

CHAPTER

# DOES DEBT POLICY MATTER?

---

---

---

---

---

---

---

---

## Topics Covered

- The Effect of Financial Leverage in a Competitive Tax-Free Environment
- Financial Risk and Expected Returns
- The Weighted Average Cost of Capital
- A Final Word on After Tax WACC

---

---

---

---

---

---

---

---

## M&M (Debt Policy Doesn't Matter)

- Modigliani & Miller
  - When there are no taxes and capital markets function well, it makes no difference whether the firm borrows or individual shareholders borrow. Therefore, the market value of a company does not depend on its capital structure.

---

---

---

---

---

---

---

---

### M&M (Debt Policy Doesn't Matter)

17.4

**Assumptions**

- By issuing 1 security rather than 2, company diminishes investor choice. This does not reduce value if:
  - Investors do not need choice, OR
  - There are sufficient alternative securities
- Capital structure does not affect cash flows, e.g...
  - No taxes
  - No bankruptcy costs
  - No effect on management incentives

---

---

---

---

---

---

---

---

### M&M (Debt Policy Doesn't Matter)

17.5

	Dollar Investment	Dollar Return
	$.01V_U$	$.01 \times \text{profits}$
	Dollar Investment	Dollar Return
Debt	$.01D_L$	$.01 \times \text{interest}$
Equity	$.01E_L$	$.01 \times (\text{profits} - \text{interest})$
Total	$.01(D_L + E_L)$	$.01 \times \text{profits}$
	$= .01V_L$	

---

---

---

---

---

---

---

---

### M&M (Debt Policy Doesn't Matter)

17.6

	Dollar Investment	Dollar Return
	$.01E_L$	$.01 \times (\text{profits} - \text{interest})$
	$= .01(V_L - D_L)$	

	Dollar Investment	Dollar Return
Borrowing	$-.01D_L$	$-.01 \times \text{interest}$
Equity	$.01V_U$	$.01 \times \text{profits}$
Total	$.01(V_U + D_L)$	$.01 \times (\text{profits} - \text{interest})$

---

---

---

---

---

---

---

---

### M&M (Debt Policy Doesn't Matter)

**Example** - Macbeth Spot Removers - All Equity Financed

Data

Number of shares	1,000		
Price per share	\$10		
Market value of shares	\$10,000		

Outcomes

	A	B	C	D
Operating income	\$500	1,000	1,500	2,000
Earnings per share	\$.50	1.00	1.50	2.00
Return on shares (%)	5%	10	15	20

Expected outcome

---

---

---

---

---

---

---

---

---

---

### M&M (Debt Policy Doesn't Matter)

**Example** 50% debt

Data

Number of shares	500		
Price per share	\$10		
Market value of shares	\$5,000		
Market value of debt	\$5,000		

Outcomes

	A	B	C	D
Operating income	\$500	1,000	1,500	2,000
Interest	\$500	500	500	500
Equity earnings	\$0	500	1,000	1,500
Earnings per share	\$0	1	2	3
Return on shares (%)	0%	10	20	30

---

---

---

---

---

---

---

---

---

---

### M&M (Debt Policy Doesn't Matter)

**Example** - Macbeth's

- All equity financed
- Debt replicated by investors

Outcomes

	A	B	C	D
Earnings on two shares	\$1.00	2.00	3.00	4.00
LESS: Interest @ 10%	\$1.00	1.00	1.00	1.00
Net earnings on investment	\$0	1.00	2.00	3.00
Return on \$10 investment (%)	0%	10	20	30

---

---

---

---

---

---

---

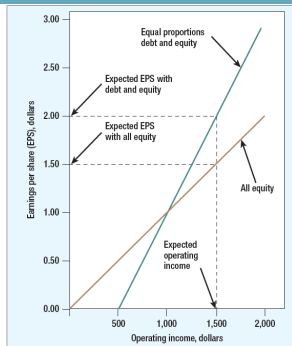
---

---

---

### Borrowing and EPS at Macbeth

17-10




---

---

---

---

---

---

---

---

### No Magic in Financial Leverage

17-11

#### MM's Proposition I

If capital markets are doing their job, firms cannot increase value by tinkering with capital structure.

V is independent of the debt ratio.

#### An Everyday Analogy

It should cost no more to assemble a chicken than to buy one whole

---

---

---

---

---

---

---

---

### Proposition I and Macbeth

17-12

#### **Example** - Macbeth continued

	Current Structure:		Proposed Structure:	
	All Equity	Equal Debt and Equity	All Equity	Equal Debt and Equity
Expected earnings per share (\$)	1.50	2.00		
Price per share (\$)	10	10		
Expected return per share (%)	15	20		

---

---

---

---

---

---

---

---

### Leverage and Returns

17-13

Expected return on assets =  $r_A = \frac{\text{expected operating income}}{\text{market value of all securities}}$

$$r_A = \left( \frac{D}{D+E} \times r_D \right) + \left( \frac{E}{D+E} \times r_E \right)$$

---

---

---

---

---

---

---

---

### M&M Proposition II

17-14

**Example - Macbeth continued**

$$r_E = r_A + (r_A - r_D) \frac{D}{E}$$

$$r_E = r_A = \frac{\text{expected operating income}}{\text{market value of all securities}} = \frac{1500}{10,000} = .15$$

---

---

---

---

---

---

---

---

### M&M Proposition II

17-15

**Example - Macbeth continued**

$$r_E = r_A = \frac{\text{expected operating income}}{\text{market value of all securities}} = \frac{1500}{10,000} = .15$$

$$r_E = r_A + (r_A - r_D) \frac{D}{E}$$

$$r_E = .15 + (.15 - .10) \frac{5000}{5000} = .20 \text{ or } 20\%$$

---

---

---

---

---

---

---

---

## Leverage and Risk

17-16

### Example - Macbeth continued

Leverage increases the risk of Macbeth shares

		Operating	Income	Change
		\$1,500 to	\$500	
All equity	Earnings per share (\$)	1.50	0.50	-\$1.00
	Return on shares	15%	5%	-10%
50% debt:	Earnings per share (\$)	2	0	-\$2.00
	Return on shares	20%	0	-20%

---

---

---

---

---

---

---

---

---

---

## Leverage and Returns

17-17

### Example - Market Value Balance Sheet

Asset value	100	Debt (D)	30
		Equity (E)	70
Asset value	100	Firm value (V)	100

$$r_d = 7.5\%$$

$$r_e = 15\%$$

$$r_A = \left( r_d \times \frac{D}{D+E} \right) + \left( r_e \times \frac{E}{D+E} \right)$$

$$r_A = \left( .075 \times \frac{30}{100} \right) + \left( .15 \times \frac{70}{100} \right) = 12.75\%$$

---

---

---

---

---

---

---

---

---

---

## Leverage and Returns

17-18

### Example - Market Value Balance Sheet

What happens to  $R_e$  when debt costs rise?

Asset value	100	Debt (D)	40
		Equity (E)	60
Asset value	100	Firm value (V)	100

$$r_d = 7.5\% \text{ changes to } 7.875\%$$

$$r_e = ??$$

$$.1275 = \left( .07875 \times \frac{40}{100} \right) + \left( r_e \times \frac{60}{100} \right)$$

$$r_e = 16.0\%$$

---

---

---

---

---

---

---

---

---

---

### Leverage and Returns

17-19

$$B_A = \left( B_D \times \frac{D}{V} \right) + \left( B_E \times \frac{E}{V} \right)$$

$$B_E = B_A + \frac{D}{V} (B_A - B_D)$$

---

---

---

---

---

---

---

---

### WACC

17-20

WACC is the traditional view of capital structure, risk and return.

$$WACC = r_A = \left( r_D \times \frac{D}{V} \right) + \left( r_E \times \frac{E}{V} \right)$$

---

---

---

---

---

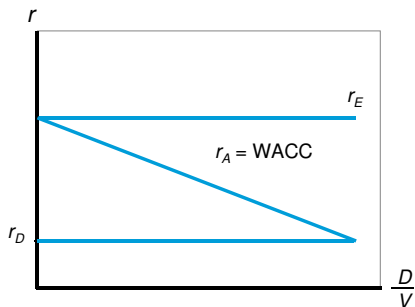
---

---

---

### WACC

17-21




---

---

---

---

---

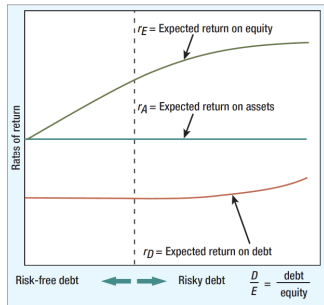
---

---

---

## M&M Proposition II

17-22




---

---

---

---

---

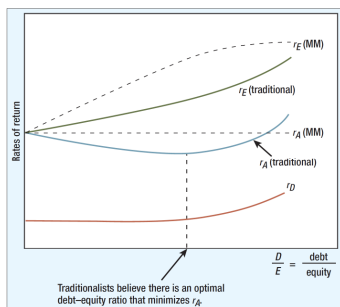
---

---

---

## WACC (traditional view)

17-23




---

---

---

---

---

---

---

---

## After-Tax WACC

17-24

- The tax benefit from interest expense deductibility must be included in the cost of funds
- This tax benefit reduces the effective cost of debt by a factor of the marginal tax rate

$$WACC = \left( r_D \times \frac{D}{V} \right) + \left( r_E \times \frac{E}{V} \right)$$

Old Formula

---

---

---

---

---

---

---

---



### After-Tax WACC

17.25

Tax-Adjusted Formula

$$WACC = r_D \times (1 - T_c) \times \left( \frac{D}{V} \right) + \left( r_E \times \frac{E}{V} \right)$$

---

---

---

---

---

---

---

---

### After-Tax WACC

17.26

**Example** - Union Pacific

The firm has a marginal tax rate of 35%. The cost of equity is 9.8% and the pretax cost of debt is 4.2%. Given the book and market value balance sheets, what is the tax-adjusted WACC?

---

---

---

---

---

---

---

---

### After-Tax WACC

17.27

**Example** - Union Pacific

Debt ratio =  $(D/V) = 9.4\%$

Equity ratio =  $(E/V) = 90.6\%$

$$WACC = r_D \times (1 - T_c) \times \left( \frac{D}{V} \right) + \left( r_E \times \frac{E}{V} \right)$$

---

---

---

---

---

---

---

---

### After-Tax WACC

17-28

**Example** - Union Pacific

$$\begin{aligned} \text{WACC} &= 4.2 \times (1 - .35) \times .094 \times 9.8 + .906 \\ &= 9.1\% \end{aligned}$$

---

---

---

---

---

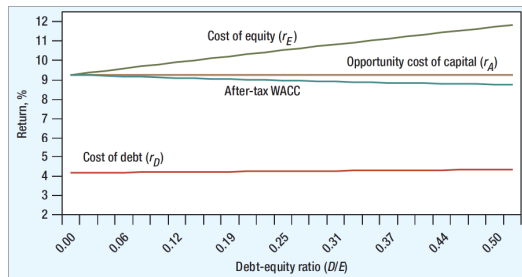
---

---

---

### Union Pacific WACC

17-29




---

---

---

---

---

---

---

---

### After-Tax WACC

17-30

**Example** - Kate's Cafe

Kate's Café has a marginal tax rate of 35%. The cost of equity is 10.0% and the pretax cost of debt is 5.5%. Given the book and market value balance sheets, what is the tax adjusted WACC?

---

---

---

---

---

---

---

---

### After-Tax WACC

17-31

**Example** - Kate's Cafe

Assets	22.6	7.6	Debt
		15	Equity
Total assets	22.6	22.6	Total liabilities

**MARKET VALUES**

---

---

---

---

---

---

---

---

---

---

### After-Tax WACC

17-32

**Example** - Kate's Cafe

Debt ratio =  $(D/V) = 7.6/22.6 = .34$  or 34%

Equity ratio =  $(E/V) = 15/22.6 = .66$  or 66%

$$WACC = r_D \times (1 - T_c) \times \left(\frac{D}{V}\right) + \left(r_E \times \frac{E}{V}\right)$$

---

---

---

---

---

---

---

---

---

---

### After-Tax WACC

17-33

**Example** - Kate's Cafe

$$WACC = r_D \times (1 - T_c) \times \left(\frac{D}{V}\right) + \left(r_E \times \frac{E}{V}\right)$$

$$\begin{aligned} WACC &= .055 \times (1 - .35) \times (.34) + .10 \times (.66) \\ &= .078 \\ &= 7.8\% \end{aligned}$$

---

---

---

---

---

---

---

---

---

---