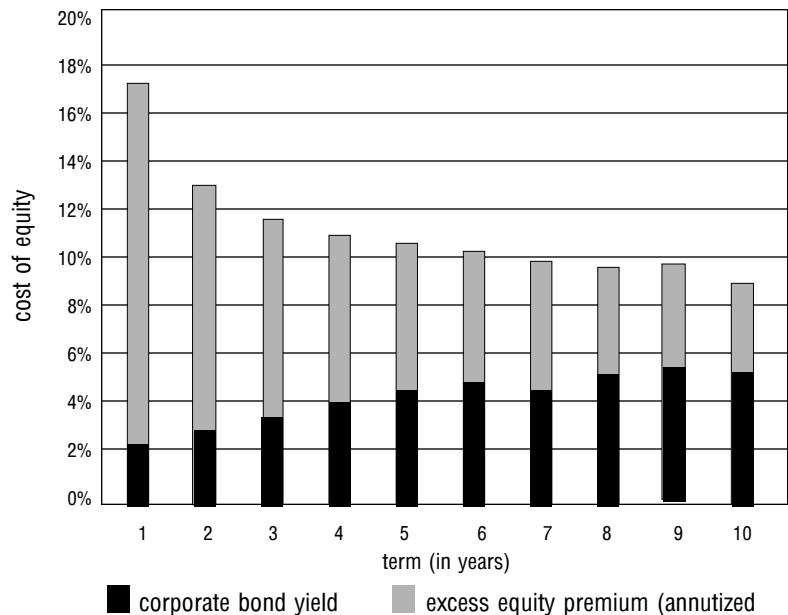
As with any new formula or theory, MCPM should be judged by its results. Does it consistently produce more reasonable and intuitive discount rates than CAPM?

Certainly, we found that the 1998 MCPM rate for Apple made more sense at 19.2% than did its CAPM cost of equity at 8%. We did similar comparisons of MCPM and CAPM numbers for hundreds of companies in a wide range of industries with the same result.

Consider the electric utility business before deregulation. Most investors and analysts agreed that the cost of equity for utilities should not have varied greatly across companies or even across countries. After all, this was (and is) a mature business providing a commodity service, using well-established technologies. Indeed, because regulated utilities typically had predictable cash flows, almost as regular as coupons on a bond, their share prices often behaved like corporate bond prices. Nonetheless, the

GE's Term Structure of Equity Cost

This chart shows GE's MCPM cost-of-equity rates for terms of one to ten years. The MCPM rate is made up of two components: the corporate bond yield (the dark portion of each bar) and the excess equity premium (the light portion). Unlike CAPM rates, which are the same regardless of the term of the investment, MCPM rates take the investment horizon into account, applying different rates to longer-term investments (such as the development of a new aircraft engine) than to shorter-term investments (such as a new marketing program). Compensation for the risk of longer investments remains greater than that of shorter ones – five years of 10.64% is greater than one year of 17.45% – but the additional compensation for the risk that GE takes on per year decreases over time.



Information in this chart is based on data provided by Bloomberg on June 26, 2002

standard CAPM calculation implied discount rates that varied greatly – from 5.1% to 10.3%. Looking closely, we found that the source of the problem was the correlation conflict: Utilities before deregulation varied much more in their degree of historical correlation with the equity market than they did with the bond market. The MCPM calculation, which removes the distorting effect of correlation with the stock market altogether, produced numbers that were far closer together, ranging from only 9.9% to 11.5%.

We also looked at the biotech industry. Here, CAPM seemed to compress the cost-of-capital numbers into an unreasonably narrow range. Take Genomic Solutions, for example, a newer company that went public in 2000. Before the IPO, Genomic Solutions had been owned entirely by venture capital investors, who had expected returns on equity of 30% or more. After just a year as a listed stock, bankers using CAPM estimated that the company's cost of capital was only 12%, a rate similar to those of established industry players. Anomalies like this vanish if MCPM is used instead. Of the ten biotech companies

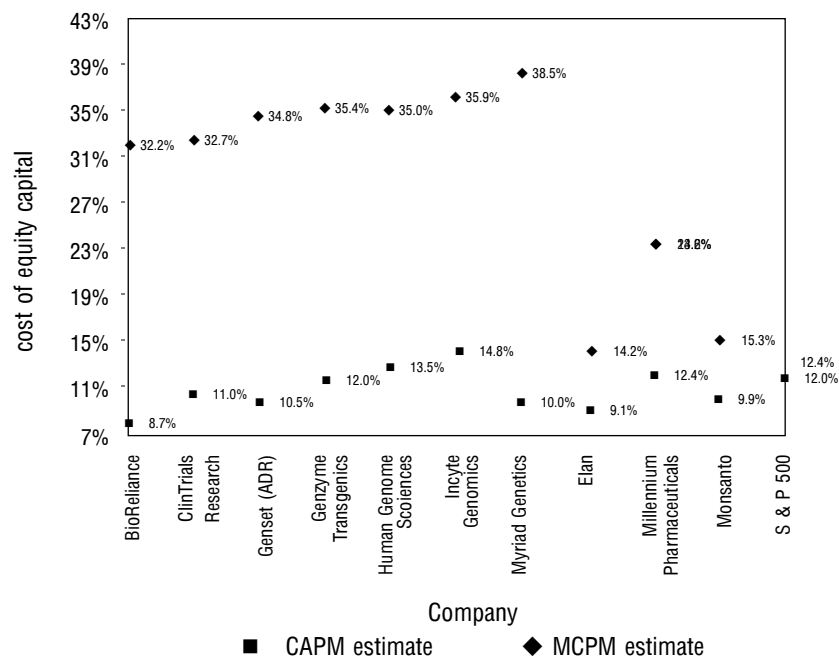
we looked at, the rates for the newly public ones were consistently higher than the rates for the established businesses. (See the exhibit "Estimated Costs of Capital for Biotech Companies.")

Further compelling evidence came from our analysis of 32 publicly traded real estate investment trusts (REITs). Regulations require that 90% of the cash flows of these companies be paid out to investors as dividends. The greater the cash flows, of course, the greater the immediately realizable value of the REIT to its investors. As a result, REIT prices tend to trade as a multiple of their current cash flows – specifically, funds from operations (FFO) – divided by the share price, those with more reliable cash flows trading at higher multiples. You would expect the discount rates, therefore, to correlate negatively with FFO multiples. But as the exhibit "Comparing CAPM and MCPM for Real Estate Investment Trusts" shows, for the REITs we looked at, there is almost no relationship between FFO multiples and CAPM discount rates. Once again, the culprit is stock-to-market correlation. Some of the lower yielding REITs also had a high market correlation, which made for a high CAPM rate, and vice versa. By contrast, plotting FFO multiples against MCPM rates reveals a significant relationship.

Estimated Costs of Capital for Biotech Companies

This graph compares MCPM cost-of-equity rates with CAPM estimates for a number of biotech companies. Some are start-ups with no track records that are dependent on a single unproven technology. Others – Elan, Millennium Pharmaceuticals, and Monsanto – are established businesses with relatively predictable and diversified project pipelines. While common sense would dictate that the riskier start-ups would have higher cost-of-equity rates than the more stable businesses, CAPM rates for all the companies are very similar. By contrast, MCPM rates reflect the relative riskiness of the ventures.

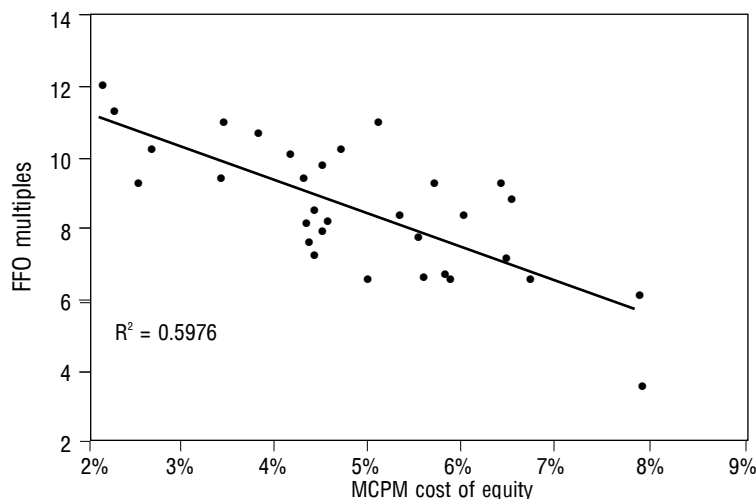
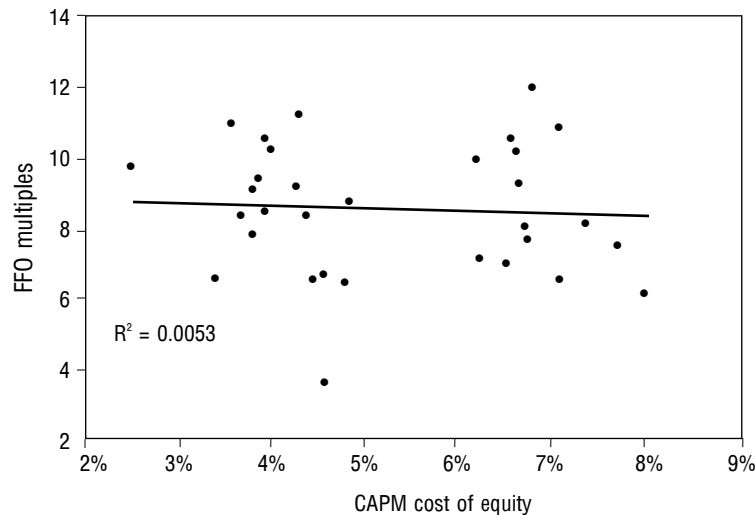
Information in this chart is based on data provided by Warburg Dillon Read on October 16, 1999.



We're under no illusions that our approach to calculating the cost of capital will be the final word. However, this method should be useful to CEOs and CFOs who need to hit total return targets to satisfy shareholders. MCPM is a total return measure that is not diluted by guesses at a stock's correlation to an index, and it has

Comparing CAPM and MCPM for Real Estate Investment Trusts

These charts compare CAPM and MCPM rates against the FFO multiples for 32 real estate investment trusts. FFO multiples (market capitalization divided by funds from operations) are an accepted metric used by REIT investors and reflect the market's perception of the riskiness of these investments. As the top chart shows, there is almost no relationship between CAPM rates and the FFO multiples. By contrast, the bottom chart shows that MCPM cost-of-capital numbers are quite closely linked to FFO multiples – the cost of equity declines as the multiple increases – which is what you would expect.



Information in this chart is based on data provided by Warburg Dillon Read on April 30, 1999.

the advantage of being based on forward-looking market expectations, not historical data. This is helpful since these are the same investor expectations that are built into a company's current stock price. Financial risk management has evolved a great deal in the past 50 years with the development of deeply liquid markets in stock options and futures. MCPM lets corporate managers take advantage of the rich information these markets provide to determine discount rates that can help them increase their probability of creating shareholder value as they make major capital allocation decisions or assess the value of acquisitions.

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BY DAVID C. Lam, CA, CBV

Post-Transaction Analysis Sample Documentation and Framework for a Post Mortem Review

Editor's Note

The following article represents a post transaction review for the divestiture of a division. The article is presented for the benefit of students of the Institute as well as members practicing in areas other than Corporate Finance, but with an interest in Corporate Finance. As part of the transaction, the author prepared a formal business valuation report to management. For publishing purposes, we have not included the business valuation report. It is, however, available to members and students upon requests to the CICBV office (admin@cicbv.ca).

Executive Summary

Purpose

Despite the current wave of restructuring and downsizing to mitigate the economic effects of a precarious business environment, AMAD ("Alliance, Merger, Acquisition and Divestiture") remains a deep-seated strategy for most companies. Whether it is seizing an acquisition opportunity to penetrate a vertical in hopes to forge ahead of the competition, or divesting ("pruning") non-core assets to continually focus management on critical strengths, many companies still strive to make "M&A" their core competency.

To that end, the same companies have institutionalized a learning process (commonly referred to as the Post Mortem Analysis) in connection with all AMAD activities.

The primary purpose of Post Mortem Analyses is to review the execution of past transactions, with a view to the following:

1. Ensuring the transaction have met or exceeded the financial targets and operational metrics set out in the original business case;

2. Determining whether all the strategic benefits or rationale for the transaction has been extracted; and
3. Identifying and documenting critical issues and findings in the transaction process for learning purposes.

This paper is not a theoretical document on the reasons why M&A generally fail or succeed. Not surprisingly, many buckets of ink have already been spilled on that topic. Rather, this paper is presented as an illustration to point 3 above. Specifically, this paper is intended to provide a high level analysis concerning crucial transaction issues that were encountered in the sample divestiture ("Viper"), and the framework in which such analysis can be documented.

Three general components are offered in this sample Post Mortem Analysis. The first component describes the general overview of Viper and the landscape in which it operates. The second component investigates the various elements of the transaction that were particularly germane to its consummation, most notably in the areas of valuation, taxation, legal, structure and negotiation. The third component of this document contains the valuation for Viper as reported to the vendor's executives. The valuation report is intended to highlight the basic framework, thinking and rationale behind the pricing strategy (see editor's note above).

The names and certain information, financial or otherwise, have been altered to protect the confidentiality of the parties involved.

Sample Post Mortem Review

Background

Project Viper originated from a comprehensive review of the service offerings of the Vendor (herein referred to as TECH Corporation) in June 2002. The decision was made to divest Viper, a subsidiary of TECH Corporation, for the following reasons:

- The medical practice management software and services business is not central to TECH Corporation, nor does it pull through any significant amount of core business;
- Viper has a history of generating financial losses (i.e. in 2000 and 2001, Viper had a negative EBITDA of approximately \$3,700,000 and \$240,000, respectively)

TECH Corporation initiated the divestiture process in early October 2002. After canvassing the market, TECH Corporation solicited and received six Letters of Intent from prospective third party buyers. The Letters of Intent were assessed on the following parameters:

- Cash consideration
- Deal structure/terms
- Treatment of employees, particularly with respect to the impact on potential severance costs to TECH Corporation
- TECH Corporation's assessment of the "do-ability" of a transaction with the bidder (i.e., execution risk)
- Assessment of business continuity risk, including a bidder's knowledge of the market and probability of success.

On November 4, 2002, TECH Corporation entered into exclusive negotiations with Purchaser Co., a private, local company that develops medical software for doctors, hospitals and laboratories in Province X.

Purchaser Co. conducted due diligence through the remainder of November, and began negotiation on the Asset Purchase Agreement ("APA") thereafter. The APA was signed on December 4, 2002, and the transaction closed on December 20, 2002.

Description Of Business

Viper is a leading provider of medical practice management software and services that consists of billing, scheduling and reporting with extended functionality for office operations. Viper was established in 1988, and was acquired by TECH Corporation through a TECH Sub Co. joint venture in 1997 from Seller Co. for \$7.5 million. The acquisition was seen as a way to build the health care vertical of TECH Sub Co.

Operating primarily in Province X, Viper has 22 (non-unionized) employees – 2 management, 3 developers, 1 account manager, 1 administrative assistant, 2 accountant, and 13 customer service representatives.

Viper has 8,000 installed systems to date, including physicians (both general practitioners and medical specialists), physiotherapists, chiropractors, registered massage therapists, and optometrists.

During the last three years, Viper has been restructured through the following initiatives:

- Scaled down product line from five systems to only one, "Software A"
- Upgraded infrastructure to improve operational efficiency (i.e. upgraded hardware/server and implemented a new contact management system)
- Standardized installed customer software (brought all clients to the same software revision)
- Updated the development methodology
- Reduced headcount from 35 in 2000 to 22 currently

The restructuring yielded strong results by the end of 2002, with double-digit revenue growth rate, accompanied by a positive EBITDA. Since Q3:02, Viper began winning back customers lost to competitors and has been adding on average 50 new customers per month, to a current base of 28,000.

Service Portfolio

The primary product for Viper is Software A. Software A is a MSP & private billing, scheduling, and advanced query reporting software, providing 2 revenue streams to Viper:

- One time revenue through the sale of the software: Base system prices range from \$2,000 for a single stand alone version for billing to \$3,000 for a network version of Software A Office (billing and scheduling).
- On going maintenance and support revenue: Depending on the configuration, monthly fees range from \$200 to \$300, for contracts varying from 1 year to 3 years.

In addition to Software A, Viper is currently developing 2 new products:

1) ASP based product

- Release date expected to be in mid 2003
- ASP based product for MSP billing, additional phases for scheduling and electronic health records

2) Software A+

- Currently in beta stage with expected release date at end of October 2002
- Updated 32 bit version of Software A, with new scheduler functionality plus numerous other enhancements

- Introduction of the first of a series of add-on modules, Software A Office Assistant that integrates Microsoft Office with the Software A database
- Additional modules in design, including Software Retail - an add-on to provide retail sales functionality for physiotherapy and chiropractor offices

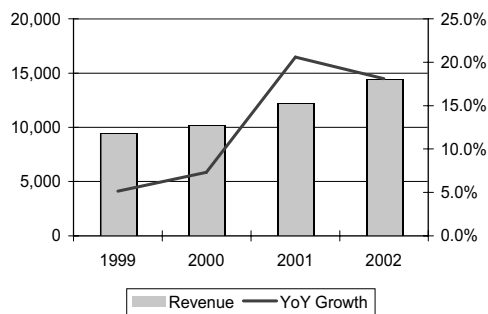
With the new product developments, Viper is well positioned to meet future demands for greater functionality at lower costs.

Financial Performance

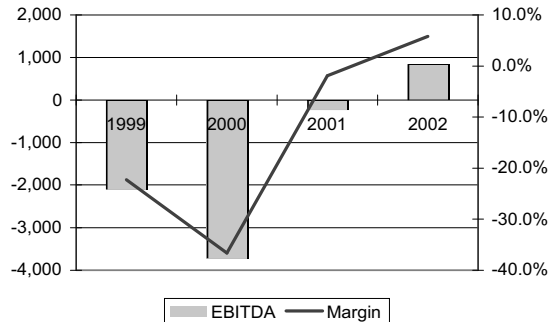
Historical Revenue and EBITDA

The poor financial results during the 1999 - 2002 period was due in large measure to redundant product lines, research & development costs associated with Software A, and overall operational inefficiencies.

Historical Revenue, 1999 - 2002
\$Thousands YoY Growth %



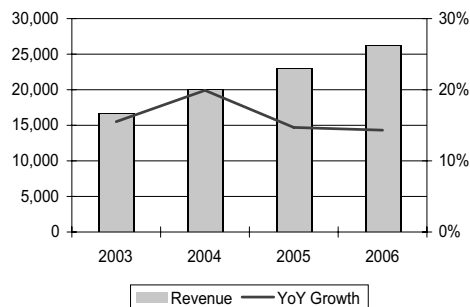
Historical EBITDA, 1999 - 2002
\$Thousands Margin %



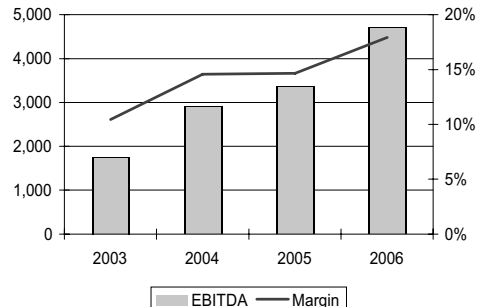
Management's Revenue and EBITDA Projections

The financial characteristics are projected to improve over the 2003 - 2006 period. This positive outlook hinges on the combination of 3 important factors: the sustainability of their premier Software A products and services, continued operational efficiency through restructuring plans and efforts, and capital discipline going forward.

Revenue Projections, 2003 - 2006
\$Thousands YoY Growth %



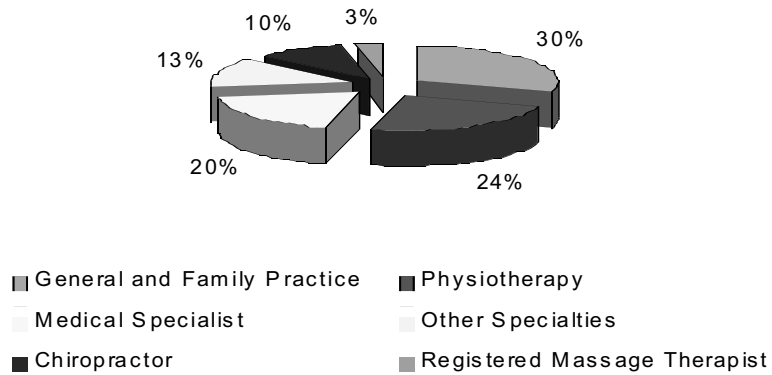
EBITDA Projections, 2003 - 2006
\$Thousands Margin %



Customer Base

Currently, there are approximately 80,000 medical practitioners in the Provincial X market place. Viper's estimated 28,000 customers represent a 35% market share, with General and Family Practice sector comprising roughly 30% of Viper's total 2002 revenues.

Viper Customer Mix, 2002



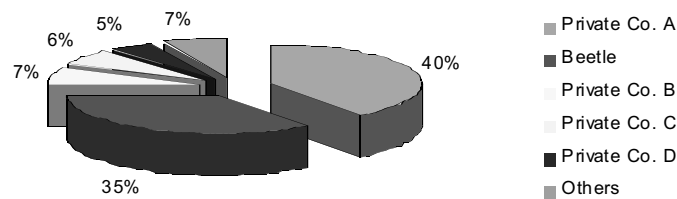
Human Resources

While Viper was a subsidiary of TECH Corporation, it was operationally and culturally independent. In 1999, the General Manager was recruited from a competitor to lead the restructuring efforts and implement the 5-year strategic plan.



Industry Landscape

The medical practice billing management software and services market in Province X is highly concentrated, with the top 5 providers claiming 90+% of the market. Market share per Viper management estimates are as follows:



Two (2) market trends pose significant challenges to the medical practice billing management service providers:

- The general practitioner segment, being the largest segment within the medical practice billing management sector, is declining due to retirements and general closures of offices. To add new customers, providers must "steal" customers from competitors. However, changing providers would require customers to incur substantial new set up costs.
- The Province X Medical Association is planning to introduce an ASP based product that would allow clients to avoid the one time purchase of a software system and pay a monthly user fee only. This impending ASP model in the medical practice billing management sector could render the existing model(s) cost ineffective.

Current industry participants are as follows:

Private Co. A

- Largest provider in Province X with estimated 1,100 offices, vast majority of which are in GP and Specialist market
- Family owned and operated business
DOS based product; New Windows product release scheduled for early 2003
- No current or future plans for EMR

Private Co. B

- Physiotherapy and Chiropractor market place
- Estimated 200 offices plus service bureau
- DOS based billing software

Private Co. C

- EMR software
- Expanding in Province Y market place
- Currently have approximately 120 clients
- Doctor owned company

Private Co. D

- Provides product for Physiotherapy and Chiropractor market only
- Estimated less than 100 office installations

Significant Issues & Findings

Accounting and Taxation Implication of an Earn-out

During negotiations with Purchaser Co., an earn-out was proposed by Purchaser Co. to address 2 significant issues:

- Viper's history of losses poses a greater uncertainty concerning the forecasts; and
- The need to retain two key managers for six months to execute the final phase of the restructuring and strategic plan.

The proposed earn-out would be based on the following:

- Viper meeting the forecasted revenue and EBITDA targets; and
- Key management still being employed with Purchaser Co. after 6 months.

Despite the fact that the negotiations concluded without an earn-out in the final structure of the transaction, we came to understand that there were 2 primary technical implications for the purchaser concerning an earn-out - Whether an earn-out is a capital cost or an expenditure, and how an earn-out would be taxed.

Earn-outs: Capital cost or expenditure, and the impact on EBITDA

Generally, earn-out based on performance is treated as addition to the purchase price, and would be amortized over an appropriate period of time. Performance based earn-outs therefore, does not impact the EBITDA. Earn-out based on employee retention on the other hand, is treated as compensation expense amortized over the period from acquisition date to the date paid/payable, if all the "employees to be retained" are also shareholders. Employee retention based earn-outs can have a negative impact on EBITDA. (Technical reference: FAS 123 and EITF 95-8)

Taxation on Earn-outs

(i) Share Transaction:

The earn-out would be added to the ACB of shares purchased. If the shares were sold in the future, then the proceeds from such a disposition, less the ACB, would represent capital gains. However, no immediate tax deductibility is available.

(ii) Asset Transaction:

The earn-out would be allocated to certain asset classes, from which CCA can be taken to reduce income tax liability.

The Impact of Non-Capital Loss Carry Forward on Deal Structure

Due to previous losses incurred, Viper accumulated \$2.6 M of Non Capital Loss Carry Forward ("LCF") at the end of 2001. To maximize the purchase price, TECH Corporation considered selling the LCF via a share transaction.

During the preliminary discussion stage, all the bidders did express a strong interest in acquiring the potential tax shields from the \$2.6 M of LCF. However, the divergence in view regarding the valuation of the LCF became a major obstacle. The prices offered for the LCF, which in part is dependent on a bidder's tax position and future taxable income levels, ranged from \$.01 to \$.03 to the dollar. If, on the other hand, TECH Corporation were to utilize the LCF itself, the present value of the possible tax shield would be approximately \$.05 to the dollar. As a result of this analysis, a decision was made to structure the deal as an asset sale, wind up Viper through section 88(1) of the Income Tax Act, and allow TECH Corporation to utilize the LCF accordingly.

Tax shield available from Non Capital Loss Carry Forward ⁽¹⁾								
Scenario 1: Purchaser able to evenly utilize LCF over allowable remaining years								
Year of Origin	Non-capital losses (\$)	2002	2003	2004	2005	2006	2007	2008
01	597,403	85,343	85,343	85,343	85,343	85,343	85,343	85,343
00	640,073	106,679	106,679	106,679	106,679	106,679	106,679	-
99	110,353	22,071	22,071	22,071	22,071	22,071	-	-
98	118,212	29,553	29,553	29,553	29,553	-	-	-
97	1,169,233	389,744	389,744	389,744	-	-	-	-
Total	2,635,274	633,390	633,390	633,390	243,646	214,093	192,022	85,343
Tax shield available		221,687	221,687	221,687	85,276	74,932	67,208	29,870
PV of tax shield available to purchaser		\$ 783,355	\$0.30 to the dollar					
Scenario 2: Purchaser able to utilize full LCF immediately								
PV of tax shield available purchaser		\$ 922,346	\$0.35 to the dollar					
Scenario 3: TECH Corporation retains the company and utilizes the LCF subsequent to a wind up								
PV of tax shield available to TECH		\$ 128,536	\$0.05 to the dollar					
Assume full application at 2006								

(1): Calculations based on an assumed tax rate of 35% and a discount rate of 6%.

Negotiation of Various Deal Points

Severance

With respect to the employees of Viper, Purchaser Co.'s position was to retain only 2 management staff, principally to execute the balance of the strategic plan. In this scenario, TECH Corporation would be heavily exposed to latent severance costs. In particular, TECH Corporation was keenly aware of the following contingent liabilities:

- Severance of approximately \$500,000 relating to the 20 employees;
- Additional severance in the range of \$100,000 to \$200,000 if Purchaser Co. decides to dismiss the 2 management staff shortly after the completion of the deal.
- Public relation implications – With a closing date that was days before Christmas, severing substantially all of the staff of Viper would likely attract negative publicity to TECH Corporation.

Results of Negotiation

What we got -

- Purchaser Co. offered employment to the 20 staff members on substantially the same terms and conditions as to their employment with TECH Corporation, while recognizing prior years of service. Moreover, TECH Corporation retained the 2 key management staff as employees, and contracted them out to Purchaser Co., under a 6 months management contract. The management fees charged not only represented the managers' salary, bonus, and benefits, but also reflected approximately 50% of the potential severance cost associated with their departure. This way, if TECH Corporation can place the 2 managers back into the company at the end of the contract, the severance issue is deferred indefinitely. If not, the severance liability has been substantially mitigated.

What we gave -

- We surrendered our position over the unearned revenue discrepancy. See below for details.

Unearned Revenue

Per the letter of intent ("LOI"), the purchase price payable by Purchaser Co. to TECH Corporation for the Business Assets (excluding cash on hand) will be the sum of \$7 M, plus the increase or minus the decrease in the aggregate of Accounts Receivable between August 31, 2002 and the Effective Date, less an amount equal to the value of the Unearned Revenues. The conceptual understanding between TECH Corporation and Purchaser Co. as expressed in the purchase price calculation is that Purchaser Co. should not be liable for goods & services that are already pre-paid to TECH Corporation.

During the due diligence process, it was discovered that the unearned revenue balance was incorrectly overstated due to accounting errors. Specifically, post-dated payments were recorded as unearned revenue. The overstatement was approximately \$800,000. Herein lies the issue – Will Purchaser Co. honor the spirit of the intent within the LOI, and allow for the adjustment to the unearned revenue balance, or will he negotiate on the basis of what is stated, incorrect as it may be, in the initial financial information provided?

Results of Negotiation

What we gave -

- TECH Corporation acquiesced on the \$800,000, and in exchange, we received the wins below.

What we got -

- Severance: See above for the win on Severance.
- Watered down representations and warranties (i.e. short survival dates with the representations and warranties; Liberal use of *true and correct from a material perspective and to the best of our knowledge* language regarding information provided to Purchaser Co.)
- Conditions Precedent - Minimized the number of subjects for the deal to complete.

Non compete Agreement

While it is quite common to have a NCA to protect the goodwill and future prospects of the Purchaser's investment, TECH Corporation was reticent in signing a NCA for the following reasons:

- Viper is a relatively small deal for TECH Corporation. Consequently, TECH Corporation did not want to unwittingly prevent itself from getting into markets, businesses, partnerships, joint ventures, etc. in the future as a result of a \$7 M sale.
- Even by limiting the scope of the NCA based upon known exceptions at the time of the deal, there is a risk that the scope will become prohibitive to TECH Corporation due to new or future developments. This is particularly critical when dealing with high technology. Amid the rapid profusion of technologies, NCA can quickly become a hindrance. Due care should be given regarding the scope of NCA, especially when IP-based ASP and the health care vertical are areas from which TECH Corporation would want to be shut out in any respect.

Results of Negotiation

What we gave -

- We accepted a nominal discount to the price

What we got -

- Placed a very restrictive definition of "Business" in the NCA;
- Shorten the term of the NCA to 2 years; and
- Restricted the geographic area.

The Role of Senior Management And The Potential For Conflict of Interest

It is necessary to pre-determine the role that senior management of the company will play in the divestiture process, most notably in the area of communications and negotiation strategies. While managers are bound by their fiduciary duty to act in the best interest of the company, as a practical matter, a selling company may be exposed to potential conflicts of interest. Stock should be taken to assess the manager's attitudes and predispositions, as well as their personal agendas, to ensure they are incented the right way.

For example, to what extent, if any, does senior management participate in the bidder selection process? Their direct experience with the industry and the players provide invaluable insight on the do-ability of each bidder. However, the fact that the buyer will likely be the employer to the senior management after the deal should not be taken lightly. As a consequence, senior management might

naturally be partial to the bidder whom they perceive as being the "better boss".

Conversely, management may not like any of the bidders at the table and in turn sabotage the deal. In Viper, senior management had a good relationship with a bidder and recommended TECH Corporation to proceed on the premise that this bidder had the highest chance of success in the sector. As it turned out, the buyer was not as reputable as management claimed, and may not have the expertise in comparison to the other bidders.

To ensure successful completion and transition of the deal, it is not uncommon to provide monetary incentives (i.e. retainer fee) for senior management. Particularly in a knowledge-based business like Viper, senior management is often a key component to the deal. In this situation, the senior management may leverage this dependence to negotiate a higher retainer fee from the selling company, or a better salary/bonus from the buyer. In Viper, the senior management understood their importance to the deal, and was aware that they were a condition precedent to the transaction (i.e. subject to the signing of a management contract). And as such, management negotiated a higher retainer fee than what was agreed upon earlier. In fact, management made every effort to display their leverage with TECH Corporation. For instance, when TECH Corporation refused to acquiesce to a higher retainer fee, management made it very difficult for the prospective buyer to get data for additional assurance on certain issues to complete the due diligence exercise. Furthermore, senior management may have potentially leaked the news of the pending sale to the media as well as to key employees to rally the staff against the sale.

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