

The Effect of Changes in Financial Leverage on the Value Relevance of Earnings and Book Value of Equity

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ABSTRACT

This study examines the *changes* in the firm's financial leverage as an additional contributing factor to the cross-sectional variation in the roles of earnings and book value for the firm's equity valuation, i.e., the value relevance of earnings and equity book value. In particular, we compare the valuation coefficients of earnings and equity book value between *leverage-increasing firms* and *leverage-decreasing firms*. Based on arguments of default risk and earnings quality associated with financial leverage, it is hypothesized that the value relevance of earnings (equity book value) is smaller (larger) for leverage-increasing firms than for leverage-decreasing firms. Using a sample of 1,089 levered firms over twenty-year period, we find that earnings (equity book value) response coefficients are smaller (larger) for leverage-increasing vis-à-vis leverage-decreasing firms. These findings are consistent with our hypothesis.

Key Words: financial leverage, value relevance, ERC, BVRC

JEL: M4

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1. INTRODUCTION

The purpose of this study is to investigate whether the *changes* in the firm's financial leverage affect the cross-sectional variation in the value relevance of earnings and equity book value. In particular, we examine whether the value relevance of earnings and equity book value is systematically different between *leverage-increasing firms* and *leverage-decreasing firms*.

Our approach to measure differences in the value relevance of earnings and equity book value between *leverage-increasing firms* and *leverage-decreasing firms* is to compare the magnitudes of valuation coefficients on earnings and equity book value similar to those in Lee et al. (2015), Lee and Huh (2010), Barth et al. (1998) and Collins et al. (1997).

Using a sample of 1,089 levered firms (14,770 firm-year observations) over twenty-year period, we find that earnings (equity book value) response coefficients are smaller (larger) for leverage-increasing firms vis-à-vis leverage-decreasing firms. These results are consistent across different model specifications and testing methods.

The remainder of this paper is organized as follows. Based on prior research, a hypothesis is developed in the next section. Then, sample selections and measurements of variables are described. The empirical tests and their results are followed. In the final section, conclusions and future research suggestions are addressed.

2. HYPOTHESIS DEVELOPMENT

While the value relevance of earnings and book value of equity is well-documented in the accounting literature since Ball and Brown (1968), several studies have investigated specific conditions under which book value is more value relevant than earnings, or *vice versa*. For example, empirical studies show that book value of equity is more value relevant than earnings for the firms with negative earnings (Hayn(1995); Collins, Pincus and Xie (1999)), extreme return-on-equity (Penman (1998)), low return on equity (Burgstahler and Dichev(1997)), deteriorating financial health (Barth, Beaver and Landsman (1998)), low earnings persistence (Ou and Sepe (2002)), and the *level* of financial leverage (Lee and Huh (2010)).

This study extends the study by Lee and Huh (2010) by examining the *changes* in financial leverage as additional factor affecting the cross-sectional variation in the relative value relevance of earnings and book value of equity. Either the increase or the decrease in the level of debt in a firm's capital structure would cause earnings and book value to play differential roles in pricing its equity for several reasons, including the argument that highly levered firms are susceptible to higher default and tend to manipulate earnings.² This negative relation between default risk and the valuation importance of earnings has been well-documented (Dhaliwal et al (1992); Dhaliwal and Reynolds (1994); Barth et al (1998); Kwak et al (2007); Lee and Huh (2010)).

Hence, it is expected that earnings (equity book value) would be less (more) important to valuation for leverage-increasing firms than for leverage-decreasing firms. Therefore, testable hypothesis is:

² In addition to the 'default risk' argument, there are other arguments that suggest the differential impacts of financial leverage on value relevance of earnings and book value of equity, including contracting costs and earnings management argument. See Lee and Huh (2010) for detailed discussion.

Hypothesis: Value relevance of earnings (equity book value) is smaller (larger) for leverage-increasing firms than for leverage-decreasing firms.

3. SAMPLE SELECTION AND RESEARCH METHOD

3.1 Sample selection

Our sample firms were drawn from the COMPUSTAT database. To be included in the sample, each firm must have relevant financial data (earnings, equity book value, number of shares outstanding and year-end stock price) available over twenty year period (1994-2013). The sample of levered firms was selected by requiring that each firm had long-term debt outstanding throughout the twenty year period. Implementation of these procedures yielded a sample of 1,089 levered firms.

From this initial sample of levered firms, leverage-increasing and leverage-decreasing firms were selected by classifying firms into three groups (increasing, decreasing, and no change) each year according to the direction of changes in their financial leverage. Financial leverage was measured by the ratio of long-term debt to total asset. Firm-years without leverage changes (2,073 observations) were excluded in the analysis. Final sample consists of 6,045 leverage-increasing observations and 8,725 leverage-decreasing observations.

The selection of firms using above criteria may bias the sample in favor of excluding firms with high default risk. For example, bankrupted firms and firms with discontinuing operations during the period are less likely to be included. However, such bias would work against finding a significant difference in the value relevance between leverage-increasing and leverage-decreasing firms.

The breakdown of sample firms by industry is shown in Table 1. The sample consists of 11 industries and there is some clustering in particular industries. For example, durable manufacturers account for 32.7% (356 firms) and computers and retail industries account for 11.6% and 10.8%, respectively. Other than this clustering, however, sample firms are well-distributed among industries.

3.2. Research Method

Following the valuation model developed by Ohlson (1995) and subsequent empirical studies (e.g., Collins et al. (1997); Francis and Schipper (1999)), we operationalize the value relevance of earnings and book value by estimating the following regression model:

$$P_{it} = a_0 + a_1 EPS_{it} + a_2 BV_{it} + \varepsilon_{it} \quad (1)$$

Where, P_{it} = the price of stock for firm i at the end of year t ;

EPS_{it} = the earnings per share of firm i during the year t ;

BV_{it} = the book value per share for firm i at the end of year t .

As our metrics to measure the value relevance of earnings and book value, we use the coefficient estimates (\hat{a}_1 and \hat{a}_2) of regression model (1). We estimate the model (1) for the sample of leverage-increasing firms and leverage-decreasing firms separately. Regression coefficients, \hat{a}_1 and \hat{a}_2 , can be interpreted as the weight of earnings and book value in pricing equity, respectively. Alternatively, they are called 'earnings response coefficient' (ERC) and 'book value response coefficient' (BVRC), respectively. Using these metrics of value relevance, we can state our hypothesis as:

$$\text{Hypothesis: } \hat{a}_1 (\text{leverage-increasing firms}) < \hat{a}_1 (\text{leverage-decreasing firms})$$

$$\hat{a}_2 (\text{leverage-increasing firms}) > \hat{a}_2 (\text{leverage-decreasing firms});$$

As an additional approach to test our hypothesis, we estimate the pooled cross-sectional and time-series model which includes a dummy variable, D_{it} , which takes a value one if the observation belongs to the sample of leverage-increasing firms and zero otherwise:

$$P_{it} = b_0 + b_1 D_{it} + b_2 EPS_{it} + b_3 EPS_{it} * D_{it} + b_4 BV_{it} + b_5 BV_{it} * D_{it} + \varepsilon_{it} \quad (2)$$

In this model, the coefficients, b_3 and b_5 , represent the differences in ERCs and BVRCs, respectively, between leverage-increasing and leverage-decreasing firms. Under this approach, we can state our hypothesis as:

$$\text{Hypothesis: } \hat{b}_3 < 0; \hat{b}_5 > 0$$

Table 1. Industry Classification of Sample Firms

Industry	SIC codes	No. of Firms	%
Mining & Construction	1000-1299, 1400-1999	53	4.9
Food	2000-2111	42	3.9
Textiles & Printing	2200-2780	78	7.2
Chemicals	2800-2824, 2840-2899	51	4.7
Pharmaceuticals	2830-2836	63	5.8
Extractive industries	1300-1399, 2900-2999	59	5.4
Durable manufactures	3000-3569, 3580-3669, 3680-3999	356	32.7
Computers	3570-3579, 3670-3679, 7370-7379	126	11.6
Transportation	4000-4899	64	5.9
Retail	5000-5999	118	10.8
Services	7000-7369, 7380-8999	79	7.2
Total		1,089	100.0

* Industry classification criteria are same as those used in Barth et al (1998).

4. EMPIRICAL RESULTS

4.1 Descriptive Statistics

Table 2 provides descriptive statistics for selected variables of the sample firms. Also reported are Wilcoxon rank test statistics for the differences in these variables between leverage-increasing firms and leverage-decreasing firms. Selected variables include the changes in financial leverage (ChLevg) and return on equity (ChROE) from year t-1 to year t, financial leverage (LEVG), return on equity (ROE), stock price (P), earnings per share (EPS), book value of equity per share (BV), firm size as measured by market value of equity (MV) at the end of year t.

Table 2. Comparison of Firm Characteristics between Leverage-increasing

Firms and Leverage-decreasing Firms

Variables	Leverage-increasing Firms			Leverage-decreasing Firms			Wilcoxon z-statistics (p-value)
	Mean	Std Dev	Median	Mean	Std Dev	Median	
ChLevg ¹⁾	0.061	0.074	0.036	-0.042	0.054	-0.025	103.499 (0.0001)
ChROE ²⁾	-0.045	0.316	-0.014	0.012	0.410	0.006	-18.028 (0.0001)
LEVG ³⁾	0.202	0.135	0.184	0.179	0.135	0.162	10.731 (0.0001)
ROE ⁴⁾	0.081	0.261	0.106	0.142	0.347	0.138	-16.258 (0.0001)
P ⁵⁾	27.298	23.014	21.875	28.751	23.626	23.140	-4.080 (0.0001)
EPS ⁶⁾	1.035	2.111	1.004	1.503	1.881	1.232	-12.367 (0.0001)
BV ⁷⁾	12.563	10.771	9.787	12.912	10.837	10.177	-2.820 (0.0048)
MV ⁸⁾	8.110	28.216	0.789	6.833	22.685	0.698	2.396 (0.0166)

- 1) Change in financial leverage (long-term debt/total asset) from year t -1 to year t.
- 2) Change in ROE (net income before tax/ equity at the beginning of the year) from year t-1 to year t.
- 3) Average financial leverage for a year.
- 4) Return on Equity (net income before tax for year t/ equity for year t-1).
- 5) Stock price at the end of year t.
- 6) Earnings per share.
- 7) Book value of equity (stockholders equity/number of shares outstanding).
- 8) Market value (stock price at the end of the year x number of shares outstanding).

As expected, leverage increasing (decreasing) firms show an average increase (decrease) in financial leverage by 6.1% (4.2%), but a decrease (increase) in ROE by 4.5% (1.2%). The average (median) LEVG is 0.202 (0.184) for leverage-increasing firms and 0.179 (0.162) for leverage-decreasing firms, and the difference is statistically significant (at $\alpha < 0.001$). Leverage-increasing firms also exhibit larger MV than leverage-decreasing firms, indicating that larger firms tend to increase their debt. However, other variables (ROE, P, EPS and BV) are significantly smaller for leverage-increasing firms than for leverage-decreasing firms.

4.2 Results of Comparing Valuation Coefficients

Table 3 presents the results of comparing the value relevance of earnings and book value, as measured by the coefficients from regression model (1). In order to avoid potential problem of cross-sectional dependence from pooling cross-sectional and time-series data, we estimate equation (1) each year of twenty year research period and for the leverage-increasing and leverage-decreasing firms, separately.

The coefficients reported for each independent variable are the sample means of the parameter estimates from the 20 yearly cross-sectional regressions. The t-statistics are calculated from the time-series sampling distribution of parameter estimates and, thus, the statistical inferences are not subject to the cross-sectional dependence problem.

Table 3. Coefficients from Regressions of Stock Price on Earnings and Equity Book Value: Using Yearly Regression

$$P_{it} = a_0 + a_1 EPS_{it} + a_2 BV_{it} + \varepsilon_{it}$$

	Expected sign	Leverage increasing firms	Leverage decreasing Firms	Difference (Wilcoxon z-stat)
Intercept	?	10.012 (16.116)***	8.753 (16.758)***	1.259 (1.313)
EPS	+	4.520 (21.854)***	5.729 (15.654)***	-1.209 (2.641)***
BV	+	0.987 (23.570)***	0.867 (19.674)***	0.120 (2.167)**
Adj. R ² (%)		56.34	61.10	

1) Coefficient estimates and adjusted R-squares are averages of 20 yearly estimates.

2) Wilcoxon z-statistics are based on these 20 yearly data.

*** Significant at $\alpha < 0.01$; ** Significant $\alpha < 0.05$; * Significant $\alpha < 0.10$;

The coefficients on EPS and BV have the predicted sign (positive) and are statistically significant (at $\alpha < 0.001$) for both leverage-increasing and leverage-decreasing firms. The coefficient on EPS (earnings response coefficient: ERC) of leverage-increasing firms (4.520) is smaller than that of leverage-decreasing firms (5.729). Wilcoxon rank sum test shows that the difference in ERCs is statistically significant. This result is consistent with those of Dhaliwal et al (1992); Dhaliwal and Reynolds (1994); Barth et al (1998); Kwak et al (2007); Lee and Huh (2010). More importantly, the coefficient on BV (book value response coefficient: BVRC) of leverage-increasing firms (0.987) is *larger* than that of leverage-decreasing firms (0.867), and the difference is also statistically significant,

supporting our hypothesis.

Table 4. Coefficients from Regressions of Stock Price on Earnings and Equity Book Value: Using Pooled Regression with Dummy Variables

$$P_{it} = b_0 + b_1 D_{it} + b_2 EPS_{it} + b_3 EPS_{it} * D_{it} + b_4 BV_{it} + b_5 BV_{it} * D_{it} + \varepsilon_{it}$$

	Expected sign	Leverage increasing firms	Leverage decreasing Firms	Pooled Sample
Intercept	?	10.144 (32.860)***	8.816 (35.300)***	8.816 (34.680)***
<i>D</i>	?			1.328 (3.370)***
<i>EPS</i>	+	4.197 (39.490)***	5.706 (52.290)***	5.706 (51.390)***
<i>EPS*D</i>	-			-1.509 (9.930)***
<i>BV</i>	+	1.020 (48.950)***	0.880 (46.460)***	0.880 (46.500)***
<i>BV*D</i>	+			0.140 (4.990)***
Adj. R ² (%)		53.94	59.79	57.51

- 1) Coefficient estimates and adjusted R-squares are averages of 20 yearly estimates. Wilcoxon z-statistics are based on these 20 yearly data.
- 2) D_{it} is a dummy variable which takes a value of one if the firm i in year t belongs to the sample of 'leverage increasing' firms, and zero if it belongs to the sample of 'leverage decreasing' firms.
*** Significant at $\alpha < 0.01$; ** Significant $\alpha < 0.05$; * Significant $\alpha < 0.10$;

Table 4 presents the results of estimating the regression model (2) separately for leverage-increasing and leverage-decreasing firms, as well as for the pooled sample.³ The ERC is 4.197 for leverage-increasing firms, but 5.706 for leverage-decreasing firms. Along with significantly negative value (-1.509 with t-value of 9.930) of coefficient b_3 , this result indicates that EPS has smaller effect on equity price for leverage-increasing firms than for leverage-decreasing firms. As for BV, the coefficient b_5 is positive and statistically significant (0.140 with t-value of 4.990), indicating that BV has larger effect on equity price for leverage-increasing firms than for leverage-decreasing firms.

Overall, these results lend strong support to our hypothesis. Our findings are also consistent with the notion that investors will place more weight on book value (balance sheet) than on earnings (income statement) in valuing equity for firms with more debt in their capital structures.

³ Year dummy variables, which take a value of 1 if the observation belongs to a specific year and 0 otherwise over the years 1994 to 2013, are also included in order to avoid the potential problem of cross-sectional dependence. Results are essentially the same as those from the regression model without year dummy variables.

4. CONCLUSION

This study investigates the changes in the firm's financial leverage as an additional contributing factor to the cross-sectional variation in the value relevance of earnings and equity book value. In particular, we examine whether the value relevance of earnings and equity book value is systematically different between leverage-increasing firms and leverage-decreasing firms. Based on the empirical evidence from previous studies and their arguments regarding the relation of the firm's default risk to the differential roles of earnings and book value for equity valuation, we hypothesize that value relevance of earnings (equity book value) is smaller (larger) for leverage-increasing firms than for leverage-decreasing firms.

Our empirical results, using a sample of 1,089 levered firms over twenty-year period, indicate that earnings and equity book value have differential roles in equity valuation for leverage-increasing and leverage-decreasing firms. Specifically, we find that earnings (book value) response coefficients are smaller (larger) for leverage-increasing firms than for leverage-decreasing firms. These results are consistent across different model specifications and testing methods, lending a strong support to our hypothesis.

Several related issues are left for future research. First, a different inter-temporal analysis that examines the direction of changes in value relevance of earnings and book value associated with the changes in the firm's financial leverage would be an interesting approach, and particularly useful for controlling for other firm characteristics affecting the variations in value relevance of earnings and book value. For example, we may conduct this approach by using a sample of firms that retire old debt or issue new debt. Additionally, a natural extension would be to apply the same methodology to comparing the value relevance of other pieces of information available on financial statements such as cash flows and dividends.

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