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Value Relevance of Information in Hi-tech Industries in Australia: Accounting Information and Intangible Asset Disclosures

Nadana Abayadeera*

The main objective of this study is to test the value relevance of financial and non-financial information in high-tech industries in Australia. Ninety-one companies were selected from the sectors of Pharmaceuticals, Biotechnology and Life Sciences; Technology, Hardware and Equipment; and Telecommunication Services of ASX for the analysis. Both financial and non-financial sections of annual reports were scrutinized in order to obtain data for the analysis. The unaudited sections of annual reports were particularly analysed using NVivo to obtain the word-count of intangible assets. Ohlson's (1995) Equity Valuation Model (modified for the intangible assets disclosures) was explicitly applied to examine the value relevance of financial and non-financial information. The overall results provide evidence that book value is the most significant factor and earnings are the least significant factor in deciding share prices in high-tech industries in Australia. This finding supports the previous studies that showed value relevance declined in earnings but increased in book value. This research proved that voluntary disclosures of intangible assets are value relevant, providing support for the previous US and Australian studies and the conclusion that investors probably increasingly rely upon alternative information sources.

Field of Research: Accounting

1. Introduction

Accounting theorists have generally evaluated the usefulness of accounting practices by the extent of their agreement with the particular analytical model. The limitations of the completely analytical approach to usefulness are illustrated by an argument that income numbers cannot be defined substantively, that they lack "meaning" and are therefore of doubtful utility (Ball and Brown, 1968). In accordance with prior studies, Hung (2001) defined the value relevance of financial statements as the ability of accounting data to summarise information impounded in market prices.

The large economic transformation from the industrial economy to the knowledge economy causes the growing Intangible Assets (IA) base of companies, such as goodwill, patents, brand names. Compared with tangible assets of companies, intangible assets are associated with more complex information related to measurement and value. The current financial reporting model seems to be no longer sufficient to capture the company values and performance mainly due to the fact that it ignores many of the non-financial intangible factors (Helen, 2006).

Many claim that the shift from an industrial economy to a high-tech service orientated economy (such as telecommunication, pharmaceuticals and

*Nadana Abayadeera: PhD Candidate, School of Accounting, Victoria University, Australia. Email: nadana.abayadeera@live.vu.edu.au/ nadanaabayadeera@yahoo.com

bio-technology, software development) has rendered traditional financial statements less relevant for assessing shareholder value. Studies in the USA and Australia documented that the value relevance of earnings has declined over the last few decades (Amir and Lev, 1996; Lev, 1996; Goodwin and Ahmad, 2006). In investigating the reasons for the decline, they comment that the accounting measurement and reporting system is ill-equipped to provide value relevant information in emerging high-tech industries and the investments in intangibles are largely expensed in financial statements, leading to depressed and often irrelevant earnings and book value figures (Amir and Lev, 1996). However, the presence of considerable additional information does not always relate to the draw-backs and restrictions of the accounting process and firms operating in fast changing, high growth and technology-based industries find that supplementary disclosures are necessary simply because of the rapid pace of change in their industries (Tasker, 1998). Thus, the additional disclosures may reflect investors' increased information requirements rather than the inadequacies of the accounting process. Further, there is evidence that the value relevance of financial information has not declined, in fact, has increased (Collins et al., 1997; Brimble, 2007).

2. Literature Review

2.1 Intangible Assets and Financial Reporting

Literature related to intangible assets (IA) and financial reporting reveals that companies increasingly depend on more supplementary or voluntary disclosures rather than accounting numbers for reporting intangible assets (Amir and Lev, 1996). Further, there is no consistent or mutually agreed reporting framework for intangible assets. As such, there is a dire need of establishing a uniform methodology for disclosure of intangible assets (Helen, 2006). Also it revealed that the adoption of IFRS has a major impact on the financial reporting practices of intangible assets. Marr et al. (2003) conducted a systematic literature review and found five reasons identified for the measurement of intangible assets: to help organizations formulate their strategy; to assess strategy execution; to assist in diversification and expansion decisions; to use as the basis for the compensation; and to communicate to external stakeholders.

2.2 Value Relevance of Accounting Information

In analysing the studies related to value relevance of accounting information, it can be concluded that the evidence is mixed. Although Amir and Lev (1996) reported that the financial information is largely irrelevant for the valuation of high-tech industries such as cellular companies, they further report when combined with non-financial information and with information about intangibles, those are value relevant. Basu (1997) provides evidence that accruals make earnings more timely in reporting "bad news" but not "good news". Furthermore, Hung (2001) reports that the value relevance of accounting information is "context driven", i.e., higher use of accrual accounting lowers the value relevance of accounting performance measures for countries with weak shareholder protection, which suggests that the shareholder protection improves the effectiveness of accrual accounting.

Biddle et al. (1997) found that the value relevance of accounting information with the evidence that RI (residual income) and EVA (economic value added) have significant and similar explanatory power, compared with “accounting profit”, in terms of evaluating the performance of the information electronics industry. Brief and Zarowin (1999) question the benefits of accrual accounting in assessing the value relevance by comparing with the dividend valuation model. Aboody and Lev (1998) provide evidence that the annual software capitalization, cumulative software assets and both upwards and downwards revaluations are value relevant, although those decisions may be subject to management discretions. Kalapur and Kwan (2004) also proved that brand assets are value relevant. Furthermore, the findings of Ahmad and Falk (2006) suggest that allowing managers to signal their superior information by either capitalizing successful R&D or expensing unsuccessful R&D would reduce the information asymmetry in the market.

2.3 Changes of Value Relevance across Time

The evidence is mixed for the topic of “Changes of Value Relevance across Time”. Collins et al. (1997) found that the combined value relevance of earnings and book values has not declined over the past 40 years and, in fact, has increased slightly. Further, the authors claimed that the value relevance of “bottom-line” earnings has declined over time, having been replaced by an increased value relevance of book values. Also Brimble (2007) suggested that any conclusion that conventional accounting earnings have lost their relevance in Australia is premature. However, Francis and Schipper (1999) addressed the concern that financial statements have lost a significant portion of their relevance to investors and the results indicate that for some financial statement metrics there has been a statistically significant decline in value relevance. Similarly, Goodwin and Ahmad (2006) suggested that earnings and financial statement information value relevance has declined over this period. Holthausen and Watts (2001) highlight the draw-back of value relevance literature in the context of input to financial accounting standard setting. These comments are very valuable in re-thinking the tests of value relevance of accounting information, including the models that may be adopted for the same.

The above literature review indicates that there were minor discussions about the value relevance of non-financial information, which are in the form of voluntary disclosures. This reveals that there is a vacuum of research in specifically testing the value relevance of non-financial information. Examining the value relevance of non-financial information, in addition to financial information, in high-tech industries in Australia, provides an original contribution to accounting literature.

3. Methodology

3.1 Population and Sample

The sample for the research was selected from the companies listed under three industry sectors of the Australian Securities Exchange (ASX): Pharmaceuticals, Biotechnology, and Life Sciences; Technology, Hardware and Equipment; and Telecommunication Services. The number of companies

in the population and the sample (under each of the industry sector) are listed in Table 1.

Table 1: Population and Sample

	Industry Sector	Population (Number of companies listed, June 2008)	Sample (Number of companies from each sector)
1	Pharmaceuticals, Biotechnology, and Life Sciences	91	46
2	Technology, Hardware and Equipment	35	24
3	Telecommunication Services	34	21
	Total	**160**	**91**

The above three industry sectors can be identified as high technology intensive sectors, where the intangible intensity is generally high. Large companies were selected, based on market capitalization as the sample for the analysis, using stratified sampling. The latest annual reports (2007/08) of the selected companies were analysed to gather the required data.

3.2 Hypothesis

Following is the hypothesis developed to achieve the aims of the research.

> **H:** There is a value relevance of financial information and IA disclosures in the form of non-financial information.

3.3 Methodology for the Test of Hypothesis

There are two phases in this research:

i. identification and quantification of intangible assets disclosures in the form of non-financial information; and
ii. examination of value relevance of accounting information and intangible assets disclosures in high-tech industries in Australia.

Two different methodologies are applied for the above two phases. Content analysis is employed for the identification and measurement of IA disclosures in the form of non-financial information. Initially, the annual reports were converted into Word, from the PDF form, using PDF-Word convertor. Then, the converted reports were imported to the NVivo 8 software package and the intangible assets disclosures were coded to each of the intangible asset categories, by reading all unaudited sections of the annual reports. Finally, the “word count” of the intangible assets disclosure was obtained using the facility of “matrix coding queries” of NVivo 8. This quantification of disclosures of IA, in the form of non-financial information, is applied to test the value relevance of information (phase 2 of the research).

The main issue of this research is to test the value relevance of financial information and IA disclosures in annual reports of hi-tech industries in

Australia. The value relevance was tested by using the value relevance model developed by Ohlson (1995). Out of the two types of valuation models in the literature, earnings model and price model, the price model was employed. While return models are heavily reliant upon market-based accounting research, price models persist in the literature (Landsman, 1986; Barth, 1991; Eccher et al., 1996; Burgstahler and Dichev, 1997; Collins et al., 1997; Bao and Chow, 1999; Chen et al., 2001).

3.3.1 Ohlson's (1995) Equity Valuation Model Modified for the Intangible Assets Disclosures

Following the methodology of studies in the value relevance literature, Ohlson's (1995) model is modified for this research. Particularly, it is modified by including the word count of intangible asset disclosures in the form of non-financial information, as another variable to the multiple regression model, in addition to the earnings and book values, which are originally in Ohlson's (1995) model. After the modification, the model is as follows.

R_1: $P_{it} = \alpha_0 + \alpha_1 E_i + \alpha_2 BV_i + \alpha_3 IA_i + €$

α_0: Intercept

P_{it}: Price of a share of firm i at the date on which the annual report is issued

E_i : Earnings per share of firm i

BV_i: Book value per share of firm i

IA_i: Result of the word count of intangible assets disclosures in the form of non-financial information, for firm i

€: Independently and identically disturbed error term

3.3.2 Impact of Scale Effect

The scale effect is referred to as the overwhelming influence of large firms over the regressions (Easton and Sommers, 2003). Scale effect has an impact to R^2. Brown, et al. (1999) suggest that some of the differences between "too low" R^2 in return regressions and (higher) R^2 in level regressions are caused by the scale effect. Also they found that R^2 in the regression of price on earnings per share and book value per share is positively correlated with CV of the scale factor. There are two main remedies discussed in literature to overcome or mitigate the scale effect of capital market research. They are; deflation by a scale proxy and inclusion of scale proxy as an additional independent variable (Barth and Kallapur, 1996).

Since the sample of this research is cross-sectional, it is possible to have the scale effect on the regressions of per share basis measure. In order to control for the cross-sectional scale differences (scale effect), more regressions were run by considering firm-level aggregates to replace the share price, earnings and book values of the original regression model. Accordingly, the following alternative regression model is developed to test the same hypothesis.

R_2: $MC_{it} = \alpha_0 + \alpha_1 NPAT_i + \alpha_2 EQ_i + \alpha_3 IA_i + €$

α_0: Intercept

MC_{it}: Market Capitalization of firm i, at the date on which the annual report is issued

$NPAT_i$: Net Profit after Tax of firm i

EQ_i: Book Value of Equity, firm i

IA_i: Result of the word count of intangible assets disclosures in the form of non-financial information, for firm i

€: Independently and identically disturbed error term

4. Analysis of Data

4.1 Descriptive Statistics

Descriptive statistics were calculated for dependent and independent variables in order to obtain an overview of the nature of data to be analysed. This has been done after eliminating outliers. An outlier is an observation that lies an abnormal distance from other values in a random sample from a population, which will distort statistics. Although outliers are often bad points, they should be investigated carefully (Tabachnick and Fidell, 2007). The reason for the outliers in this study is the existence of more extreme values than a normal distribution such as due to the scale of the company and performance of the company. Since the analysis was done on six sets of data, outliers were identified and removed in each of the data sets separately: four companies from the full sample; 2 companies from Sector 1: all companies; one company from Sector 1: companies reported negative earnings; one company from Sector 2; two companies from Sector 3 and six companies from Sector 2 and 3 together were identified as outliers and removed from further analysis. Since the majority of companies (38 out of 48) in Sector 1: Pharmaceuticals, Bio Technology and Life Sciences reported negative earnings, the data analysis was done in two stages for this sector, initially for all companies, then for the companies reporting negative earnings. The size of the sample is smaller in two sectors (sector 2 and sector 3) because smaller numbers of companies are listed in these sectors (population) and filtered for outliers. The results of descriptive statistics for each of the data sets are presented in Table 2.

Table2: Descriptive Statistics of Dependent and Independent Variables

Data Set	Variable	N	Min	Max	Mean	SD	Skewness	Kurtosis
Full Sample	**Share Price**	**90**	0.01	3.51	0.3709	0.61349	2.799	8.926
	Earnings per Share		-8.90	3.00	-0.1181	1.01626	-7.133	65.069
	Book Value per Share		-0.01	2.10	0.2609	0.40770	2.439	6.067
	IA (word count)		961.00	23999.00	6005.211	3170.36	2.265	10.676
	Market Capitalization		204271.63	475000000	45823000	77485500	3.519	15.170
	Net Profit After Tax		-99044000	20077000	-5135200	13618300	-3.934	25.283
	Book Value of Equity		-11711000	307000000	28286000	50970100	4.114	19.257
Sector 1: All Companies	**Share Price**	**46**	0.02	2.24	0.4724	0.62077	1.828	2.470
	Earnings per Share		-8.90	3.00	-0.2310	1.41807	-5.059	32.975
	Book Value per Share		0.00	1.29	0.2573	0.34177	2.023	3.466
	IA (word count)		986	23999	7368.1087	3555.92	2.341	9.804
	Market Capitalization		2204955	417000000	56968000	75040800	2.875	11.071
	Net Profit After Tax		-36093000	7110000	-6171400	8000200	-1.729	4.303
	Book Value of Equity		73052	304000000	29968000	47993000	4.461	24.201
Sector 1: Companies reported negative Earnings	**Share Price**	**37**	0.02	2.20	0.3586	0.460	2.362	6.740
	Earnings per Share		-1.74	-0.01	-0.1495	0.3199	-4.083	18.173
	Book Value per Share		0.00	1.29	0.2316	0.34468	2.40	5.127
	IA (word count)		2832	23999	7869.2973	3585.565	2.692	10.716
	Market Capitalization		2204955	417000000	53881000	78579400	3.104	12.232
	Net Profit After Tax		-26148000	-1429160	-7094700	6075940	-1.876	3.329
	Book Value of Equity		73052	304000000	29710000	52461800	4.320	21.618

Table 2 contd.

Table 2: Descriptive Statistics of Dependent and Independent Variables contd.

Data Set	Variable	N	Min	Max	Mean	SD	Skewness	Kurtosis
Sector 2	**Share Price**	**20**	0.01	0.71	0.1312	0.18868	2.003	3.921
	Earnings per Share		-0.12	0.20	0.0015	0.06512	1.339	4.245
	Book Value per Share		-0.01	0.75	0.1571	0.22338	1.633	1.848
	IA (word count)		961	9231	4760.95	2221.82	0.164	-0.728
	Market Capitalization		1306222	115000000	15554000	24484900	3.867	16.200
	Net Profit After Tax		-99044000	11496000	-7934500	23246300	-3.532	13.674
	Book Value of Equity		-11711000	62044000	14637000	17724400	1.375	1.891
Sector 3	**Share Price**	**23**	0.01	3.51	0.3896	0.79279	3.186	11.246
	Earnings per Share		-0.22	0.22	-0.0024	0.08008	0.353	4.276
	Book Value per Share		-0.01	2.10	0.3402	0.60611	2.009	2.849
	IA (word count)		2398	8614	4732.6087	1838.7545	0.552	-0.670
	Market Capitalization		204271	475000000	53576000	106050000	3.208	11.628
	Net Profit After Tax		-27102264	20077000	-35211.04	10360800	-0.385	1.901
	Book Value of Equity		3830000	187000000	27056000	43134800	2.761	8.541
Sector 2&3	**Share Price**	**40**	0.01	1.44	0.1949	0.33764	2.683	7.249
	Earnings per Share		-0.22	0.22	0.0051	0.07298	0.578	3.996
	Book Value per Share		-0.01	1.46	0.1780	0.28325	2.878	10.170
	IA (word count)		961	9231.00	4661.0250	1930.83421	0.436	-0.368
	Market Capitalization		204271.63	185000000	23998000	39188800	2.776	7.860
	Net Profit After Tax		-33940000	20077000	-2367800	10164100	-0.768	2.678
	Book Value of Equity		-3830000	307000000	26140000	56465900	3.968	17.064

4.2 Assumptions of Multiple Regression Analysis

There are four principal assumptions which justify the use of linear regression models for the purpose of predictions and validity of any conclusions reached. Only three assumptions are applicable for the data analysis of this research. The assumption of independence is not applicable, since the data set is cross-sectional, not time series (Berenson et al., 2005). The following section discusses the tests carried out to assess the assumptions and the inference obtained. Further, one of the important problems in the application of multiple regression analysis, the possible multicollinearity of the independent variables, is discussed.

4.2.1 Linearity

Non-linearity is most evident in a plot of observed versus predicted values or plot of residuals versus predicted values. The points should be symmetrically distributed around a diagonal line. In order to test the linearity of the regression equations that are developed in this research, a graphical method, a normal P-P plot of regression standardised residuals using SPSS (version 17) has been employed. Then, the symmetrical distribution around a diagonal line was carefully observed. No observations were found contrary to the linearity assumption.

4.2.2 Normality

Normality requires that the errors be normally distributed at each value of X. (Berenson et al., 2005). The best test for normality is the normal probability plot of the residuals. If the distribution is normal, the points on the plot should fall close to the diagonal line. Further, there are statistical tests (such as Klomogorov-Smirnov, Anderson -Darling test, Shapiro-Wilk test) available to check the normality of errors of the sample. Both the graphical and statistical methods to test the normality of the regression models have been used. Some of the regression models failed the normality tests of Klomogorov-Smirnov and Shapiro-Wilk, reporting significant p values (less than .05). However, no contrary evidence for the normality was found either in Normal Q-Q plots or frequency histograms.

Snow (2007) argues that the normality tests are not particularly useful because of the following potential problems.

i. Small samples almost always pass the normality test.
ii. With large samples, minor deviation from normality may be flagged as statistically significant, even though small deviations from a normal distribution will not affect the results of a t-test or ANOVA.
iii. Decisions about when to use parametric versus non-parametric tests should usually be made to cover an entire series of analysis. It is rarely appropriate to make a decision based on a normality test of the data set.

Further, many parametric tests, such as t-test and ANOVA, use the mean of the sample so some non-normality can be tolerated due to the Central Limit Theorem (Motulsky, 2002). In accordance with the above arguments, it can be concluded that the data set of this research is not disqualified for the linear regression analysis due to the deviation from the assumption of normality.

4.2.3 Equal Variance (Homoscedasticity)

Violation of homoscedasticity, which is known as heteroscedasticity, means a situation in which the variance of the dependent variable varies across the data. Heteroscedasticity can be detected by the visual examination of residuals. A number of residual plots are appropriate: histogram of residuals; normal probability plot of residuals; and scatter plot of the standardised residuals. Scatter plots of the standardised residuals will allow the detection of outliers and non-linearities, since "well behaved" residuals will be spherical, i.e., scattered randomly in an approximate circular pattern. If the plot fans out in (or fans in) a funnel shape, this is a sign of heteroscedasticity. Both scatter plots of standardised residuals and normal Q-Q plot of unstandardized residuals have been applied to test the homoscedasticity of each of the regression models. No evidence was found for heteroscedasticity in any of the models.

4.2.4 Multicollinearity

Multicollinearity exists when two or more of the independent variables are correlated. The consequence is that the individual p values of variables can be misleading (a p value can be high, even though the variable is significant). In order to detect the multicollinearity problem, if any, and to solve it, the correlation-coefficients of X variables are calculated and their significance studied before modelling the multiple-linear regression equations. Tables 3 and 4 present the correlationcoefficients and their significance calculated for each of the data sets separately for each of the measures, per share basis and firm-level aggregates. A number of independent variables are significantly correlated (identified by p values); as a result, the multicollinearity problem exists in two sets of data of per share basis measure and five sets of data in firm-level aggregates measure. Sector 1, companies reporting negative earnings, EPS and BV (-.491); sector 2 & 3 together, EPS and BV (.371) were identified as significantly correlated independent variables of the measure of per share basis. Full sample, book value of equity and IA (.210); sector 1, all companies, net profit and IA (-.315), book value of equity and IA (.331); Sector 1, companies reported negative earnings, book value of equity and IA (.365); and Sector 3 net profit and book value of equity (.576) were identified as significantly correlated independent variables of the measure of firm-level aggregates. There are several remedies for this problem. The best solution is to understand the cause of multicollinearity and remove it (Motulsky, 2002). Accordingly, the significantly correlated variables have been removed when modelling equations.

Table 3: Pearson Correlation between Independent Variables, Per share Basis Measure

Data Set	Variable	Correlations of Variables		N
		Book Value per Share	IA (word-count)	
Full sample	Earnings per Share	.011	-.090	90
	Significance	.921	.401	
	Book Value per Share		.087	
	Significance		.417	
Sector 1, all companies	Earnings per Share	.010	-.051	46
	Significance	.948	.735	
	Book Value per Share		.162	
	Significance		.282	
Sector 1 Companies reported negative EPS	Earnings per Share	-.491**	-.059	37
	Significance	.002	.728	
	Book Value per Share		.230	
	Significance		.170	
Sector 2	Earnings per Share	.111	.075	20
	Significance	.642	.753	
	Book Value per Share		-.256	
	Significance		.277	
Sector 3	Earnings per Share	.108	0.76	23
	Significance	.625	.731	
	Book Value per Share		.216	
	Significance		.321	
Sector 2&3	Earnings per Share	.317*	.038	40
	Significance	.046	.815	
	Book Value per Share		.096	
	Significance		.555	

*Correlation is significant at 0.05 level (2-tailed)
**Correlation is significant at 0.01 level (2-tailed)

Table 4: Pearson Correlation between Independent Variables, Firm-Level Aggregate Measure

Data Set	Variable	Correlations of Variables		N
		Book Value of Equity	IA (word-count)	
Full sample	Net Profit after Tax	.034	-.048	90
	Significance	.748	.652	
	Book Value of Equity		.210*	
	Significance		.047	
Sector 1, all companies	Net Profit after Tax	-.190	-.315*	46
	Significance	.206	.033	
	Book Value of Equity		.331*	
	Significance		.025	
Sector 1 Companies reported negative EPS	Net Profit after Tax	-.240	-.307	37
	Significance	.152	.065	
	Book Value of Equity		.365*	
	Significance		.026	
Sector 2	Net Profit after Tax	.432	.324	20
	Significance	.057	.164	
	Book Value of Equity		.140	
	Significance		.555	
Sector 3	Net Profit after Tax	.576**	.102	23
	Significance	.004	.645	
	Book Value of Equity		.411	
	Significance		.051	
Sector 2&3	Net Profit after Tax	.057	.151	40
	Significance	.727	.354	
	Book Value of Equity		.085	
	Significance		.602	

*Correlation is significant at 0.05 level (2-tailed)
**Correlation is significant at 0.01 level (2-tailed)

4.3 Assessment of Value Relevance of Financial and Non-Financial Information

Sixteen multiple regressions models were developed to test the hypothesis discussed in section 3, methodology. The first seven regression models were to test the value relevance of information on the per share basis measure (R_1) and second nine models were for the firm-level aggregates measure (R_2). The both sets of models were developed; initially for the full sample (all industry sectors together), then for each of the industry sectors, and for industry sectors 2&3 together. Industry sectors 2 and 3 are taken together because the majority of companies in sector 1 reported negative earnings. Slope coefficients of each of the independent variable and their significance; F-statistic and its significance; and the value of R^2_{adj} are taken into account to assess the value relevance of each of the variables; significance of the overall model; and explanatory power of the models, respectively. The critical value considered to rejecting the null-hypothesis is 5%. Further, some of the independent variables are removed by considering the correlation coefficients when modelling equations (models 3,4,9,10,11,12,14 and 15), in order to avoid the multicollinearity problem. Results of the regressions are presented in Tables 5 and 6 and discussed in the following sub-sections.

Table 5: Assessment of Value Relevance: Per Share Basis

Panel A

Model	Data Set	Intercept	EPS	BV	IA (100's words)	R^2_{adj}	F Value	N
1	Full Sample	-0.014	0.025	0.815	0.0029	30.8%	14.199	90
	Significance	0.909	0.638	0.000**	0.094		0.000**	
2	Sector 1, All companies	0.044	0.028	0.875	0.0028	23.7%	5.648	46
	Significance	0.816	0.630	0.001**	0.225		0.002**	
3	Sector 1, Companies reported negative earnings	-0.230	-0.180		0.0071	29.3%	8.470	37
	Significance	0.152	0.380		0.000**		0.001**	
4	Sector 1, Companies reported negative earnings	-0.244		0.592	0.0059	47.4%	17.204	37
	Significance	0.078		0.001**	0.001**		0.000**	
5	Sector 2	-0.145	0.129	0.683	0.0035	60.6%	10.761	20
	Significance	0.066	0.763	0.000**	0.013**		0.000**	
6	Sector 3	0.602	3.372	0.824	0.0001	46.5%	7.378	23
	Significance	0.094	0.043*	0.001**	0.154		0.002**	
7	Sector 2&3 together	-0.046	2.074	0.625	0.0025	63.8%	23.900	40
	Significance	0.598	0.000**	0.000**	0.141		0.000**	

Table 5: Assessment of Value Relevance: Firm-Level Aggregates

Panel B

Model	Data Set	Intercept	NPAT	EQ	IA (words)	R^2_{adj}	F Value	N
8	Full Sample	-18070000	0.584	0.560	8500	29.7%	13.510	90
	Significance	0.229	0.252	0.000**	0.000**		0.000**	
9	Sector 1, All companies	23280000	-1.401	0.836		30.7%	10.990	46
	Significance	0.070	0.244	0.001**			0.000**	
10	Sector 1, All companies	-25100000	-0.901		10383	24.8%	8.405	46
	Significance	0.267	0.485		0.001**		0.001**	
11	Sector 1, Companies reported negative Earnings	-3198466	-4.67	0.806		48.5%	17.928	37
	Significance	0.828	0.006**	0.000**			0.000**	
12	Sector 1, Companies reported negative Earnings	-73720000	-4.067		12547	51%	19.738	37
	Significance	0.002	0.015**		0.000**		0.000**	
13	Sector 2	-27010000	-0.366	1.062	5067	63.0%	11.771	20
	Significance	0.013	0.048*	0.000**	0.007**		0.000**	
14	Sector 3	-21190000	5.393		15838	32.1%	6.192	23
	Significance	0.685	0.007**		0.136		0.008**	
15	Sector 3	-7550000		0.991	9361	16.7%	3.206	23
	Significance	0.764		0.073	0.456		0.062	
16	Sector 2&3 together	-4266754	1.656	0.389	4725	60.1%	20.582	40
	Significance	0.692	0.000**	0.000**	0.029*		0.000**	

** Significant at 1% level
* Significant at 5% level

Variable Definitions: Sector 1: Pharmaceuticals, Bio Technology and Life Sciences; Sector 2: Hardware, Technology and Equipment; Sector 3: Telecommunication; EPS: Earnings per share; BV: Book value per share; IA: Voluntary Disclosure of Intangible Assets quantified by word count NPAT: Net Profit after Tax; EQ: Book Value of Total Equity

4.3.1 Full Sample

Following are the multiple regression equations estimated for the full sample.

Model 1: $$P_{it} = \underset{(0.909)}{-0.014} + \underset{(0.638)}{0.025}E_i + \underset{(0.000)}{0.815}BV_i + \underset{(0.094)}{0.0029}IA_i + \varepsilon_i$$

Model 8: $$MC_{it} = \underset{(0.229)}{-18070000} + \underset{(0.252)}{0.584}NPAT_i + \underset{(0.000)}{0.560}EQ_i + \underset{(0.000)}{8500}IA_i + \varepsilon_i$$

Model 1 is estimated for the per share basis and model 8 is for the firm-level aggregates. The F-statistics used to test the overall fit of the above models are 14.199 and 13.510, respectively, which are highly statistically significant with p-value at 1%. The coefficients of all independent variables have the expected signs, indicating that they are positively correlated with share prices. The coefficients of only two variables, book value and IA, are statistically significant in both models. However, the level of significance of IA is higher in model 8 (at 1%) compared with model 1 (10%). This indicates only book value and IA disclosures are value relevant in Australian High-Tech industries and earnings are not value relevant. Further, reasonable explanatory powers (30.8% and 29.7%) were reported in these models, measured by adjusted R^2.

4.3.2 Sector 1: Pharmaceuticals, Bio Technology and Life Sciences, All Companies

Following are the multiple regression equations estimated for the sector 1: Pharmaceuticals, Bio Technology and Life Sciences, all companies.

Model 2: $$P_{it} = \underset{(0.816)}{0.044} + \underset{(0.630)}{0028}E_i + \underset{(0.001)}{0.875}BV_i + \underset{(0.225)}{0.0028}IA_i + \varepsilon_i$$

Model 9: $$MC_{it} = \underset{(0.070)}{23280000} - \underset{(0.244)}{1.401}NPAT_i + \underset{(0.001)}{0.836}EQ_i + \varepsilon_i$$

Model 10: $$MC_{it} = \underset{(0.267)}{-25100000} - \underset{(0.485)}{0.901}NPAT_i + \underset{(0.001)}{10383}IA_i + \varepsilon_i$$

Value relevance of sector 1: Pharmaceuticals, Bio Technology and Life Sciences, all companies were tested in three models, model 2 is for the per share basis and models 9 and 10 are for the firm-level aggregates. Firm-level aggregates are tested in two models as a remedy for the multicollinearity problem. The F-statistics used to test the overall fit of the above models are 5.648, 10.990 and 8.405, respectively, which are highly statistically significant with p-value, at 1%. The coefficients of independent variables, other than NPAT in models 9 and 10 have the expected signs, indicating that they are positively correlated with share prices. The coefficient of only BV is statistically significant at 1% level in model 2 (per share basis). However, the coefficients of EQ and IA are statistically significant at 1% level in models 9 and 10 respectively. This indicates book value and IA disclosures are value relevant in sector 1: Pharmaceuticals, Bio Technology and Life Sciences and earnings are not value relevant. Further, reasonable explanatory powers (23.7%, 30.7% and 24.8%) were reported in these models, measured by adjusted R^2.

The majority of companies in sector 1 reported negative earnings in 2008. Therefore separate regression models were estimated for companies reporting negative earnings in this sector, in order to obtain a clear view of the value relevance of negative earnings.

4.3.3 Sector 1: Pharmaceuticals, Bio Technology and Life Sciences, Companies Reporting Negative Earnings

Following are the multiple regression equations estimated for the sector 1: Pharmaceuticals, Bio Technology and Life Sciences, companies reporting negative earnings.

Model 3: $$P_{it} = -\underset{(0.152)}{0.230} - \underset{(0.380)}{0.180}E_i + \underset{(0.000)}{0.0071}IA_i + \varepsilon_i$$

Model 4: $$P_{it} = -\underset{(0.078)}{0.244} + \underset{(0.001)}{0.592}BV_i + \underset{(0.001)}{0.0059}IA_i + \varepsilon_i$$

Model 11: $$MC_{it} = -\underset{(0.828)}{3198466} - \underset{(0.006)}{4.67}NPAT_i + \underset{(0.000)}{0.806}EQ_i + \varepsilon_i$$

Model 12: $$MC_{it} = -\underset{(0.002)}{73720000} - \underset{(0.015)}{4.067}NPAT_i + \underset{(0.000)}{12547}IA_i + \varepsilon_i$$

Value relevance of sector 1: Pharmaceuticals, Bio Technology and Life Sciences, companies reported negative earnings were tested in four models, models 3 and 4 for the per share basis and model 11 and 12 for the firm-level aggregates. Both measures are tested in two models as a remedy for the multicollinearity problem. The F-statistics used to test the overall fit of the above models are 8.470, 17.204, 17.928 and 19.738, respectively, which are highly statistically significant with p-value, at 1%. The coefficients of all independent variables have the expected signs, indicating that negative earnings are negatively and book value and IA are positively correlated with share prices. The coefficients of only BV and IA are statistically significant at 1% level in models 3 and 4 (per share basis) and NPAT, EQ and IA are statistically significant at 1% level in models 11 and 12 (firm-level aggregates). This indicates negative earnings; book value and IA disclosures are value relevant in sector 1: Pharmaceuticals, Bio Technology and Life Sciences. Further, reasonable explanatory powers (29.3%, 47.4%, 48.5% and 51%) were reported in these models, measured by adjusted R^2.

4.3.4 Sector 2: Hardware, Technology and Equipment

Following are the multiple regression equations estimated for the Sector 2: Hardware, Technology and Equipment

Model 5: $$P_{it} = -\underset{(0.066)}{0.145} + \underset{(0.763)}{0.129}E_i + \underset{(0.000)}{0.683}BV_i + \underset{(0.013)}{0.0035}IA_i + \varepsilon_i$$

Model 13: $$MC_{it} = -\underset{(0.013)}{27010000} - \underset{(0.048)}{0.366}NPAT_i + \underset{(0.000)}{1.062}EQ_i + \underset{(0.007)}{5067}IA_i + \varepsilon_i$$

Model 5 is estimated for the per share basis and model 13 is for the firm-level aggregates. The F-statistics used to test the overall fit of the above models are 10.761 and 11.771, respectively, which are highly statistically significant with p-value, at 1%. The coefficients of independent variables other than NPAT have the expected signs, indicating they are positively correlated with share prices. The coefficients of only two variables, book value and IA, are statistically significant (at 1% level) in both models. The significant coefficient (at 5%) with negative correlation reported for earnings (NPAT) in model 13 is an ambiguous result. This indicates only book value and IA disclosures are value relevant in Sector 2: Hardware, Technology and Equipment. Further, considerable explanatory powers (60.6% and 63.0%) were reported in these models, measured by adjusted R^2. However, the small sample size of this sector limits the strength of the above results.

4.3.5 Sector 3: Telecommunications

Following are the multiple regression equations estimated for the Sector 3: Telecommunications.

Model 6: $$P_{it} = \underset{(0.094)}{0.602} + \underset{(0.043)}{3.372}E_i + \underset{(0.001)}{0.824}BV_i + \underset{(0.154)}{0.0001}IA_i + \varepsilon_i$$

Model 14: $$MC_{it} = -\underset{(0.685)}{21190000} + \underset{(0.007)}{5.393}NPAT_i + \underset{(0.136)}{15838}IA_i + \varepsilon_i$$

Model 15: $$MC_{it} = -\underset{(0.764)}{7550000} + \underset{(0.073)}{0.991}EQ_i + \underset{(0.456)}{9361}IA_i + \varepsilon_i$$

Model 6 is estimated for the per share basis and models 14 and 15 are for the firm-level aggregates. The F-statistics used to test the overall fit of the above models are 7.378, 6.192 and 3.206, respectively, which are statistically significant with p-value at 1% for models 6 and 14 and at 6% for model 15. The coefficients of all independent variables have the expected signs, indicating they are positively correlated with share prices. The coefficients of only two variables, earnings and book value are statistically significant in both measures. This indicates earnings and book values are value relevant in Sector 3: Telecommunications. However, the statistical significance level of earnings was increased from 4% to 1% and was decreased for book value from 1% to 7% in the measure of firm-level aggregates compared with per share basis. Further, reasonable explanatory powers (46.5%, 32.5% and 16.7%) were reported in these models, measured by adjusted R^2.

4.3.6 Sectors 2 and 3 Together

Separate regressions were run by taking sectors 2 and 3 together in order to obtain a clear view of the value relevance of earnings, since the majority of companies in sector 1 reported negative earnings. Following are the multiple regression equations estimated for Sectors 2 and 3 together.

Model 7: $$P_{it} = -\underset{(0.598)}{0.046} + \underset{(0.000)}{2.074}E_i + \underset{(0.000)}{0.625}BV_i + \underset{(0.141)}{0.0025}IA_i + \varepsilon_i$$

Model 16: $$MC_{it} = \underset{(0.692)}{-4266754} + \underset{(0.000)}{1.656}NPAT_i + \underset{(0.000)}{0.389}EQ_i + \underset{(0.029)}{4725}IA_i + \varepsilon_i$$

Model 7 is estimated for the per share basis and model 16 is for the firm-level aggregates. The F-statistics used to test the overall fit of the above models are 23.9 and 20.582, respectively, which are statistically significant with p-value at 1%. The coefficients of all independent variables have the expected signs, indicating they are positively correlated with share prices. The coefficients of only two variables, earnings and book value, are statistically significant (at 1% level) in per share basis measure. However, all three variables were reported as statistically significant in the measure of firm-level aggregates. This indicates earnings and book values as well as IA are value relevant when sectors 2 and 3 are taken together. Further, considerable explanatory powers (63.8% and 60.1%) were reported in these models, measured by adjusted R^2.

The above results revealed that book value is highly value relevant in all three industry sectors. The statistical significances, as shown by p-values, were at 1% in eleven models out of twelve models testing the book values. Earnings are reported as value relevant in more models in the measure of firm-level aggregates (four models out of six models), compared with per share basis measure (two models out of six models). The finding of high value relevance of book value and less value relevance of earnings provides support for Francis and Schipper (1999) that value relevance has declined in earnings but increased in balance sheet relations (book value). Further, the results of the analysis proved that non-financial, intangible assets disclosures are value relevant in high-tech industries in Australia. Significant results were found to support the value relevance of non-financial, intangible assets disclosures in all sectors other than sector 3, Telecommunications. This finding provides support for the previous US and Australian studies, the conclusion that investors would probably increasingly rely upon alternative information sources.

5 Discussion of Results of Value Relevance of Financial and Non-financial Information

The outcome of the analysis done in section 4.3 is discussed in this section, by referring to the literature. The findings are consistent with several Australian as well as overseas prior research findings. It is consistent with Amir and Lev (1996), who demonstrate the complementarities between financial and non-financial information. The high value relevance of IA compared with earnings in the current study is consistent with their finding that the value relevance of non-financial information overwhelms that of traditional financial indicators. Then, the results are going in line with the findings of Han and Manry (2004) who commented that the market may accept the information about R&D whether capitalized or expensed, therefore the disclosure is, however, of importance for the value creation. The findings are also consistent with the results put forward by Ritter and Wells (2006) indicating there is a significant association between voluntarily recognized and disclosed identifiable intangible assets and stock prices, in Australia 1979-1997. Further, the findings of very high value relevance of book value and less value relevance of earnings are particularly consistent with Collins et al. (1997) and Francis and Schipper (1999); the value relevance of “bottom-line” earnings has declined over time, having been replaced by an increased value relevance of book values. Also the results are consistent with the argument of Godfrey et al. (2006), that there is a the high and

significant economic association between Australian firms' market value of equity and the book value. Finally it is interesting that the results are comparable with the Chinese market, where, Chen et al.(2001) report that accounting information is value relevant to Chinese investors despite the young age of the market.

In some instances, the results contradict comparable prior literature. They contradict the argument of Amir and Lev (1996), that, on a stand-alone basis, financial information is largely irrelevant for the valuation of cellular companies, with the finding of value relevance of financial information in this research. Also, the current finding of value relevance of voluntary disclosures of IA in the Australian market disagrees with the Godfrey et al. (2006) inference that investors do not obtain information about levels of expenditure on intangible assets and its probable success from sources other than capitalised balances on balance sheets, then the market value of Australian firms' equity is likely to fall now that the rules governing accounting for intangibles have changed. Finally, the findings contradict Banghoj and Plenborg (2008) who report that, although the objective of the annual report is to provide useful information to stakeholders, investors in Danish companies have not benefited from an improved level of voluntary disclosure, since there is clear evidence that voluntary disclosures are considered in determining share prices of Australian market.

Findings of this research contribute to improve the financial reporting models of the market. Ritter and Wells (2006) stated that the recognition and disclosure of identifiable IA by Australian firms will cease, because of regulatory reforms, as a part of international convergence. As a result, the company management may shift to voluntary disclosure of intangibles. The findings of this research show that the voluntary disclosures of IA are successful in an environment where capitalization is restricted. Kohlbeck and Warfield (2007) argue that intangible asset measures or factors that are indicative of intangible assets should be considered when assessing value. Results of the current study strengthen the above argument; with the finding that there are considerable IA disclosures in the form of non-financial information, in company annual reports and those disclosures are value relevant to the market. Further, this research contributes to the suggestion of Garcia-Ayuso (2003) that researchers should attempt to establish empirical relationships between current intangible investments and future value creation in companies so as to provide guidance for the fair value of intangibles.

6. Conclusion

The specific aim of the research is to examine the value relevance of accounting information and intangible asset disclosures. Ninety-one companies were selected cross-sectionally from three industry sectors (Pharmaceuticals, Bio Technology and Life Sciences; Hardware, Technology and Equipment and Telecommunications) of the Australian Securities Exchange (ASX). Intangible assets disclosures of the annual reports were measured as the total of word-count obtained by analysing the unaudited sections of annual reports, using the facilities of NVivo 8. Results of the word count were incorporated as a modification to Ohlson's (1995) model to measure the value relevance of intangible assets disclosures in addition to earnings and book value. Value relevance of three variables (earnings, book value and intangible assets disclosures) were assessed by developing sixteen regression models, under main two measures, per share basis and firm-level aggregates. Data sets were categorized for the full sample, each of the sectors separately and sector 2

and 3 together. Further analysis was done for sector 1: Pharmaceuticals, Bio Technology and Life Sciences, since the majority of companies reported losses in that sector. Further, possible multicollinearities of independent variables were taken into account when modelling equations.

The overall results provide evidence that book value is the most significant factor and earnings are the least significant factor in determining the share prices of companies in high-tech industries in Australia. This provides support for Francis and Schipper (1999) and Collins et al. (1997), that value relevance has declined in earnings but increased in balance sheet relations (book value). Further, the hypotheses tests indicate that the voluntary disclosures of intangible assets in annual reports of high-tech industries in Australia also have value relevance at a very high level of statistical significance, providing support for the previous US and Australian studies and the conclusion that investors would probably increasingly rely upon alternative information sources (Collins et al., 1997; Brown et al., 1999; Francis and Schipper, 1999; Lev, 1999; Brimble, 2007).

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