

# DOES DEBT POLICY MATTER?

## Topics Covered

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- 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)

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- 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)

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## 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)

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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	$.01(D_L + E_L)$ $= .01V_L$	$.01 \times \text{profits}$

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

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

	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)

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## **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)

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**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
<b><i>Return on shares (%)</i></b>	<b><i>0%</i></b>	<b><i>10</i></b>	<b><i>20</i></b>	<b><i>30</i></b>



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

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### **Example** - Macbeth's

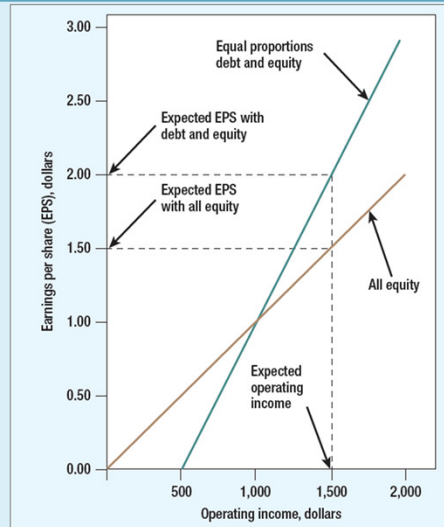
- All equity financed
- Debt replicated by investors

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
<b><i>Return on \$10 investment (%)</i></b>	<b><i>0%</i></b>	<b><i>10</i></b>	<b><i>20</i></b>	<b><i>30</i></b>

# Borrowing and EPS at Macbeth

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# No Magic in Financial Leverage

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## 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

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

	Current Structure :	Proposed Structure :
	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

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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

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### **Example - Macbeth continued**

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

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

## M&M Proposition II

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### ***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

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### ***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

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## **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

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## **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

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

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

# WACC

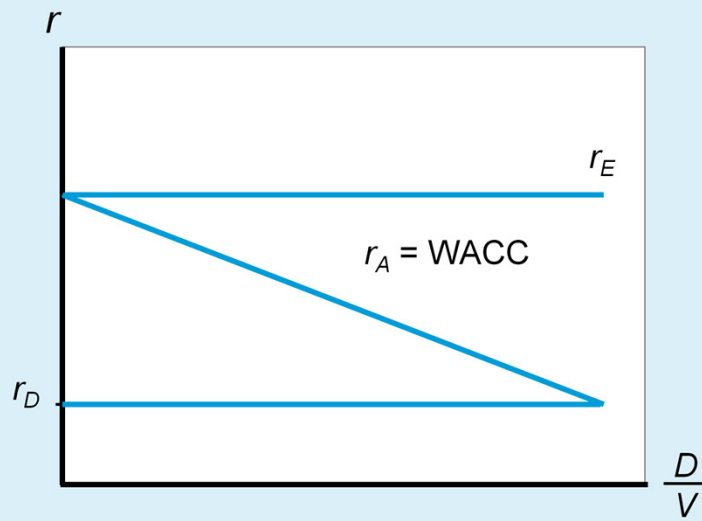
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WACC is the traditional view of capital structure, risk and return.

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

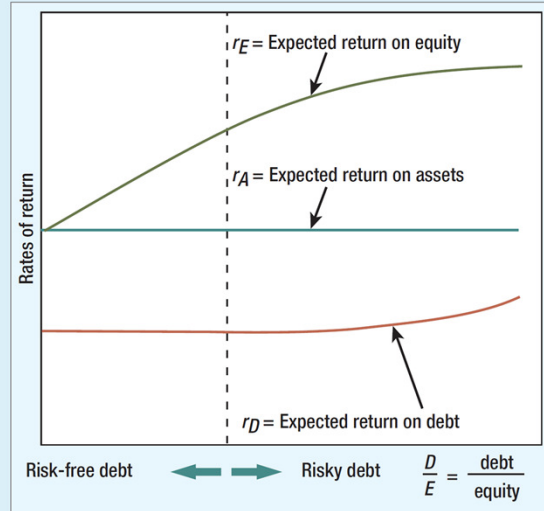
# WACC

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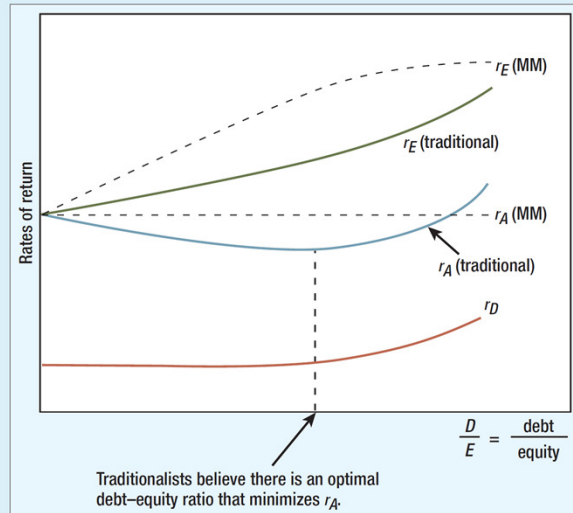
# M&M Proposition II

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# WACC (traditional view)

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## After-Tax WACC

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- 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

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### Tax-Adjusted Formula

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

## After-Tax WACC

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### **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 =  $(E/V) = 90.6\%$

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

## After-Tax WACC

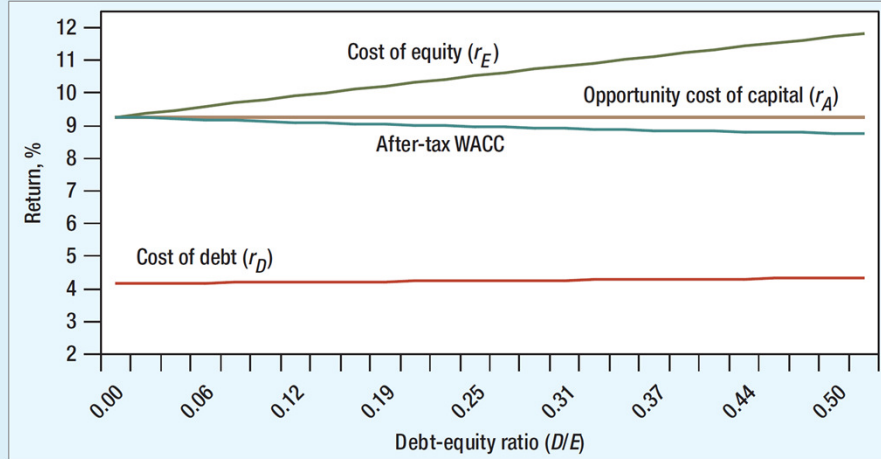
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**Example** - *Union Pacific*

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

# Union Pacific WACC

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## After-Tax WACC

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### **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

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### Example - Kate's Cafe

Assets	22.6	7.6	Debt
		<u>15</u>	Equity
Total assets	22.6	22.6	Total liabilities

**MARKET VALUES**

## After-Tax WACC

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### **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%

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



## After-Tax WACC

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**Example** - *Kate's Cafe*

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

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