Changing Business Environment and the Value Relevance of Accounting Information

University of Huelva - October 13th, 2005

Virginia Cortijo and Ari Yezegel

Value Relevance

- Following Ohlson (1995), numerous studies have examined the value relevance of accounting.
  - In the U.S. these studies include : (Lev & Zarowin (1999), Collins et al. (1997), Francis et al. (1999)) and in Europe: (Arce et al. (2002))
- The literature has focused on determining the direction of the value relevance of accounting measures and has shown mixed results.
  - Collins et al. (1997) show that the value relevance of accounting information has increased.
  - Francis et al. (1999) have found mixed results concerning the direction of accounting's relevance.
  - Lev et al. (1999) show that accounting has lost relevance.
- The current literature is developing on investigating the sources of the change in value relevance and including non-financial variables (Amir and Lev (1996), Riley et al. (2003)) to show the need for an improvement in the existing accounting disclosure model.

Research Questions

- Has the value relevance of accounting information changed over the past fifty years?
- Are technology intensive industries associated with a different level of accounting relevance?
- How does accounting's ability to explain market prices vary with respect to firms with different levels of technology intensity?

Data

- The accounting data is obtained from the Primary, Supplementary and Tertiary COMPUSTAT files.
- The security prices come from Center for Research and Security Prices (CRSP) monthly file.
- The initial sample consists of 181,184 firm-year observations that are available in both COMPUSTAT and CRSP files.
- Outliers:
  - Firm year data, that is in the top and bottom one-half percent of either earnings-to-price or book value-to-market value or in the one-half percent of firms with the extreme values of one-time items as a percent of income.
  - Firm year observations with studentized residuals greater than four or less than negative four in any of the regressions of price on EPS; price on BVPS and price on EPS and BVPS are removed.
- The final sample consists of 164,765 firm-year observations.

Methodology

$$P_{it} = \beta_1 EPS_{it} + \beta_2 BVPS_{it} + \varepsilon_{it} \tag{1}$$

$$\begin{array}{rrrr} Residuals: \varepsilon_{it} & & \overset{Price}{Deflated\ Errors}: \frac{\varepsilon_{it}}{P_{it}} \\ \varepsilon_{it} = 5 & P_{it} = 100\$ & \rightarrow & \frac{5\$}{100\$} = 5\% \\ \varepsilon_{it} = 5 & P_{it} = 20\$ & \rightarrow & \frac{5\$}{20\$} = 25\% \end{array}$$

$$\begin{aligned} \min \left[var\left(\frac{\varepsilon_{it}}{P_{it}}\right)\right] &= \min \left[var\left(\frac{P_{it} - \beta_1 EPS_{it} - \beta_2 BVPS_{it}}{P_{it}}\right)\right] \\ s.t.\ E\left[\frac{\varepsilon_{it}}{P_{it}}\right] &= 0 \end{aligned}$$

Estimators

$$\hat{\beta}_1 = \frac{E\left[\frac{x_{it}}{P_{it}}\right] var\left(\frac{y_{it}}{P_{it}}\right) - cov\left(\frac{y_{it}}{P_{it}}, \frac{x_{it}}{P_{it}}\right) E\left[\frac{y_{it}}{P_{it}}\right]}{E\left[\frac{y_{it}}{P_{it}}\right]^2 var\left(\frac{x_{it}}{P_{it}}\right) + E\left[\frac{x_{it}}{P_{it}}\right]^2 var\left(\frac{y_{it}}{P_{it}}\right) - 2E\left[\frac{y_{it}}{P_{it}}\right] E\left[\frac{x_{it}}{P_{it}}\right] cov\left(\frac{y_{it}}{P_{it}}, \frac{x_{it}}{P_{it}}\right)}$$

$$\hat{\beta}_2 = \frac{E\left[\frac{y_{it}}{P_{it}}\right] var\left(\frac{x_{it}}{P_{it}}\right) - cov\left(\frac{y_{it}}{P_{it}}, \frac{x_{it}}{P_{it}}\right) E\left[\frac{x_{it}}{P_{it}}\right]}{E\left[\frac{y_{it}}{P_{it}}\right]^2 var\left(\frac{x_{it}}{P_{it}}\right) + E\left[\frac{x_{it}}{P_{it}}\right]^2 var\left(\frac{y_{it}}{P_{it}}\right) - 2E\left[\frac{y_{it}}{P_{it}}\right] E\left[\frac{x_{it}}{P_{it}}\right] cov\left(\frac{y_{it}}{P_{it}}, \frac{x_{it}}{P_{it}}\right)}$$

Descriptive Statistics

Distribution of Price Deflated Errors

	1	...	i	μ	...	σ
1953	$\frac{\varepsilon_{1,1953}}{P_{1,1953}}$	...	$\frac{\varepsilon_{i,1953}}{P_{i,1953}}$	μ_{1953}	...	σ_{1953}
$\vdots$	$\vdots$	$\ddots$	$\vdots$	$\vdots$	$\ddots$	$\vdots$
2003	$\frac{\varepsilon_{1,2003}}{P_{1,2003}}$	...	$\frac{\varepsilon_{i,2003}}{P_{i,2003}}$	μ_{2003}	...	σ_{2003}

Year	Obs.	Adj. R^2	Median	σ	Skewness	Kurtosis	95th-5th Percentile	75th-25th Percentile
1953	310	0.4897	0.0514	0.3731	-0.5733	0.1303	1.1982	0.4914
1963	1,089	0.7431	0.0388	0.4932	-0.3710	1.5589	1.5418	0.5793
1973	3,296	0.4891	0.0291	0.5106	-0.3415	0.2982	1.6662	0.6939
1983	4,283	0.6893	0.0946	0.6303	-0.7495	0.2133	2.0008	0.9100
1993	5,605	0.5688	0.1261	0.6767	-1.0644	1.1977	2.1802	0.8438
2003	4,409	0.6488	0.1025	0.6623	-1.1885	2.1409	2.0989	0.7855

Has the Value Relevance of Accounting Information Changed During the Past Half Century?

H_0 : Accounting information has not lost its relevance during the past fifty years.

In order to investigate the direction of the relevance of accounting information, we estimate (Prais-Winsten AR(1) Regression) the following two equations :

$$IQ_t = \alpha_0 + \alpha_1 Time_t + \varepsilon_t \quad (2)$$

$$MAE_t = \beta_0 + \beta_1 Time_t + \upsilon_t \quad (3)$$

where

IQ_t	: Interquartile range of price deflated errors.
MAE_t	: Yearly average of absolute price deflated errors.
$Time_t$	: Year-1952.
$\varepsilon_t, \upsilon_t$	: Error terms.

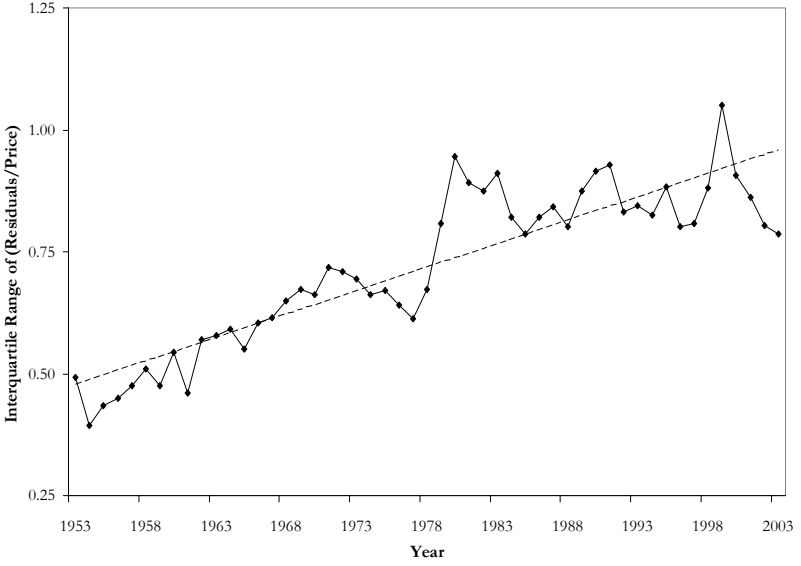
Value Relevance and Time *(continued)*

	Interquartile Range of Pricing Errors *Equation (2)* $IQ_t = \hat{\alpha}_0 + \hat{\alpha}_1 Time_t$		**Mean Absolute Pricing Errors** *Equation (3)* $MAE_t = \hat{\beta}_0 + \hat{\beta}_1 Time_t$	
	Intercept	*Time*	*Intercept*	*Time*
Coefficients	0.4813	0.0088	0.2825	0.0063
Robust Standard Errors	0.0364	0.0015	0.0220	0.0010
t Value	13.21***	5.68***	12.82***	6.07***
R - Squared	0.3801		0.4664	
F Value	515.71		624.40	
Number of Observations	51		51	

*, **, *** indicates significance at the 10, 5, and 1 percent levels, respectively.

Equation (2)	**Equation (3)**
$H_0: \ \alpha_1 \leq 0$	$H_0: \ \beta_1 \leq 0$
t-value : 5.68***	t-value: 6.07***
Rejected at the 1% significance level	Rejected at the 1% significance level

Interquartile Range of Price Deflated Errors



Cross Sectional Analysis of Price Deflated Errors

- It is argued that the decline in the value relevance of financial statements has been due to the experienced transformation in firms' structure and their activities. More specifically the literature suggests that the move from a tangible economy to an intangible one has played a significant role in accounting's loss of relevance.
- To investigate such a possible association we explore how price deflated errors vary with respect to firms' Research and Development expenditures and their Intangible assets.

$$\left|\frac{\varepsilon_{it}}{p_{it}}\right| = \gamma_0 + \gamma_1 \frac{Int.Assets_{it}}{Tot.Assets_{it}} + \gamma_2 \frac{R\&D_{it}}{Net\ Sales_{it}} + \gamma_3 \log\left(Tot.Assets\right) + \nu_{it} \qquad (4)$$

	$Intercept$	$\frac{Int.Assets_{it}}{Tot.Assets_{it}}$	$\frac{R\&D_{it}}{Net\ Sales_{it}}$	$\log\left(Tot.Assets\right)$
Coefficients	0.6231	0.1901	0.0001	-0.0309
Robust S. E.	0.0023	0.0095	0.0000	0.0004
t-values	276.37	**20.01**	**2.93**	-75.89
$R^2 = 0.0322$			$F - Value = 2008.4$	

High Technology Industries versus Low Technology Industries

- Given that firms with a higher level of technology intensity are associated with a greater pricing error, we investigate whether there is a significant difference across High Technology and Low Technology industries.
- For consistency and comparability we follow the same high and low technology industry classification used by Francis et al. (1999).
- In order to compare the pricing error distribution of high and low technology industries we use the median of the absolute pricing errors of each set of industries.

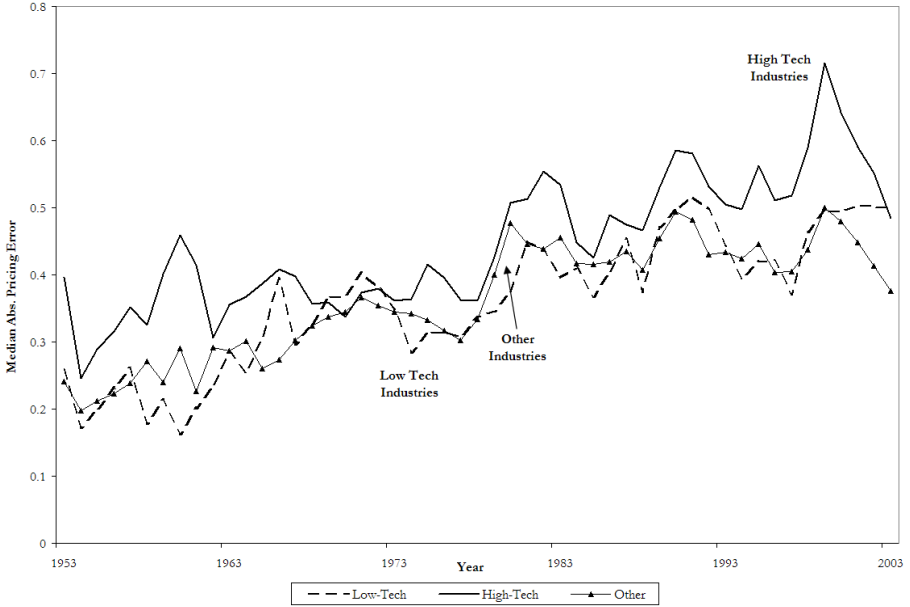
H_0 : The median absolute pricing error of High Technology Industries is equal to that of Low Technology Industries.

Non-parametric test on the equality of medians

$\geq$ **Median**	**High − Tech Industries**	**Low − Tech Industries**	**Total**
No	$14,223$	$6,652$	$20,875$
Yes	$16,368$	$4,508$	$20,875$
Total	$30,591$	$11,160$	$41,751$

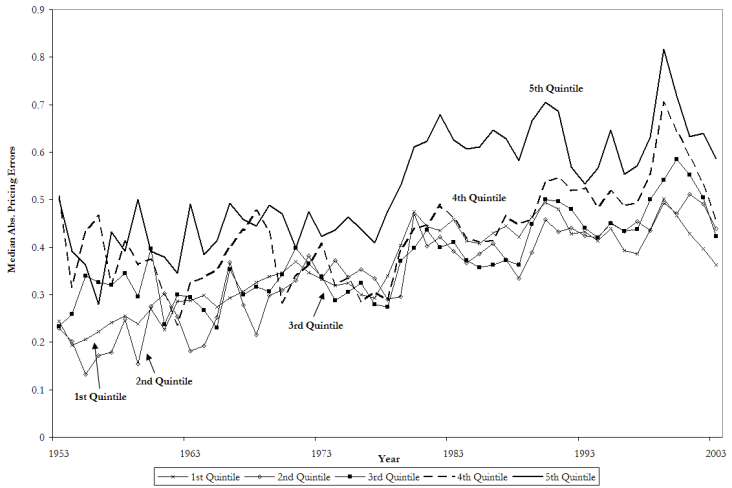
Pearson $\chi^2 = \ 562.2984 \quad \Pr = 0.000$

High Technology Industries versus Low Technology Industries *(continued)*



Quintile Analysis of Pricing Errors with Respect to R&D Intensity

Five groups of companies for each year are formed on the basis of their R&D Intensity $\frac{R\&D_{it}}{Net\ Sales_{it}}$.



Conclusion

- The empirical results show that the value relevance of accounting information has been declining over the past five decades.
- Cross sectional analysis of price deflated errors shows that firms with higher levels of R&D and Intangible intensity are associated with greater pricing errors. This evidence supports the argument that accounting is less accurate in the valuation of firms that are intangible intensive.
- Firms that are members of high technology industries are associated with greater pricing errors. The deterioration in the relevance of accounting information is experienced more intensely in firms involved in technology related activities.
- The overall findings of this study emphasize the need for the proposals of the Galileo Model which not only includes supplements to standard and traditional reports but also suggests changes and emphasizes Information Technologies, as a way to enhance the process of obtaining, preparing and communicating financial information.

Thank You