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)

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)

Dollar Investment	Dollar Return
$.01V_U$	$.01 \times$ profits

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

M&M (Debt Policy Doesn't Matter)

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

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

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*

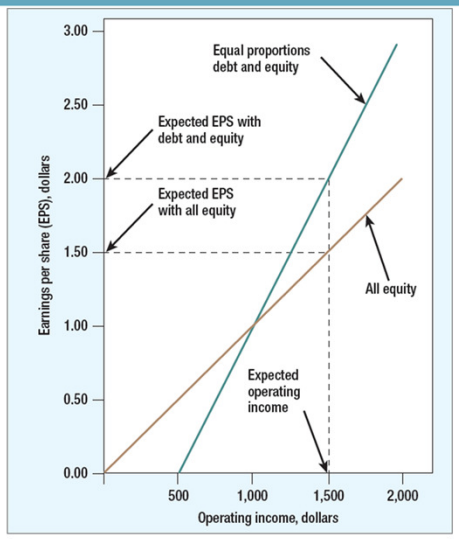
- All equity financed

- 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



No Magic in Financial Leverage

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

Example *- Macbeth continued*

	Current Structure: All Equity	Proposed Structure: 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

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

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

M&M Proposition II

***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

***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

Example - *Macbeth continued*

Leverage increases the risk of Macbeth shares

		Operating Income $1,500 to $500		Change
All equity	Earnings per share ($)	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

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

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% 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

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

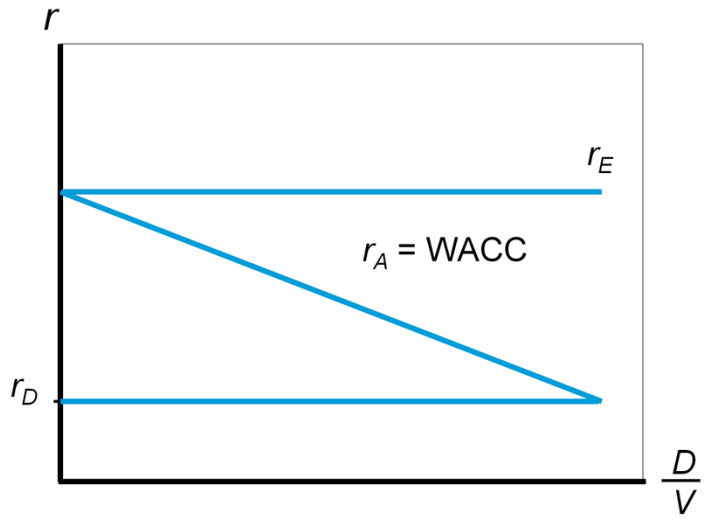
$$B_E = B_A + \frac{D}{V}\left(B_A - B_D \right)$$

WACC

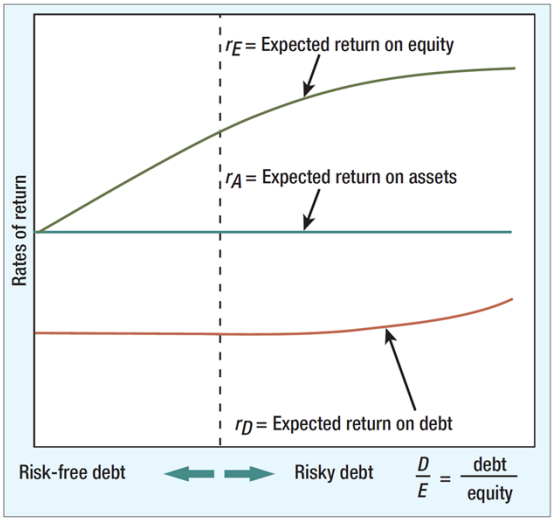
WACC is the traditional view of capital structure, risk and return.

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

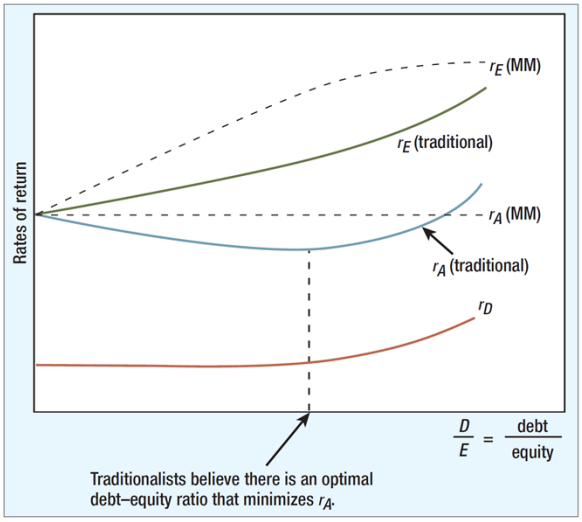
WACC



M&M Proposition II



WACC (traditional view)



After-Tax WACC

- 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

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

Old Formula

After-Tax WACC

Tax-Adjusted Formula

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

After-Tax WACC

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

Example *- Union Pacific*

Debt ratio = (*D*/*V*) = 9.4%

Equity ratio = (*E*/*V*) = 90.6%

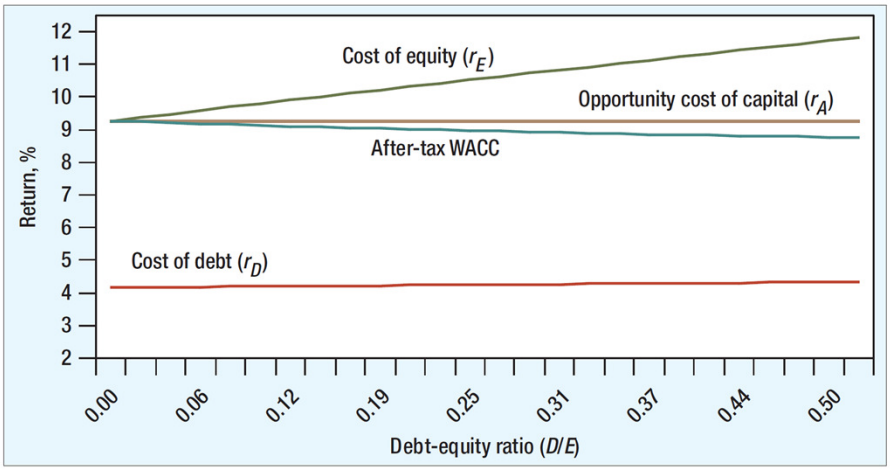
$$\text{WACC} = r_D \times (1 - Tc) \times \left(\frac{D}{V}\right) + \left(r_E \times \frac{E}{V}\right)$$

After-Tax WACC

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



After-Tax WACC

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

Example - *Kate's Cafe*

Balance Sheet (Market Value, billions)

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

MARKET VALUES

After-Tax WACC

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%

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

After-Tax WACC

Example - *Kate's Cafe*

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

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