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Brand Intangible Asset Valuation-
The Complement of Technology, Market and Human Resources

Introduction

Intangible valuation has become an important business research topic in the age of knowledge-based economy, especially in accounting. Even there are growing concerns about Generally Accepted Accounting Principles (GAAP) not recognizing the intangible assets in financial statements. When the difference between market value and book value is enlarged in a substantial scale, the irrelevance of accounting numbers in valuation becomes apparent. To comply with the objective principle, the financial statement is only allowed to record the tangible assets except in the situation of merger and acquisition (MA). In the case of MA, the price paid in excess of the adjusted book value can be recognized as the "good will". The financial statements of the acquired firms after MA can recognize portion of the intangible asset values. However, majority of the firms trading in the capital market have no opportunity to reflect the value of the intangible assets in the financial statements. According to Litan and Wallison (2000), failure to properly value intangibles can result in distorted valuation, volatility and, perhaps, a bubble.

The "good will" account in accounting shall include all the intangible assets including human capitals (human asset), market and brand assets, corporate competence, such as process flexibility and financial innovation, and technology assets. A complete description of the tangible and intangible assets can be referred to the Exhibit 1.

[Insert Exhibit 1 here]

Blair, Hoffman and Tamburo (2001) have referred the technology assets as the intellectual property rights in their study. Since firms obtain the intangible values from different sources, deriving a general model to be used in explaining the unrecognized intangibles across industries seems impossible. For example, brand name may explain the majority intangible values of McDonald, but not technology. In opposite, technology may be the most important variable in explaining the intangible values for Merck, but the brand name may play very little role in explaining the intangible values even if it exists. However, both brand name and technology may be required to understand the intangibles of Microsoft. Therefore, a meaningful intangible valuation research shall be at least an industry specific, if not s

firm specific. This has been seen in the intangible literature. Philip Joos (2201) conducts his study based on the pharmaceutical industry. Aboody and Lev (1999) study the value relevance of intangibles on software companies. Kohlbeck and Warfield (2002) investigate the banking industry's intangible valuation issue.

Most of the current intangible researches are designed to extract variables that can provide better explanation power for the difference between the market value and book value of the equity. Because of the sample firms under study more or large are technology related companies, the results are implicitly to explain the technology intangibles, but without a good control of other intangibles. The failure in controlling other confounding variables makes theses studies difficult to claim to provide a specific aspect of intangible valuation. Baruch Lev is considered the pioneer in systematically studying the intangible asset issues in accounting. However, most of his studies are focused at technology intangible assets. Although there are many brand valuation research and papers in marketing field, they are not often seen in accounting journals. The most influential accounting capital market research addressing brand value can be seen in 1998 by Barth, Clement, Foster, and Kasznik (BCFK). BCFK study the association between the association between the published brand values of FinancialWorld and the stock prices of the firms owing the brands.

Different from most of the current intangible literature, this study is intended to study the interactions of technology intangible, market intangible and human resources intangible on firm valuation. An in-depth analysis of the three intangibles can provide us a better understanding on how good wills are incorporated in firm valuation variables as well as accounting numbers.

Intangible valuation model

The current intangible literature assumes that the market capitalization is the best proxy in estimating the true underlying value of a firm. Therefore, the total intangible assets (or total intellectual capitals) of a firm are equal to total market capitalization subtracting the equity book value reported in balance sheet. The larger the difference is, the higher the intangible assets are. For empirical tests, most papers found in the literature use market to book value ratio (M/B ratio) to represent the magnitude of the intangible assets. That is, higher M/B ratio represents a higher intangible asset for a firm. The central focus of the current intangible research is to construct a model or identify the variables in helping understand the M/B ratio

behavior. This study will follow the same spirit of the existing intangible literature with the intent of identifying the variables with stronger power in explaining the M/B ratio variations in the computer related industry.

According to Ohlson (1995), the underlying value of a firm is equal to the current book value plus the net present value of all future abnormal earnings. Under his theory, M/B ratio can be written as:

$$\frac{M_t}{B_t} = 1 + \frac{E_t[(ROE_{t+1} - \gamma_E)]}{(1+\gamma_E)} + \frac{E_t[(ROE_{t+2} - \gamma_E)(1+g_{t+1})]}{(1+\gamma_E)^2} + \frac{E_t[(ROE_{t+3} - \gamma_E)(1+g_{t+1})(1+g_{t+2})]}{(1+\gamma_E)^3} + \ldots\ldots$$

where, g is the growth rate of the firm and γ_E is the cost of equity.

Given the above equation, we shall be able to predict M/B ratio very accurately as long as we can have a perfect knowledge of the series of future return on equity (ROE) and growth rate (g). In reality, however, no one can foresee the future ROE and growth rate for sure simply basing on the financial statement information. The current period's ROE may be able to explain portion of M/B ratio at the same period, but not perfectly. Exhibit 2 provides a good evidence of using ROE variable to predict M/B ratio. However, the stability of the future ROE will be a function of the industry's competitive environment, a firm's technology strategy, and the technology competence of a firm and the marketing efforts. Therefore, other information is needed for a better understanding the future perspectives of a firm's financial performance.

[Insert Exhibit 2 here]

Joos (2001) shows that the adjusted R^2 of using ROE as the only independent variable to regress the M/B ratio is only 0.2%. By adding the R&D intensity (measured by the R&D expense divided by book value) as the second independent variable, the adjusted R^2 increases to 49%. Further including several dummy variables, such as technology strategy, the market share, patent intensity, and R&D investment growth, the adjusted R^2 achieves to 66%. In this study, we will use the similar approach demonstrated in Joos (2001), but construct different brad variables to

reflect the purposes of this study. In addition, we will include the necessary variables to control the effects of other intangibles on the firm's valuation.

Brand equity definitions and measures

According to David A. Aaker (1991), brand equity is "a set of brand assets and liabilities linked to a brand, its name and symbol, that add to or subtract from the value provided by a product or service to a firm and/or that firm's customers." Lance Leuthesser, et al (1995) write that "… brand equity represents the value (to a consumer) of a product, above that which would result for an otherwise identical product without the brand's name. In other words, brand equity represents the degree to which a brand's name alone contributes value to the offering (again, from the perspective of the consumer)." The Marketing Science Institute (1988) defines brand equity as, "The set of associations and behaviors on the part of the brand's customers, channel members, and parent corporations that permit the brand to earn greater volume or greater margins than it could without the brand name and that gives the brand a strong, sustainable, and differentiated advantage over competitors." Therefore, brand equity can be defined as three distinct elements:

1. The total value of a brand as a separable asset -- when it is sold or included on a balance sheet.
2. A measure of the strength of consumers' attachment to a brand.
3. A description of the associations and beliefs the consumer has about the brand.

<u>Loyalty measures</u>

1. Price Premium: A basic indicator of loyalty is the amount a customer will pay for a product in comparison to other comparable products. A price premium can be determined by simply asking consumers how much more they would be willing to pay for the brand.
2. Customer Satisfaction: A direct measure of customer satisfaction can be applied to existing customers. The focus can be the last use experience or simply the use experience from the customer's view.

<u>Perceived quality and leadership measures</u>

3. Perceived Quality is one of the key dimensions of brand equity and has been shown to be associated with price premiums, price elasticity, brand usage and stock return. It can be calculated by asking consumers to directly compare

similar brands.

4. Leadership/Popularity has three dimensions. First, if enough consumers are buying into the brand concept it must have merit. Second, leadership often taps innovation within a product class. Third, leadership taps the dynamics of consumer acceptance. Namely, people are uneasy swimming against the tide are a likely to buy a popular product. This can be measured by asking consumers about the product's leadership position, its popularity and its innovative qualities.

Associations/ differentiation measures

5. Perceived Value: This dimension simply involves determining whether the product provides good value for the money and whether there are reasons to buy this brand over competitive brands.
6. Brand Personality: This element is based on the brand-as-person perspective. For some brands, the brand personality can provide links to the brands emotional and self-expressive benefits.
7. Organizational Associations: This dimension considers the type of organization that lies behind the brand.

Awareness measures

8. Brand awareness reflects the salience of the product in the consumer's mind and involves various levels including recognition, recall, brand dominance, brand knowledge and brand opinion.

Market behavior measures

9. Market Share. The performance of a brand as measured by market share often provides a valid and dynamic reflection of the brand's standing with customers.
10. Price and Distribution indices. Market share can prove deceptive when it increases as a result of reduced prices or promotions. Calculating market price and distribution coverage can provide or more accurate picture of the product's true strength. Relative market price can be calculated by dividing the average price at which the product was sold during the month by the average price at which all the brands were sold.

Financial perspectives measures

There are several possible ways to measure brand equity in financial terms. (Srivastava and Shocker, 1991)

11. Brand Equity Index Model

Under this model brand equity is calculated by multiplying the relative price of the product by market share in units. The product is then multiplied by a measure of loyalty or durability representing the staying power of the brand.

12. Book or Replacement Values

Brand equity is estimated as the replacement cost of the brand over a generic equivalent. A generic equivalent is a product that is sold only on the basis of product attributes. Alternatively, replacement value can be estimated as book value. The challenge with this latter method is that marketing expenditures do not appear on the balance sheet. For either method, replacement cost is difficult to estimate accurately.

13. Market Transactions

Brand equity is estimated by identifying comparable mergers or acquisitions. The premiums paid for those companies are associated with the equity in their brands. Data is scarce for comparable M&As, however, and buyers could have paid more or less than the true value of brands.

14. Incremental Cash Flow from Branding

Brand equity is estimated by determining the cash flows of a brand and subtracting the cash flows from an unbranded product. The estimation challenge becomes more difficult as the product of interest belongs to an increasingly differentiated category. For example, it is harder to find a generic equivalent for cars than for cigarettes.

15. Discounted Value Of Future Earnings Projections

Brand Equity is evaluated by discounting the value of future earnings projections and adding to the value the cost competitors would incur if they duplicated the brand.

16. Price/Earnings Multiple

Multiplying current earnings by an estimate for P/E multiple yields an equity price. The critical step is estimating the P/E multiplier. One approach that has been taken is to measure brand strength by a weighted average of seven factors. (Penrose, 1989) Next, the P/E multiplier is estimated using and S-shaped relationship

between brand strength and the P/E multiple that is based on similarities to risk free rates, industry rates, and other factors.

17. Value of Avoided Advertising

Advertising is a key tool for developing brand strength that management can leverage into equity. Advertising can affect how readily a consumer associates attributes with a brand, what brands consumers include in their evoked set, and other behavioral and perceptual factors. The effect of advertising builds up over time and leads to extending brands with greater ease and less cost. An estimate of Brand Equity is the value of advertising avoided to achieve the current level of performance.

Research Design

1. Hypotheses

According to Seviby (1999), the three major intangible sources of the firm are: technology, market and human resources. Therefore, we will expect all the three variables can explain the intangible value independently. In addition, the interactions of the three variables can also incrementally explain the intangible value of the firm. However, the extent of the three variables to the intangible valuation is industry specific. In other words, different variables may have different explanation power to different industries, and the imputed intangible values of the three variables can be different for different industries. In summary, we can have the following three hypotheses:

Hypothesis 1: The intangible value of the firm is positively associated with its technology, market and human resources respectively.

Hypothesis 2: The intangible value of the firm is positively associated with the interactions of its technology, market and human resources.

2. Variables Definition and Testing Models

Similar to most of the intangible research, we will use market to book value ratio (MV/BV) as the proxy for firm's intangibles. To be able to apply Ohlson (1995) model, we need to define the abnormal earnings (ABE). To simplify the calculation, we use 10% as the required return for all the firms deriving firm's abnormal earnings,

instead of using cost of equity. The three intangible variables are: technology intensity (RD/BV) measured by R&D expenditures divided by book value, marketing intensity (AD/BV) measured by advertising expenditures divided by book value, and human resources intensity (HE/BV) measured by human resources expenditures divided by book value. The human resources expenditures include all direct and indirect wages, salaries and cash and stock bonuses.

To test the named two hypotheses, we use the following regression models:

$$\frac{MV_{it}}{BV_{it}} = \alpha_0 \frac{BV_{it}}{BV_{it}} + \alpha_1 \frac{1}{BV_{it}} + \alpha_2 \frac{ABE_{it}}{BV_{it}} + \alpha_3 \frac{RD_{it}}{BV_{it}} + \alpha_4 \frac{AD_{it}}{BV_{it}} + \alpha_5 \frac{HE_{it}}{BV_{it}} + e_{it} \qquad \text{(M1)}$$

$$\frac{MV_{it}}{BV_{it}} = \alpha_0 + \alpha_1 \frac{1}{BV_{it}} + \alpha_2 \frac{ABE_{it}}{BV_{it}} + \alpha_3 \frac{RD_{it}}{BV_{it}} + \alpha_4 \frac{AD_{it}}{BV_{it}} + \alpha_5 \frac{HE_{it}}{BV_{it}} + \alpha_6 \frac{RD_{it}}{BV_{it}} \bullet \frac{AD_{it}}{BV_{it}} + \alpha_7 \frac{RD_{it}}{BV_{it}} \bullet \frac{HE_{it}}{BV_{it}} + \alpha_8 \frac{AD_{it}}{BV_{it}} \bullet \frac{HE_{it}}{BV_{it}} + \alpha_9 \frac{RD_{it}}{BV_{it}} \bullet \frac{AD_{it}}{BV_{it}} \bullet \frac{HE_{it}}{BV_{it}} + e_{it} \qquad \text{(M2)}$$

3. Data and Sample

Based on our previous study, we found that the regressions in testing the intangible values of firms are industry specific. Therefore, this study restricts the testing sample to the public traded semiconductor companies in United States. We collect data from Compustat database for the years 1995 – 2002. In addition, we eliminate the firms with insufficient data for a given year, financial distress, or stock trading subject to regulation, to avoid the valuation bias. We result in total of 131 firms those have all the required data over the eight (8) years period.

Empirical Results

1. Preliminary Test of Technology and Firm Performance

Before formally testing regressions (M1) and (M2), we first test whether the technology can explain the financial performance of the semiconductor companies. As its advanced technology required, we anticipate the R&D spending shall be highly correlated with the financial performance. We conduct the tests of the following regressions:

$$\text{Financial Performance}_{it+1} = \beta_0 + \beta_1 \text{ R\&D Spending}_{it} + e_{it} \qquad \text{(M3)}$$

We measure the financial performance of the firms in terms of Gross Margin, Profit Margin, ROA, and Sale per Employee respectively. On the other side, we measure the R&D spending in terms of average R&D expenditure, R&D expenditure per Employee, and R&D expenditure per Dollar of Sale.

To capture the performance lag of R&D spending, we regress the financial performance of 2000 with respect to 1995-1995 R&D spending figures, similarly for 2001 and 2002. The regression results are summarized as Table 1-A, 1-B and 1-C. We find that most of the R&D measures can explain both Gross Margin and Sale per Employee well, but not Profit Margin and ROA. The reason is that profit margin is a noisy measure of the R&D performance. In terms of R square, R&D expenditure per employee predict the R&D performance best, then R&D per sale (or called R&D intensity). The R&D expenditure amount does not provide high explanation power to R&D performance.

[Insert Table 1-A, Table 1-B, and Table 1-C here]

2. Intangible Regression Results

Based on the preliminary tests of the previous section, many of the companies in 2001 and 2002 have negative net profits. The negative profit creates the non-stable regression relationship. In this intangible regression tests, therefore, we only include the observations from 1995 to 2000. In addition, we further eliminate the companies with negative equities. This elimination may create the bias of regressions, but it certainly increases the stability of regressions over the long-term periods. To calculate the market book value ratio, we use the year-end market value, instead of average market value.

Table 2 is the summary of the regression model (M1). Although the regression fits very well, with 60% adjusted R-Square, but not all the independent variables are significantly associated with market to book value ratio as the predicted signs. Among the three variables, the technology intensity is the most significant one in explaining the intangible value, but advertising and human resource intensities. This result is consistent with the previous preliminary test results reported in Table 1. In this paper, inverse of book value and ABE/BV can be explained as the proxy for firm's structure variable, which can also be a source of intangible according to Exhibit 1. Although the coefficient is significant, it is not in the direction as the prediction. Also we do not find that the small firm has a higher intangible value as other studies have shown, based on the association between MV/BV and the inverse of BV.

[Insert Table 2 here]

We further test the effect of the interaction of three variables on intangible valuation. The purpose of this test is to check if all the three variables are complementary or substitute? Our belief before the test is more inclined to the complementary relationship, especially for both the market intensity and technology intensity. The firm with strong technology intangible can further leverage its market intangible through their brand recognition or other market perception. The results of Table 3 do support our conjecture. However, the technology intensity becomes insignificant in explaining the intangible valuation, and the sign for market intensity becomes negative. The market and human resources interaction is not significant, neither the interaction of technology and human resource interaction. These results do support that a firm with high R&D intensity and market intensity can generate high intangible value, but either one of them is not sufficient in creating intangible value..

[Inset Table 3 here]

Conclusion

This paper investigates the intangible valuation of technology, market and human resources by using the semiconductor companies listed in U.S. stock exchanges. Particularly, we are interested in understanding the interaction effect of the technology and marketing resources. We do not find that all three variables significantly explain the intangible value of the firm by using pooling regression. However, our results do support that technology and marketing resources are complementary in explaining the firm's intangible value.

Different from most of the intangible studies, this paper restricts the tests by using single industry data, the U.S. semiconductor industry. Our intangible regression results are not in consistent with most of studies done from pooling different industries, but the R-Squares of our regressions are much higher than those reported in literature. These results reinforce our belief that the intangible effect shall be industry specific.

Exhibit 1:

Balance Sheet

Tangible Assets	**Liabilities + Retained Earnings**
Intangible Assets 1. Human Resource Assets 2. Market/Customer Assets 3. Organization/Process value 4. Technology/Innovation value	**Intellectual Capital**

Market Value-added

Market Value-added = Market value – Book value

$\Rightarrow$Market value = Book value + Market value-added

Exhibit 2:

ROE						
	93	**94**	**95**	**96**	**97**	**AVE**
INTC	31%	23%	28%	30%	36%	0.296
MICRON	16%	38%	45%	24%	12%	0.270
TI	20%	23%	27%	2%	31%	0.206
NS	14%	11%	18%	11%	2%	0.134
CY	3%	14%	22%	10%	3%	0.104
Market to Book Ratio						
	93	**94**	**95**	**96**	**97**	**AVE**
INTC	3.45	2.85	3.84	6.37	5.93	4.488
MICRON	3.35	3.91	8.37	1.90	3.26	4.158
TI	2.49	2.28	2.38	2.96	2.96	2.614
NS	1.92	2.14	2.13	1.41	2.33	1.986
CY	1.82	2.55	2.18	2.24	1.18	1.994

Table 1-A: 1995-1999 R&D vs. 2000 Performance

Dependent Variable	Independent Variable	coef.	p-value	R-square
Gross.Margin	RD.Average	0.0669	0.0003	0.0986
	RD.Per Employee	0.3953	0.0000	0.2673
	RD.Per Sale	124.8925	0.0000	0.2887
Profit.Margin	RD.Average	0.0520	0.0576	0.0277
	RD.Per Employee	0.3775	0.0001	0.1133
	RD.Per Sale	32.9684	0.2720	0.0093
ROA	RD.Average	0.0381	0.1006	0.0208
	RD.Per Employee	0.1344	0.1068	0.0200
	RD.Per Sale	-3.3524	0.8952	0.0001
Sale.Per Employee	RD.Average	0.4269	0.0153	0.0447
	RD.Per Employee	5.4493	0.0000	0.5654
	RD.Per Sale	1057.9249	0.0000	0.2306

Table 1-B: 1996-2000 R&D vs. 2001 Performance

Dependent Variable	Independent Variable	coef.	p-value	R-square
Gross.Margin	RD.Average	0.0575	0.0018	0.0727
	RD.Per Employee	0.3795	0.0000	0.2153
	RD.Per Sale	119.6761	0.0000	0.2013
Profit.Margin	RD.Average	-0.0122	0.7445	0.0008
	RD.Per Employee	-0.2743	0.0537	0.0286
	RD.Per Sale	-208.0785	0.0000	0.1546
ROA	RD.Average	-0.0005	0.9840	0.0000
	RD.Per Employee	-0.0383	0.6912	0.0012
	RD.Per Sale	-66.6844	0.0322	0.0351
Sale.Per Employee	RD.Average	0.2064	0.1804	0.0139
	RD.Per Employee	4.5401	0.0000	0.4559
	RD.Per Sale	777.6990	0.0000	0.1258

Table 1-C: 1997-2001 R&D vs. 2002Performance

Dependent Variable	Independent Variable	coef.	p-value	R-square
Gross.Margin	RD.Average	0.0592	0.0001	0.1158
	RD.Per Employee	0.3551	0.0000	0.2571
	RD.Per Sale	110.3555	0.0000	0.2473
Profit.Margin	RD.Average	-0.0282	0.3235	0.0076
	RD.Per Employee	-0.3369	0.0029	0.0666
	RD.Per Sale	-214.5953	0.0000	0.2689
ROA	RD.Average	-0.0111	0.5231	0.0032
	RD.Per Employee	-0.1655	0.0166	0.0436
	RD.Per Sale	-103.1691	0.0000	0.1688
Sale.Per Employee	RD.Average	0.1626	0.1986	0.0128
	RD.Per Employee	4.0455	0.0000	0.4876
	RD.Per Sale	595.0862	0.0002	0.1050

Table 2: M1 Regression Results

$$\frac{MV_{it}}{BV_{it}} = \alpha_0 + \alpha_1 \frac{1}{BV_{it}} + \alpha_2 \frac{ABE_{it}}{BV_{it}} + \alpha_3 \frac{RD_{it}}{BV_{it}} + \alpha_4 \frac{AD_{it}}{BV_{it}} + \alpha_5 \frac{HE_{it}}{BV_{it}} + e_{it}$$

				adj-R^2	**0.6007**
Variables	**F**	Coefficient		t-value	p-value
Intercept		1.1268		2.6241	0.0100
BVI	+	-0.0036		-0.001	0.9991
ABE	+	-3.5747		-3.6807	0.0004
RDI	+	12.6937		6.087	0.0000
ADI	+	-3.3172		-0.734	0.4642
HEI	+	0.5374		0.5564	0.5792

F: Predicted signs.

Table 3: M2 Regression Results

$$\frac{MV_{it}}{BV_{it}} = \alpha_0 + \alpha_1 \frac{1}{BV_{it}} + \alpha_2 \frac{ABE_{it}}{BV_{it}} + \alpha_3 \frac{RD_{it}}{BV_{it}} + \alpha_4 \frac{AD_{it}}{BV_{it}} + \alpha_5 \frac{HE_{it}}{BV_{it}} + \alpha_6 \frac{RD_{it}}{BV_{it}} \bullet \frac{AD_{it}}{BV_{it}}$$
$$+ \alpha_7 \frac{RD_{it}}{BV_{it}} \bullet \frac{HE_{it}}{BV_{it}} + \alpha_8 \frac{AD_{it}}{BV_{it}} \bullet \frac{HE_{it}}{BV_{it}} + \alpha_9 \frac{RD_{it}}{BV_{it}} \bullet \frac{AD_{it}}{BV_{it}} \bullet \frac{HE_{it}}{BV_{it}} + e_{it}$$

				adj-R^2	**0.6825**
Variable	**F**	Coefficient		t-value	p-value
Intercept		2.3148		3.3688	0.0011
BVI	+	-3.2086		-1.0499	0.2963
ABE10	+	-2.8928		-3.1821	0.0020
RDI	+	-1.6121		-0.3697	0.7124
ADI	+	-18.1287		-1.7457	0.0840
HEI	+	2.0270		1.2576	0.2115
RA	+	190.6986		4.4675	0.0000
RH	+	-1.4124		-0.1874	0.8518
AH	+	-7.0514		-0.6762	0.5005
RAH	+	-61.0285		-2.0936	0.0388

F: Predicted signs.

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