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H. W. Collier
University of Wollongong, collier@uow.edu.au

T. Grai
Oakland University, USA

S. Haslitt
Oakland University, USA

C. B. McGowan
Norfolk State University, USA, cbmcgowan@nsu.edu

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Abstract

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Computing the divisional cost of capital using the pure play method

Henry W. Collier (University of Wollongong)
Timothy Grai (Oakland University)
Steve Haslitt (Oakland University)
Carl B. McGowan, Jr. (Norfolk State Universtiy)

COMPUTING THE DIVISIONAL COST OF CAPITAL USING THE PURE PLAY METHOD[1]

ABSTRACT: *The Cost of Capital Model is used to calculate the net present value of projects within a multi-unit corporation but may provide incorrect answers for projects that have a level of risk that differs from the overall average risk level for the corporation. We demonstrate the use of the Pure Play Method for calculating the required rate of return for a division of a corporation that has risk characteristics that differ from the risk characteristics of the overall corporation. We apply this methodology to the Integrated Electronic Systems Segment of the Motorola Corporation. We find that the IESS division cost of capital of is 9.3% rather than the 12.3% cost of capital for the corporation as a whole.*

USING THE WEIGHTED AVERAGE COST OF CAPITAL

The goal of corporate financial management is to maximize the value of the firm as measured by the total market capitalization of the firm. When making long-term investment decisions, wealth maximization is achieved when the firm invests in all available projects that have a positive net present value (NPV). To compute the NPV, the firm needs to know the appropriate discount rate to use to discount the future cash flows from the project. This discount rate is the cost of capital, which is the minimum required rate of return on investment by the company. The discount rate represents the opportunity cost of funds for the firm, that is, the minimum rate of return that the firm or investors could achieve in another investment. Modigliani and Miller (1958) show how to calculate the overall cost of capital for the firm as a market value weighted average of the costs of each of the components of capital used by the firm. The component cost of common stock equity is derived from the Capital Asset Pricing Model of Sharpe (1964). Graham and Harvey (2001) find that 73.5 percent of respondents to their survey indicate that the company uses the capital asset pricing model to determine the component cost of common stock equity capital.

[1] The authors would like to thank the Editor and the reviewers for helpful comments. Any remaining errors remain the responsibility of the authors.

Traditional finance textbooks such as Brigham and Houston (2007) teach that the firm should accept all projects that have a net present value that is greater than zero or that have an internal rate of return that is greater than the weighted average cost of capital. A conflict arises for the corporation in evaluating a project when the project has a risk level that is different from the corporation's overall risk level. Thus, the corporation needs to use a risk-adjusted discount rate to make capital budgeting decisions. However, a difficulty may arise for divisions of the corporation that are not independent since it is not possible to compute the divisional cost of capital directly. The Pure Play Method can be used to resolve this problem. To use the Pure Play Method, the firm finds a number of stand-alone companies that are in the same industry as the division for which a cost of capital is needed. The average beta for the stand-alone companies is used to proxy the beta for the division and this proxy beta is used to compute the divisional cost of capital.

Gordon and Halpern (1974) show that a firm can estimate the cost of capital for a division.[2] The Gordon-Halpern model, later called the pure-play method, estimates the beta of the division using the beta of a publicly traded firm with characteristics similar to the division for which the beta estimate is needed. Fuller and Kerr (1981) apply the pure play method to a sample of sixty multidivisional firms with 142 divisions over the sample period from 1976 to 1978. Fuller and Kerr (1981, page 1007) match the 142 divisions with pure play firms and find that "a weighted average of pure-play betas closely approximated the observed beta of the multidivisional firm in question."

MOTOROLA SEGMENT SALES

[2] Parasuraman (2002) provides an illustrative example of using the pure-play method.

Motorola is a global manufacturer of communication products, semiconductors, and embedded electronic solutions. The company is divided into six operating segments that publicly report financial results (percent of sales for 2002): Personal Communication Segment (37.8%), Global Telecommunications Segment (15.8%), Broadband Communication Segment (7.3%, Commercial, Government, & Industrial Segment; Semiconductor Segment (13%), and, Integrated Electronic Systems Segment (7.6%). The Personal Communication Segment (PCS) designs, manufactures, and markets wireless communication products for service subscribers. Products include wireless handsets, personal 2-way radios, and messaging devices, along with the associated accessories. The Personal Communication Segment was the largest of Motorola's operating segments. Key competitors include Nokia (the market leader), Ericsson/Sony, Siemens, and Samsung.

The Global Telecommunications Segment (GTS) segment designs, manufactures, and markets the infrastructure communication systems purchased by telecommunication service providers. Products include electronic exchanges, telephone switches, and base station controllers for various wireless communication standards. Key competitors include Nokia, Ericsson, Lucent, Nortel, Siemens, Alcatel, NEC, and Samsung. The Broadband Communication Segment (BCS) segment designs, manufactures, and markets a variety of products to support the cable and broadcast television and telephony industries in delivering high speed data, including cable modems, Internet-based telephones, set-top terminals, and digital satellite television systems. Key competitors include Scientific Atlanta, Pioneer, Sony, Thomson/RCA, and Toshiba. The Commercial, Government, & Industrial Segment (CGIS) segment designs, manufactures, and markets

integrated communication systems for commercial, government, and industrial applications, typically private 2-way wireless networks for voice and data transmissions, such as would be used by public safety authorities in a community. Key competitors include Tyco, Nokia, and Kenwood. The Semiconductor Product Segment (SPS) segment designs, manufactures, and markets microprocessors and related semiconductors for use in various end products, such as computers, wireless and broadband devices, automobiles, and other consumer electronic devices. Some of the semiconductors produced are utilized in products marketed by other Motorola segments. Key competitors include Texas Instrument, Infineon, NEC, ST-Microelectronics, and Intel. The Integrated Electronic Systems Segment (IESS) segment designs, manufactures, and markets automotive and industrial electronic systems, single board computer systems, and energy storage products to support portable electronic devices (such as wireless handsets). Key competitors include TRW, Bosch, Johnson Controls, Lear, Delphi/Delco, and Visteon.

IESS DIVISIONAL COST OF CAPITAL

The overall weighted average cost of capital (WACC) for Motorola is 12.3%. The calculations are shown in Table 1, using the yield to maturity of long term debt as the cost of debt and using a cost of equity calculated by the Capital Asset Pricing Model, with the cost of debt and capital appropriately weighted to reflect Motorola's capital structure. The market value of outstanding debt is $7.722 billion. An equity Beta coefficient of 1.38 was used in the Capital Asset Pricing Model.

The 12.3% cost of capital for Motorola reflects the risk of a *typical* Motorola project investment and is based on the Beta coefficient of Motorola's common stock.

Individual segments within Motorola will likely have a different cost of capital reflecting the risks unique to that segment and individual projects within each segment likely have a different cost of capital indicative of the risk of each unique project. The cost of capital for one of Motorola's segments, IESS, which is a supplier of automotive electronic components, will be calculated. The typical automotive electronic investment projects undertaken by IESS are different than the wireless communication projects that dominate other Motorola segments, the cost of capital for IESS may be different than the overall cost of capital for Motorola.

Since equity in IESS as a separate entity is not publicly traded, the equity Beta coefficient for IESS cannot be determined by examining the relationship between its returns and the market's returns, as would be done in determining the equity Beta coefficient. An alternate methodology to determine the appropriate equity Beta coefficient for the IESS segment is to use the equity Beta coefficients of public firms that primarily operate in the same business as IESS as a proxy for the equity beta coefficient for IESS. Following Hamada (1969), each competitors' equity Beta coefficient is first un-levered to remove the capital structure influences on Beta, then the un-levered Beta coefficients are averaged, and, finally, the average un-levered Beta coefficient is levered back up to reflect IESS's capital structure. It is assumed here that IESS's capital structure is the same as Motorola's capital structure.

$$\beta_{\text{equity}} = \left[1 + \left(1 - \mathrm{T_C}\right) * \frac{\mathrm{D}}{\mathrm{E}}\right] * \beta_{\text{unlevered}} \qquad (1)$$

For purposes of this analysis, the Beta coefficients of the following competitors of IESS, all of which operate primarily as suppliers in the automotive industry, will be used to develop an appropriate Beta coefficient for IESS: Borg-Warner, Delphi, Johnson

Controls, Lear, Magna, and Visteon. The equity Beta coefficients and the un-levered Beta coefficients for these competitor firms are presented in Table 2. The average un-levered Beta coefficient in the automotive supplier industry is 0.65.

Levering this average un-levered value to reflect the capital structure of IESS results in an equity Beta coefficient for IESS of 0.83, as follows:

$$\beta_{E,IESS} = \left[1 + (1 - T_C) * \frac{D}{E}\right] * \beta_{unlevered,avg} = [1 + (1 - 0.34) * 0.42] * 0.65 = 0.83 \quad (2)$$

Comparing this to the equity Beta coefficient for Motorola as a whole, 1.38, it can be seen that the market believes there is less risk operating as a supplier to the automotive industry than operating in the wireless communication industry. For those working in the automotive industry, this makes intuitive sense, as automotive customers are known to be very conservative and risk adverse (technologically and managerially), and the traditional suppliers, such as IESS, are typically awarded project contracts, rather than speculating on new consumer products, such as is done in the wireless communication industry.

Now that an appropriate Beta has been determined for IESS, the cost of capital for IESS can be calculated:

$$\overline{R_{E,IESS}} = R_F + \beta_{E,IESS} \times \left(\overline{R_M} - R_F\right) = 4.89 + 0.83 \times (12.7 - 4.89) = 11.4\% \quad (3)$$

$$R_{WACC,IESS} = \left(\frac{D}{V}\right) \times (1 - T_C) \times R_D + \left(\frac{E}{V}\right) \times R_E$$

$$R_{WACC,IESS} = 0.295 \times (1 - 0.34) \times 0.0671 + 0.705 \times 0.114 = 9.3\% \quad (4)$$

Based on this analysis, the cost of capital for IESS is 9.3% and is less than the cost of capital for Motorola as a whole, 12.3%. If IESS uses the overall Motorola rate in investment decisions, it could be rejecting appropriate investment opportunities, based on

the required return for the risk inherent in those investments. If IESS uses the lower cost of capital indicative of the risk in the automotive industry, other segments of Motorola should use an appropriately calculated cost of capital for their particular industry segment. Some segments would use a higher cost of capital than the overall corporate cost of capital and some would use a lower cost of capital. This is significant because IESS is one of the smallest and least risky segments. Projects undertaken in larger, more risky segments based on an NPV analysis using the corporate cost of capital in the investment decision criteria may in fact be detracting value from the firm as the projects are not generating the return expected by investors for the risks inherent in the projects. This analysis clearly indicates that the cost of capital can vary significantly across divisions, so care should be taken to make sure the cost of capital is appropriate for the risk of the investment being considered.

SUMMARY AND CONCLUSIONS

In this paper, using the Integrated Electronic Systems Segment of Motorola Corporation, we show how to estimate the divisional cost of capital for a division of a multi-unit corporation using the Pure Play Method. If the divisions of a corporation have different risk levels, then, different costs of capital should be used within the divisions to evaluate capital budgeting projects rather than the corporate overall cost of capital which is an average of the costs of capital for each of the divisions within the corporation. We demonstrate how to use the Pure Play Method to determine the cost of capital for a division which has different risk characteristics from the overall firm. To use the Pure Play Method, we find a group of stand alone companies that are similar to the division for which we need to compute a cost of capital. We compute the average, un-levered beta

for the companies in this group. We compute the re-levered beta for the division and use the new beta to compute the weighted average cost of capital for the division. Corporate financial decision makers can use the division specific weighted average cost of capital to make capital budgeting decision within each division.

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http://finance.yahoo.com

Table 1 Overall Weighted Average Cost of Capital Motorola		
Income Tax Rate, T_C:	34%	
Risk Free Return, R_F:	4.89%	30 year US Treasury Security, 1/23/03; Source - Value Line
Market Return, R_M:	12.70%	
Beta:	1.38	Source – Yahoo! Finance, 2/27/03
MV of Debt:	7,722	Million
MV of Equity:	18,431	Million
Cost of Debt, R_D:	6.71%	
Cost of Equity, R_E:	15.67%	calculated by CAPM: $R_E = R_F + Beta*(R_M - R_F)$
Wt - Debt, W_D:	29.50%	= MVof Debt/(MV of Debt + Market Value of Equity)
Wt - Equity, W_E:	70.50%	= MVof Equity/(MV of Debt + Market Value of Equity)
WACC	12.30%	$WACC = W_D*R_D*(1 - T_C) + W_E*R_E$

Table 2
Automobile Suppliers
Levered and Un-levered Betas

Firm	Symbol	Beta Equity	Market Price	Shares Outstanding (million)	Equity (million)	Debt (million)	Debt/ Equity Ratio	Beta - Un-levered
Borg-Warner	BWA	0.93	53.18	26.9	1431	648	0.45	0.72
Delphi	DPH	0.67	8.00	558.1	4465	2084	0.47	0.51
Johnson Controls	JCI	0.88	79.07	89.0	7037	1527	0.22	0.77
Lear	LEA	1.21	38.08	65.7	2502	2135	0.85	0.77
Magna	MGA	0.51	57.18	90.3	5163	231	0.04	0.5
Visteon	VC	1.31	6.56	129.0	846	1298	1.53	0.65
							Average	0.65

Assumed Corporate Tax Rate: 34%
Source: Yahoo! Finance, 2/27/03