

A Model for Evaluating the Tradeoff Between Earnings per Share and Financial Leverage

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One of the most important topics in corporate finance is long-term financing. In standard textbooks, the decision regarding whether to issue debt or equity to finance an approved project is often analyzed in terms of financial leverage. In many textbook problems students are asked to compute Earnings per Share (EPS) and Degree of Financial Leverage (DFL) under both debt and equity financing options. The computations generally yield results that indicate that the debt issuance results in higher EPS and higher DFL relative to the equity issuance. A clear choice between debt and equity cannot be made because while debt offers higher return, it also entails higher risk. Thus, no conclusion can be reached and the final decision must be left to subjective judgment. Currently there is no technique for objectively evaluating the tradeoff between risk and return.

In this paper, we develop a model to determine whether the additional EPS generated by debt is worthwhile, given the additional risk. The Capital Asset Pricing Model is utilized to determine which option will add the most value to the stock price. We apply our model to a case study where a comparison is made between the difference in expected return, based on earnings per share differentials, and the difference in required return, based on the increased level of risk.

I. INTRODUCTION

Financing mix is one of the most important issues in corporate finance and the topic is covered in virtually all introductory finance textbooks.

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The primary advantage of issuing debt is that interest expense provides tax savings and thus increases Earnings per Share (EPS). However, issuing debt also increases the risk borne by the shareholders and thus raises shareholders' required return. Many textbooks advise managers to choose the financing option that provides the highest return, often measured by EPS, and/or the lowest risk, typically measured by the standard deviation and coefficient of variation of EPS. However, debt financing results in higher return but also entails higher risk. Thus, neither financing plan is clearly preferred.

The purpose of this paper is first to develop and then to apply a method that can provide a *project-specific* financing recommendation. Like all financial management decisions, the debt or equity question can be answered within a shareholder wealth maximization framework. It is not necessary, however, to actually estimate the stock price under each financing option.

A comparison of incremental risk and return forms the foundation of our approach. In an efficient market, the issuance of debt should yield both higher risk and higher return than the issuance of equity. If the bond issuance increases shareholders' expected return by more (less) than it raises shareholders' required return, then the stock price will increase (decrease).

II. LITERATURE REVIEW

The traditional textbook approach to financial leverage often involves a comparison of two operationally identical firms with different debt levels. Using simplified financial statements, numerical examples calculate a measure of return, usually EPS, and a measure of risk, typically the standard deviation and coefficient of variation of EPS (see Table 1). The results show that an increase in financial leverage yields higher return, but also higher risk. Many textbooks extend the example to demonstrate calculation of a break-even point. Thus, the standard textbook approach does not result in an objective recommendation and generally focuses on *accounting* measures of return rather than market value effects.

TABLE 1. Typical Financial Leverage Example.

Besley and Brigham: Essentials of Managerial Finance, 13th ed. (2005), p. 386							
Income Statement							
<i>(thousands of dollars except per-share figures)</i>							
Calculation of EBIT							
Prob. Of Indicated Sales	0.2	0.6	0.2				
Sales	100.0	200.0	300.0				
Fixed Costs	-40.0	-40.0	-40.0				
Variable Costs	-60.0	-120.0	-180.0				
Total Costs	-100.0	-160.0	-220.0				
EBIT	0.0	40.0	80.0				
Case I with TD/TA=0				Case I Balance Sheet			
Interest	0.0	0.0	0.0	CA	100	D	0
EBT	0.0	40.0	80.0	FA	100	E	200
Taxes (.4)	0.0	-16.0	-32.0	TA	200	TD+E	200
Net Income	0.0	24.0	48.0				
EPS (10,000 shares)	0.00	2.40	4.80	(10,000 shares at \$20 per share)			
Expected EPS		2.40					
Std. Deviation of EPS		1.52					
Coefficient of Variation		0.63					
Case II with TD/TA=.500				Case II Balance Sheet			
Interest (.12 x \$100,000)	-12.0	-12.0	-12.0	CA	100	D	100
EBT	-12.0	28.0	68.0	FA	100	E	100
Taxes (.4)	4.8	-11.2	-27.2	TA	200	TD+E	200
Net Income	-7.2	16.8	40.8				
EPS (5,000 shares)	-1.44	3.36	8.16	(5,000 shares at \$20 per share)			
Expected EPS		3.36					
Std. Deviation of EPS		3.04					
Coefficient of Variation		0.90					

Four articles discuss financial leverage pedagogy in an introductory financial management course. Burney, Marcis, and Boyles (2007), citing studies documenting differences in personality types among business students and business professors, argue that the typical introductory textbook financial leverage example is “unnecessarily complex for the initial presentation of the concept” (p. 59). They contend that a more effective approach is to use a simplified example to serve as a “hook” to enhance student learning. Their proposed numerical example utilizes simplified financial statements to demonstrate that financial leverage increases Return on Equity (NI/TE).

Liang and Singh (2001) also argue for a simplified approach to teaching financial leverage effects. While traditional textbook approaches often show the calculation of break-even EBIT, they calculate a breakeven point in terms of operating Return on Investment (ROI). Similarly, Burney, Boyles, and Marcis (2001) contend that a simple approach should be used for the initial discussion of financial leverage. Their example shows the calculation of a breakeven point relative to the Basic Earning Power (BEP) ratio. Finally, Luoma and Spiller (2002) emphasize a need for introductory accounting textbooks to include elementary coverage of financial leverage similar to that presented in introductory finance textbooks.

More advanced textbooks and case studies recognize that stock price effects must also be considered. In addition to projecting expected EPS for a finite number of debt levels, these extended examples also include forecasts of the costs of debt and equity and levered betas (see Table 2). Discounted cash flow valuation techniques are used to obtain estimates of the firm’s stock price at each debt level. The firm’s optimal capital structure is identified as the mix of debt and equity that results in the highest stock price per share or the lowest weighted average cost of capital.

In summary, introductory textbook financial leverage examples utilize accounting rates of return and generally fail to produce an objective recommendation. Although advanced textbooks incorporate market value effects, they are designed to yield *firm*-specific rather than *project*-specific solutions and require many forecasts and assumptions. In practice, managers often need to choose between debt and equity to finance an

TABLE 2. Typical Financial Leverage Example Extended to Show Stock Price Impacts.

Besley and Brigham: Essentials of Managerial Finance, 13th ed. (2005), p. 390

Financial Leverage and Stock Price

% Debt/ Assets	% Equity/ Assets	% Kd	E(EPS)	Beta	% Ks	Price	P/E Ratio	WACC %
0	100	0	\$2.40	1.5	12	\$20.00	8.33	12.00
10	90	8	\$2.56	1.55	12.2	\$20.98	8.20	11.46
20	80	8.3	\$2.75	1.65	12.6	\$21.83	7.94	11.08
30	70	9	\$2.97	1.8	13.2	\$22.50	7.58	10.86
40	60	10	\$3.20	2	14	\$22.86	7.14	10.80
50	50	12	\$3.36	2.3	15.2	\$22.11	6.58	11.20
60	40	15	\$3.30	2.7	16.8	\$19.64	5.95	12.12

approved project. We propose a new approach that is project-specific and easy to apply in practice. This is important because “the use of financial leverage to impact corporate rates of returns and corporate values is one of the clear examples in which financial management theory has found its way out of academia and has become an established technique of financial management in practice” (Burney et al 57).

III. THE MODEL

For a firm that needs to choose between the issuance of debt or equity to finance an approved project, the optimal choice is the alternative that maximizes shareholder wealth. One approach that could be used is to estimate the stock price under each financing alternative. However, stock price estimation requires a number of forecasts and assumptions. We posit that stock price estimation under each option is unnecessary. The issuance of debt increases shareholders’ expected return and shareholders’ required

return. Thus, we need only compare the change in expected return with the change in required return if the firm issues debt instead of equity. If the debt issuance increases *expected* return by more than it increases *required* return, then issuing debt will result in a higher stock price and, therefore, is the preferred financing alternative.

We now develop the model by specifying measures of the change in expected return and the change in required return.

$$\text{Expected Return} = \text{EPS} / \text{Value of Investment} \quad (1)$$

$$\begin{aligned} \Delta \text{Expected Return} = & \text{Expected Return under High Leverage} \\ & - \text{Expected Return under Low Leverage} \end{aligned} \quad (2)$$

Δ Expected Return is the change in expected return associated with moving from low leverage to high leverage. All changes in this paper will be in terms of differentials between high and low leverage.

Let

EPSH = Expected EPS under High Leverage

EPSL = Expected EPS under Low Leverage

V = current stock price

Then,

$$\Delta \text{Expected Return} = \text{EPSH}/V - \text{EPSL}/V = (\text{EPSH} - \text{EPSL})/V \quad (3)$$

We now specify the change in required return. We will use the Capital Asset Pricing Model to estimate the change in required return. Since required return is a function of beta, we must first estimate levered betas under each financing alternative. Levered betas can be estimated via the Hamada equation:

$$B_L = B_U [1 + (1-t) D/E] \quad (4)$$

where

B_U = Beta of Business Risk

t = Marginal Tax Rate

$$\Delta B = \text{Beta under High Leverage} - \text{Beta under Low Leverage} \quad (5)$$

$$\Delta \text{Required Return} = \Delta B (R_m - R_f) \quad (6)$$

Finally, a comparison of the change in expected return with the change in required return results in an objective managerial recommendation. If the change in expected return exceeds the change in required return, then the debt issuance will increase the firm's stock price and, therefore, is the preferred financing alternative.

Because of growth, not all returns are captured by EPS in a single period. However, we assume that growth under both financing plans is the same since both plans employ the same capital project. Since growth is *operation* based and not *financial* based, the change in expected return can be captured by the change in EPS.

IV. CASE STUDY ANALYSIS: AN APPLICATION

Our analysis is based on "Rosario Acero S.A." appearing in Bruner's *Case Studies in Finance*. Rosario Acero S.A. is a small, privately held steel mill in need of \$7.5 million to finance growth. An independent financial consultant has recommended two financing options. The first alternative is a private placement of debt while the second choice is an initial public offering. The primary objective of the case is to provide a recommendation on which financing alternative should be selected.

First, we consider the standard textbook treatment and the approach outlined in the teaching note that accompanies the case. The case suggests an application of the classic FRICTO (Flexibility, Risk, Income, Control, Timing, and Other) framework. The FRICTO analysis demonstrates that "neither of the two alternatives stands out as a clearly dominant choice. Debt is favored from the standpoints of control, income, and timing. Equity is favored from the standpoints of risk, flexibility, and investment liquidity" (p. 467).

The teaching note also suggests that students should estimate interest coverage and capitalization ratios, and EPS under each financing

alternative. The results demonstrate that “debt financing is associated with higher returns and EPS than with equity financing, but it affords less financial flexibility and cash flow coverage in the event of adversity” (p. 462). Thus, no satisfactory conclusion is reached because no objective recommendation emerges from these analyses.

We now apply our approach to Rosario Acero, S.A. to demonstrate its application. We first need to calculate the change in expected return associated with the issuance of debt.

$$\text{From (3), } \Delta \text{Expected Return} = \text{EPSH}/V - \text{EPSL}/V = (\text{EPSH} - \text{EPSL})/V$$

Rosario is a privately held company and so V must be estimated. Since \$9.00 per share is the price that managers most recently paid for their share (p. 434), assume that the current value of the equity is \$9.00 per share.

Next, we estimate EPS under each financing alternative as in the standard textbook approach. From Table 3 (replicated from Exhibit TN6 of the case teaching note (p. 473)) we find the “old” and “new” interest expense and the number of shares outstanding under each financing option. The case

TABLE 3. EBIT/EPS Analysis (dollar values in millions).

	Debt Financing Alternative				Equity Financing Alternative			
EBIT (1997)	\$1.00	\$2.00	\$3.00	\$4.00	\$1.00	\$2.00	\$3.00	\$4.00
Interest								
Old	\$0.74	\$0.74	\$0.74	\$0.74	\$0.74	\$0.74	\$0.74	\$0.74
New	\$0.98	\$0.98	\$0.98	\$0.98	\$0.00	\$0.00	\$0.00	\$0.00
Profit before taxes	−\$0.72	\$0.29	\$1.29	\$2.29	\$0.26	\$1.26	\$2.26	\$3.26
Taxes (at 34%)	−\$0.24	\$0.10	\$0.44	\$0.78	\$0.09	\$0.43	\$0.77	\$1.11
Net Income	−\$0.47	\$0.19	\$0.85	\$1.51	\$0.17	\$0.83	\$1.49	\$2.15
Number of shares (millions)	0.233	0.233	0.233	0.233	1.066	1.066	1.066	1.066
Earnings per share	−\$2.03	\$0.81	\$3.64	\$6.47	\$0.16	\$0.78	\$1.40	\$2.02

TABLE 4. Calculation of EPS under each financing option (dollar values in millions).

	Debt Financing	Equity Financing
EBIT (1997)	\$3.45	\$3.45
Interest		
Old	\$0.74	\$0.74
New	\$0.98	\$0.00
Profit before taxes	\$1.73	\$2.71
Taxes (at 34%)	\$0.59	\$0.92
Net Income	\$1.14	\$1.79
Number of shares (millions)	0.233	1.066
Earnings per share	\$4.90	\$1.68

also states that EBIT is projected to equal \$3.45 million in 1997. Table 4 shows the calculation of EPS under each financing alternative. Since EPS under the high leverage plan is \$4.90 and EPS under the low leverage plan is \$1.68, the change in expected return is $(4.90 - 1.68)/9.00 = 0.3578$.

We now find the change in required return associated with the debt issuance. We use the Capital Asset Pricing Model to estimate the change in required return. Since required return is a function of beta, we must first estimate Rosario's levered beta under each financing alternative. Levered betas are estimated via the Hamada equation:

$$B_L = B_U [1 + (1 - t) D/E]$$

The case's teaching note assumes an asset beta of 0.79 and a marginal tax rate of 34%. We also need estimates of the values of debt and equity under each plan to calculate the levered betas.

Table 5 (including data from Case Exhibits TN1 and TN2, p. 468–9) shows the calculation of the levered betas under each financing plan.

TABLE 5. Calculation of levered betas under each financing option.

	Debt Financing	Equity Financing
Asset beta	0.79	0.79
Tax rate	0.34	0.34
Value of debt (\$mm)	\$14.16	\$5.90
Value of equity (\$mm)	\$5.34	\$12.03
Levered beta	2.19	1.05

Under the high leverage plan, the market value of the debt is \$14.16 million and the market value of the equity is \$5.34 million. Then, the beta for the high leverage plan = $0.79 [1 + (1 - .34)(14.16 / 5.34)] = 2.19$

Under the low leverage plan, the market value of the debt is \$5.90 million and the market value of the equity is \$12.03 million. Then, the beta for the low leverage plan = $0.79 [1 + (1 - .34)(5.90 / 12.03)] = 1.05$

Since $\Delta B = \text{Beta under High Leverage} - \text{Beta under Low Leverage}$, the change in beta = $2.19 - 1.05 = 1.14$.

Finally, assume that the market risk premium ($R_m - R_f$) is 8%. Then,

$$\Delta \text{Required Return} = \Delta B (R_m - R_f) = 1.14 \times .08 = 0.0912$$

Now that we have estimated the change in expected return and the change in required return, we can conclude our analysis with an objective and project-specific recommendation. Since the change in *expected* return (.3578) exceeds the change in *required* return (.0912), the debt issuance will increase the stock price and, therefore, is the preferred financing alternative.

V. EMPIRICAL RESULTS FOR THE STEEL INDUSTRY

To see if the level of debt has a significant impact on stock valuation in the steel industry, we conduct an empirical study for a sample of firms in

this group. The original sample comprised all companies in the steel sub-industry (companies with sub-industry code of 15104050, as categorized in the Global Industry Classification Standard (GICS) by Standard and Poor's.) Data on the equity discount rate and various debt ratios are gathered for these (43) firms. The data on the discount rate and debt ratios are obtained from StockVal (an electronic database provided by Reuters) on October 27, 2009. The value of debt for a firm reflects the amount of debt as of the most recent fiscal year. After eliminating firms with missing or incomplete data, 35 companies are left in the sample.

To empirically investigate the relationship between debt and the equity discount rate, the latter is regressed against the debt ratios using Ordinary Least Square. Debt ratios which include only *long-term* debt do not provide statistically significant results, whereas using debt ratios which reflect *total* debt do yield significant results. The debt ratio, as defined by total debt as a percent of total capital, yielded the most statistically significant result.

These results are consistent with financial theory in that the level of financial risk borne by the firm should reflect all debt, not just long-term debt. As a matter of fact, short-term debt should even be more risky than long-term debt because the former is due very soon.

The regression results for the effect of financial leverage on the equity discount rate are as follows:

$$K = 8.68813 + .0068635 (\text{Total Debt/Total Capital})$$

(73.05) (3.87)

$$R\text{-squared} = .305911$$

where

K= equity discount rate

Total Capital = Long Term Debt + Common Equity + Preferred Equity +
Minority Interest

The number in the parenthesis below the coefficient values are t-statistics. Both coefficients are statistically significant at the 99% level. Thus, the empirical results indicate that higher financial leverage does lead to a

higher discount rate for equity which, in turn, lowers stock value, holding other things constant. This is a factor that managers need to consider while making project-specific financing decisions.

VI. CONCLUSION

Standard textbook discussion of long-term financing decisions does not provide an objective methodology that can be used to provide a recommendation. We propose and develop an approach that requires only a comparison of the change in expected return with the change in required return when the firm chooses the debt financing alternative. If the change in expected return exceeds the change in required return, then the debt issuance will increase the stock price and thus is preferred to the equity issuance.

An application of our method to the case of Rosario Acero, S.A. allows us to conclude that Rosario should select the debt issuance because it increases expected return by more than it increases required return and, therefore, will result in a higher stock price. Our approach simplifies the quantitative analysis associated with evaluating financing options, requires fewer assumptions, and most importantly, results in an objective and project-specific managerial recommendation.

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