

Midland Energy Resources: Cost of Capital

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Abstract

Midland Energy Resources group project focuses on assessing and computing the Weighted Average Cost of Capital (WACC) for the firm and its three primary divisions: Exploration & Production (E&P), Refining & Marketing (R&M), and Petrochemicals. This study is crucial for achieving the company's financial strategies and investment decisions.

The project addressed the challenge of calculating both the corporate and divisional WACCs. The corporate WACC calculation considered factors like the cost of debt and equity, tax rate, and market conditions. Divisional WACCs were calculated to reflect the specific risks and financial structures of each division.

The study concluded that Midland's corporate WACC differed from that of its divisions due to differences in capital structures, loan costs, and asset characteristics. When compared to the corporate average, the Petrochemicals division showed a lower WACC, indicating potential efficiency and profitability.

This group project provided Midland Energy Resources with a rigorous and critical study of WACC computation, providing vital insights for the company's strategic financial decision-making.

Background and Introduction

Midland Energy Resources is one of the biggest international suppliers of energy resources, operating in Oil and Gas exploration and production, Refining and Marketing, and Petrochemicals. With over 80,000 employees in 2006, Midland Energy had an operating revenue and operating income of \$248.5 billion and \$42.4 billion respectively. Its divisional income percentage is not far behind, with Exploration and Production being the most profitable division of the company with its revenue of \$22.4 billion and after-tax earnings of \$12.6 billion having the highest net margin in the industry over the previous 5 years. After-tax earnings for refining and marketing were \$4 billion, consistent with the steady declining trend seen in the industry through 20 years. Predicting the after-tax earnings to be consistent with the declining trend for 2007, analysts did predict a surge in investment in the coming future for refining and marketing. Petrochemicals was the smallest division of Midland, though its revenue and after-tax earnings of \$23.2 billion and \$2.1 billion respectively maintained the competitive edge for its earnings across the divisions of the company. In late January 2007, Janet Mortensen, the then-senior vice president of project finance for Midland energy resources was tasked with the calculation of WACC for the company as well as its divisions to analyze and create a strategy that

aligns with their 2007 Financial and Investment Policies. Its Financial and Investment policies include funding significant overseas growth, investing in value-creating projects across all divisions, optimizing its capital structure and opportunistically repurchasing its undervalued shares.

Problem to solve

- a. How to compute the corporate WACC of Midland
- b. How to compute the three divisional WACC of Midland's segments (Exploration & Production, Refining & Marketing, Petrochemicals)
- c. What are the corporate WACC of Midland and the significance of corporate WACC?
- d. What are the three corresponding divisional WACCs of midland and why the divisional WACCs are crucial?

Problem-solving

a.

We know that $WACC = W_D * R_D * (1 - \text{Tax rate}) + W_E * R_E$, and in this case, we can easily find the following:

- $R_D = \text{Risk-free rate} + \text{Spread to Treasury} = 4.98\% + 1.63\% = 6.61\%$;
- Weight of debt = 42.2%, while the weight of equity is $1 - 42.2\% = 57.8\%$;
- Tax rate = 39.73%;
- New beta for Midland = 1.3263
- $R_E = \text{Risk-free rate} + \text{beta} * \text{market risk premium} = 4.98\% + 1.3263 * 5\% = 11.61\%$

Therefore, the overall corporate WACC of Midland = 8.3925%

b.

There are three segments, including Exploration & Production, Refining & Marketing, and Petrochemicals. And $WACC = W_D * R_D * (1 - \text{Tax rate}) + R_E * W_E$

For segment Exploration & Production:

- Target weight of Debt = 46%; Weight of Equity = 54%;
- Return of Debt = $R_f + \text{Spread to Treasury} = 4.98\% + 1.6\% = 6.58\%$;
- Tax rate = 39.73%;
- For R_E , we should estimate the unlevered beta of the E&P Industry, which is 0.9325, and then we can calculate the levered beta of E&P in midland, which is 1.4112.
- So $R_E = \text{Risk-free rate} + \text{beta} * \text{market risk premium} = 4.98\% + 1.4112 * 5\% = 12.04\%$

Therefore, the divisional WACC of segment E&P = 8.3259%

For segment Refining & Marketing:

- Target weight of Debt = 31%; Weight of Equity = 69%;
- $R_D = R_f + \text{Spread to Treasury} = 4.98\% + 1.8\% = 6.78\%$;
- Tax rate = 39.73%
- Estimated unleveraged beta for R&M Industry = 1.049, then the leverage beta for R&M in midland = 1.3331
- So $R_E = \text{Risk-free rate} + \text{beta} * \text{market risk premium} = 4.98\% + 1.3331 * 5\% = 11.65\%$

Therefore, the divisional WACC of segment R&M = 9.3053%

For segment Petrochemicals:

- Target weight of Debt = 40%; weight of Equity = 60%;
- $R_D = R_f + \text{Spread to Treasury} = 4.98\% + 1.35\% = 6.33\%$
- Tax rate = 39.73%
- Weight of E&P segment = 53.4%; weight of segment R&M = 35.8%; weight of Petrochemicals = 10.8%

- Unlevered beta of corporate WACC of Midland = 0.921
- Levered beta of Petrochemicals = 0.61114
- So $R_E = \text{Risk-free rate} + \text{beta} * \text{market risk premium} = 4.98\% + 0.61114 * 5\% = 8.0357\%$

Therefore, the divisional WACC of segment Petrochemicals in midland = 6.3475%

The concept of WACC is central in corporate finance for making decisions and evaluating the financial health of a company. Corporate WACC provides a comprehensive view of the business, while divisional WACCs can obtain clear access to each division's performance throughout the organization. It is crucial to comprehend both corporate WACC and divisional WACC for the reasons listed below:

1. **Investment Decision-Making:** The corporate WACC represents the overall capital cost of the corporation. It can serve as a benchmark for evaluating potential projects and investments. The corporation should abandon the potential project if the expected return is lower than WACC. Conversely, if the expected return is higher than WACC, the project is profitable and worth further research. Essentially, any project undertaken is expected to generate a return that is at least equal to, if not greater than, the cost of financing it.
2. **Budgeting and Financial Planning:** WACC also plays an important role in budgeting methods like Net Present Value (NPV) and Internal Rate of Return (IRR). Both corporations or divisions can use WACC as a discount rate in the calculation to align with project evaluation. These methods help in evaluating the profitability and feasibility of long-term investments.
3. **Performance Assessment:** Comparing divisional WACCs with corporate WACC can reveal insight into the performance and risk profiles of different divisions. For example, the Midland WACC is 8.1721%. The exploration and production department

has a WACC of 8.3259%, while the refining and marketing department has a WACC of 9.3053%. Both are higher than the corporate WACC. Two divisions with a higher WACC than the corporate average may be involved in more risky or less profitable projects. Only the smallest division of petrochemicals has a lower WACC than the corporation, it might be performing efficiently and contributing profits. Among the three divisions, only Petrochemical is regarded as a good WACC. Despite operating in different sectors, divisions may be at different risk levels. Understanding these differences allows for more informed decisions about how to allocate resources and capital within the company.

In conclusion, both corporate WACC and divisional WACCs are essential tools for a company's risk management, investment analysis, performance assessment, and strategic financial planning. They provide valuable insights into the business performance and make informed decisions for future growth and sustainability.

Conclusion

From the previous analysis of the corporate WACC of Midland, as well as the WACC of three segments, it's obvious that the two main departments of Midland, including Exploration & Production and Refining & Marketing, have a higher WACC than the overall WACC, while the WACC of Petrochemicals is lower than the corporate WACC. The difference between segment WACC and corporate WACC may be due to the diverse optimal capital structures, different costs of debt, and the properties of its assets. Generally, the segment with the highest WACC can reasonably adopt debt financing to reduce the weighted average cost of capital, as long as the interest rate on net debt is not higher than the net profit rate on net operating assets of the enterprise. As for the segment Petrochemicals with the

lowest WACC, Midland could consider expanding its scale and increasing its weight to reasonably decrease the Corporate WACC in the future so that Midland would earn a greater net present value from discounted future cash flow.

Additionally, there are also some concerns about the calculation of WACC, considering the case provides some resources about the EMRP. Based on the information from historical data, the EMRP from 1987-2006 is approximately 6.4%, which is higher than the 5% we used in the quantitative analysis of WACC, with a standard error of 3.7%. However, the results from selected market surveys indicate that the EMRP within the period of 2000-2006 is significantly lower than 5%. Hence, there may be some possible error in the estimate of 5% EMRP.

Appendix

Appendix 1. Corporate WACC of Midland

Calculation of Corporate WACC of Midland		
<i>Main Parameters</i>	<i>Value</i>	<i>Comments</i>
Cost of Debt	6.61%	Since the cost of debt is equal to the sum of the risk-free rate(4.98%) and the spread to the treasury from Table 1
Target weight of Debt	42.20%	Debt/value = 42.2% from Table 1
Target weight of Equity	57.80%	1-weight of equity
Cost of Equity	11.61%	According to CAPM, the cost of equity = risk-free rate + beta * market risk premium
<i>Minor Parameters</i>		
Tax rate	39.73%	We calculate the average tax rate from the year 2004 to 2006 by taxes/income before tax (from Appendix 5)
Risk-free rate	4.98%	Normally the oil and gas reservation would last more than 30 years, therefore, we take the 30-year Treasury bill from Table 2 as our risk-free rate
Market risk premium	5%	Based on the case, the Midland use 5% as their market risk premium
Beta	1.25	Exhibit 5
Current D/E ratio	0.5928	Current Net debt(\$79,508 from Exhibit 5)/Current equity market value(\$134,114 from Exhibit 5)
Unleveraged beta	0.921	Unlevered beta =Levered beta/(1+(1-t)(D/E))
New Beta	1.3263	Levered beta=Unlevered beta*(1+(1-t)(D/E))

Appendix 2.1 WACC of E&P

Calculation of WACC of Exploration & Production		
<i>Main Parameters</i>	<i>Value</i>	<i>Comments</i>
Cost of Debt	6.58%	Since the cost of debt is equal to the sum of the risk-free rate(4.98%) and the spread to the treasury from Table 1
Weight of Debt	46.00%	Debt/value = 46% from Table 1
Weight of Equity	54.00%	1-weight of equity
Cost of Equity	12.04%	According to CAPM, the cost of equity = risk-free rate + beta * market risk premium
<i>Minor Parameters</i>		
Tax rate	39.73%	we calculate the average tax rate from the year 2004 to 2006 by taxes/income before tax (from Appendix 5)
Risk-free rate	4.98%	Normally the oil and gas reservation would last more than 30 years, therefore, we take the 30-year Treasury bill from Table 2 as our risk-free rate
Market risk premium	5%	Based on the case, the Midland use 5% as their market risk premium
Beta	1.4112	From Appendix 2.2

Appendix 2.2 Beta of E&P

Calculation of levered Beta-E&P				
<i>Company</i>	<i>Equity Beta</i>	<i>D/E ratio</i>	<i>Unlevered beta</i>	<i>Comments</i>
Jackson Energy, Inc.	0.89	11.2%	0.83	Unlevered beta = Levered beta / (1 + (1-t)(D/E))
Wide Palin Petroleum	1.21	85.4%	0.80	

Corsicana Energy Corp.	1.11	15.2%	1.02	
Worthington Petroleum	1.39	47.5%	1.08	
Average	1.15		0.93247	
Tax rate	39.73%			From Appendix 5
Divisional target D/E ratio	85%			weight of debt(46%)/weight of equity(54%)
Levered beta of Exploration & Production	1.41122			Levered beta=Unlevered beta*(1+(1-t)(D/E))

Appendix 3.1 WACC of R&M

Calculation of WACC of Refining & Marketing		
<i>Main Parameters</i>	<i>Value</i>	<i>Comments</i>
Cost of Debt	6.78%	Since the cost of debt is equal to the sum of the risk-free rate(4.98%) and the spread to the treasury from Table 1
Weight of Debt	31.00%	Debt/value = 31% from Table 1
Weight of Equity	69.00%	1-weight of equity
Cost of Equity	11.65%	According to CAPM, the cost of equity = risk-free rate + beta * market risk premium
<i>Minor Parameters</i>		
Tax rate	39.73%	We calculate the average tax rate from the year 2004 to 2006 by taxes/income before tax (from Appendix 5)
Risk-free rate	4.98%	Normally the oil and gas reservation would last more than 30 years, therefore, we take the

		30-year Treasury bill from Table 2 as our risk-free rate
Market risk premium	5%	Based on the case, the Midland use 5% as their market risk premium
Levered Beta of Refining & Marketing	1.3331	From Appendix 3.2

Appendix 3.2 Beta of R&M

Calculation of levered Beta of Refining & Marketing				
<i>Company</i>	<i>Equity Beta</i>	<i>D/E</i>	<i>Unlevered beta</i>	<i>Comments</i>
Bexar Energy, Inc.	1.7	10.3%	1.60	Unlevered beta = Levered beta / (1 + (1-t)(D/E))
Kirk Corp.	0.94	19.4%	0.84	
White Point Energy	1.78	20.9%	1.58	
Petrarch Fuel Services	0.24	-12.0%	0.26	
Arkana Petroleum Corp.	1.25	32.3%	1.05	
Beaumont Energy, Inc.	1.04	20.6%	0.92	
Dameron Fuel Services	1.42	50.3%	1.09	
Average	1.20		1.04902	
Tax rate	0.3973			From Appendix 5

Target debt-equity ratio of division	45%			Target weight of debt(31%) / weight of equity(69%)
Levered beta of Refining & Marketing	1.3331			Levered beta=Unlevered beta*(1+(1-t)(D/E))

Appendix 4.1 WACC of Petrochemicals

Calculation of WACC of Petrochemicals		
<i>Main Parameters</i>	<i>Value</i>	<i>Comments</i>
Cost of Debt	6.33%	Since the cost of debt is equal to the sum of the risk-free rate(4.98%) and the spread to the treasury from Table 1
Weight of Debt	40.00%	Debt/value = 40% from Table 1
Weight of Equity	60.00%	1-weight of equity
Cost of Equity	7.683%	According to CAPM, the cost of equity = risk-free rate + beta * market risk premium
<i>Minor Parameters</i>		
Tax rate	39.73%	We calculate the average tax rate from the year 2004 to 2006 by taxes/income before tax (from Exhibit 1)
Risk-free rate	4.98%	Normally the oil and gas reservation would last more than 30 years, therefore, we take the 30-year Treasury bill from Table 2 as our risk-free rate
Market risk premium	5%	Based on the case, the Midland use 5% as their market risk premium
Leveraged Beta of Petrochemicals	0.5406	From Appendix 4.2

Appendix 4.2 Beta of Petrochemicals

Calculation of Beta of Petrochemicals					
	<i>Exploration & Production</i>	<i>Refining & Marketing</i>	<i>Petrochemicals</i>	<i>Midland</i>	<i>Comments</i>
Weights	53.396%	35.761%	10.843%	100%	Weight is calculated by divisional total assets divided by the total assets of Midland
Tax rate	39.73%	39.73%	39.73%	39.73%	From Appendix 5
Unlevered beta	0.9325	1.0490	Beta(P)	0.921	0.9325 from Appendix 2.2 ; 1.0490 from Appendix 3.2 ; 0.921 from Appendix 1
Weighted beta	0.4979	0.3751	0.11*Beta (P)	0.921	Weighted beta = unlevered beta * weights
Unlevered beta			0.44		Unlevered beta = (unlevered Midland beta - unlevered beta of E&P - unlevered beta of R&M)/0.11
Target debt-equity ratio of division			67%		weight of debt(40%)/weight of equity(60%)
Levered beta (Beta(p))			0.61114		Levered beta=Unlevered beta(1+(1-t)(D/E))

Appendix 5 Tax rate

Operating Results:	2004	2005	2006
Income Before Taxes	17910	32723	30447

Less: Taxes	7413.893	12829.9	11746.78
Net Income	10496.11	19893.1	18700.22
Tax rate	0.413953	0.392076	0.385811
Average tax rate	0.39728		