

Capital Structure

Financing and Shareholder Value

How Much Debt should a Firm Use?

- Factors to consider
 - taxes
 - costs of financial distress
 - “agency costs”--Bondholder, Shareholder, management conflicts
- Solution
 - Lever up, for tax reasons, until the point where debt begins to interfere with operations

Modigliani and Miller

- Assumptions
 - “Efficient” markets
 - two securities with the same cash flows have the same price
 - borrowers with the same risk pay the same rate of interest
 - No Taxes
 - Corporate
 - Personal

M&M

- Financing does not alter the operations of the firm
 - investment policy unaffected by financing decision
 - firm cash flows unaffected by bankruptcy proceedings
 - no lawyer fees
 - no disruption of activities
 - any change in ownership not affect operations

An Example

- Consider two identical firms, one levered, the other unlevered:

Unlevered Firm

		Debt	0
		NW	2000
Assets	2000	L&NW	2000

number of shares, $n = 100$

M&M example

Levered Firm

		Debt	1000
		NW	1000
Assets	2000	L&NW	2000

number of shares, $n = 50$

interest rate, $r = 10\%$

	scenarios			
state	1	2	3	4
Ebit	100	200	300	400
ROIC	5%	10%	15%	20%

Unlevered Firm

state	1	2	3	4
EBIT	100	200	300	400
int	0	0	0	0
NI	100	200	300	400
ROE	5%	10%	15%	20%
eps	1	2	3	4

Levered Firm

State	1	2	3	4
EBIT	100	200	300	400
int	100	100	100	100
NI	0	100	200	300
ROE	0%	10%	20%	30%
eps	0	2	4	6

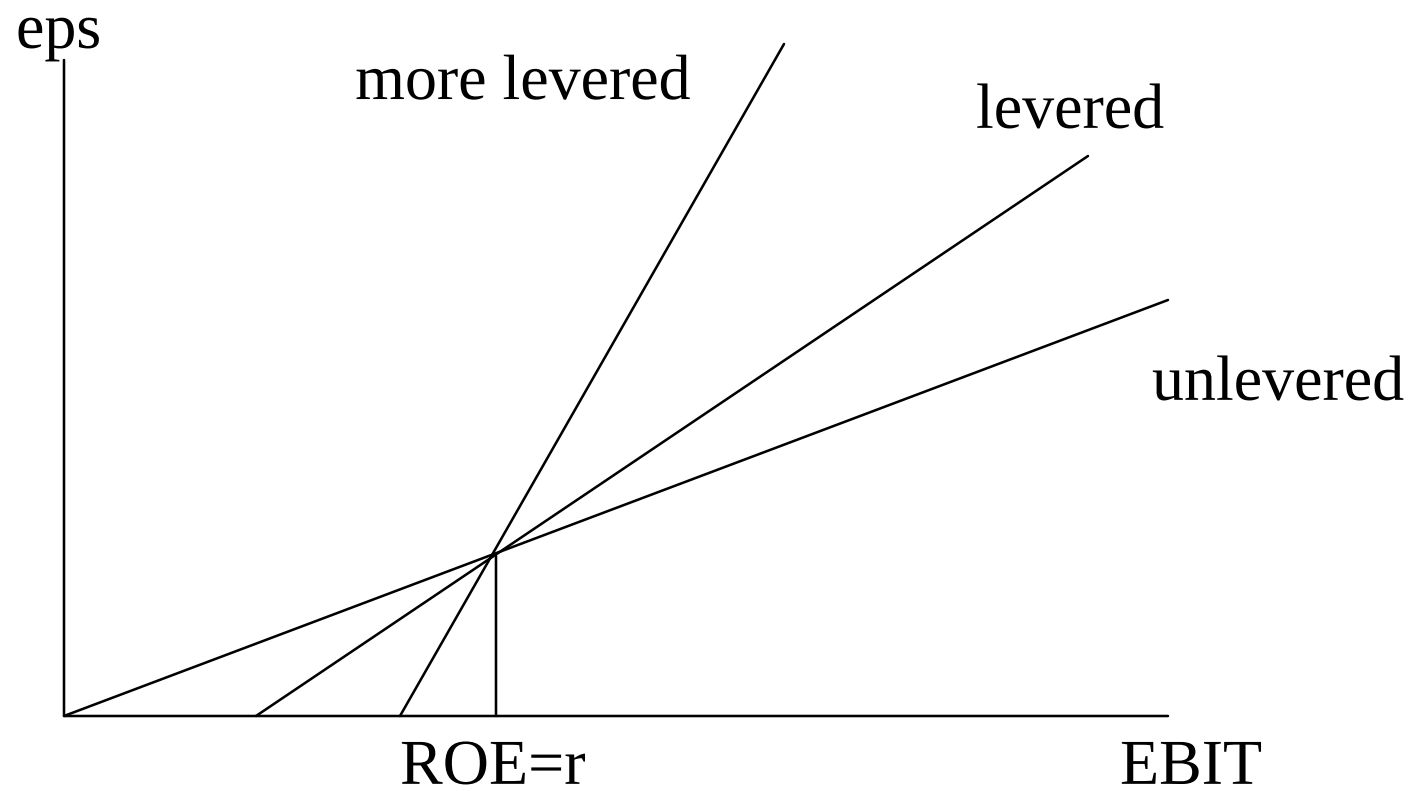
Observations

- Expected ROE and variability of ROE increase with leverage
 - expected ROE
 - unlevered: 12.5%
 - levered: 15%
 - range of ROE
 - unlevered: 5% to 20%
 - levered: 0% to 30%

Observations

- Expected eps and variability of eps increase with leverage
 - expected eps
 - unlevered: 2.50
 - levered: 3.00
 - range of eps
 - unlevered: 1.00 to 4.00
 - levered: 0.00 to 6.00

eps v. EBIT



Firm Value

		unlevered			
State		1	2	3	4
BH		0	0	0	0
SH		100	200	300	400
total		100	200	300	400
		levered			
BH		100	100	100	100
SH		0	100	200	300
total		100	200	300	400

Value of Firm

- Since the cash flows to the shareholders of the unlevered firm are identical to the cash flows to shareholders and bondholders of the levered firm, the market value of the equity in the unlevered firm must equal the value of the equity plus the value of the debt in the levered firm

Recapitalization

- Suppose the firm starts out unlevered. The firm issues 1000 in debt, and purchases 50 shares for 20 per share. Since the value of the firm will be unaffected, shareholders in aggregate will be left with 50 shares worth 20 per share $(2000-1000)/50$, and 1000 in cash. Before they had 100 shares, each worth 20 per share

portfolio management

- If shareholders liked the previous pattern of cash flow, they can take the 1000 and buy the firm's newly issued bond. Shareholders can “undo” the corporate leverage
- Similarly, if the firm is unlevered, and individuals prefer levered cash flows, they can borrow personally, pledging the stock as collateral, and receive the levered cash flows--“homemade” leverage

summary: no tax case

- Firm value is unaffected by the capital structure decision
- Therefore, financial transactions will not make shareholders better off
- higher expected equity returns are exactly offset by higher return riskiness

M&M with taxes

- Consider, as before, two identical firms with 2000 in assets, but now the corporate tax rate is $t=30\%$. The scenarios are as before

Unlevered Firm

state	1	2	3	4
EBIT	100	200	300	400
int	0	0	0	0
NI	100	200	300	400
taxes	30	60	90	120
NI	70	140	210	280
ROE	3.5%	7%	10.5%	14%
eps	.7	1.4	2.1	2.8

Levered Firm

State	1	2	3	4
EBIT	100	200	300	400
int	100	100	100	100
EBT	0	100	200	300
tax	0	30	60	90
NI	0	70	140	210
ROE	0%	7%	14%	21%
eps	0	1.4	2.8	4.2

leverage and returns

- As before, expected eps and ROE increase, as does riskiness.
- Does this leave shareholders indifferent to capital structure?

Firm Value

		unlevered			
State		1	2	3	4
BH		0	0	0	0
SH		70	140	210	280
total		70	140	210	280
		levered			
BH		100	100	100	100
SH		0	70	140	210
total		100	170	240	310

value and leverage

- In every state, the cash flows to shareholders and bondholders is 30 greater than the cash flows to shareholders in the unlevered firm
- The extra cash flow comes from:
$$CF(\text{levered}) = CF(\text{unlevered}) + t * \text{interest}$$

recapitalizations

- If an unlevered firm (value = 2000) issues debt, it can use the proceeds to purchase shares. In aggregate, the equity will be worth more than 1000

$$\text{equity} = V(\text{levered}) - 1000 > 2000 - 1000$$

- Therefore, shareholders will have 1000 (from the purchase of shares) + shares worth more than 1000. The cash can be used to purchase the firm's debt.

summary: M&M with taxes

- The value of the levered firm will be higher, by the (present value of) the tax savings
- Claimants to firm's operating cash flows
 - bondholders
 - shareholders
 - government
- Increasing debt reduces the government claim leaving more for the other two

Capital Structure

- Given corporate taxes, and given that operations are unaffected by the capital structure the firm should be all debt
- However, operations can be affected by capital structure--financial distress will typically disrupt operations
- Optimal capital structure balances tax benefit of debt with operational costs of debt

Picking the Debt Level

- If the firm's market completely collapses, then it really does not matter how much debt the firm has
- We want to pick a debt level so that the firm's operations are largely unaffected, during reasonably hard times

picking capital structure

- Picking capital structure is a function of
 - how bad can things reasonably get (variability)
 - how might the firm's operations be affected during difficult times (vulnerability)
- The riskier is the firm, the less debt it wishes to carry
- The more vulnerable the firm, the less debt it wishes to carry

vulnerability

- vulnerability is determined by the dependence on outside constituents
 - specialized labor force
 - specialized suppliers
 - dependence on dealer network
 - customers responding to financial difficulties
 - competitive attack
 - reliance on capital market to fund growth

quantification

- Vulnerability will dictate a “cushion” between EBIT and interest
- Let h be the target coverage ratio during the reasonable worst case:

$$\text{EBIT(RWC)}/\text{Interest} = h$$

or

$$\text{interest} = \text{EBIT(RWC)}/h$$

let r be the borrowing cost, and D the target debt level. Then:

$$\text{interest} = r * D = \text{EBIT}(\text{RWC})/h$$

$$\text{let } \text{OPM}(\text{RWC}) = \text{EBIT}(\text{RWC})/\text{Sales}(\text{RWC})$$

$$\text{Sales}(\text{RWC})/[\text{NWC}(\text{RWC}) + \text{FA}(\text{RWC})] = \text{sales/capital}$$

Formula

$$(D/Cap) = (1/h) * OPM(RWC) * (sales/Cap) * (1/r)$$

Use of formula

- Determine OPM(RWC)
 - history
 - analysis of risks
 - analysis of competitive environment
 - analysis of operating leverage (fixed costs)
- A rule of thumb
 - pick opm that could easily occur once in five to ten years

use of formula

- pick RWC target coverage $h = 1, 2, 3$
- determine sales/cap ratio
 - history
 - technology
 - future plans
- calculate target debt to capital ratio
- implement financing strategy

example

- $\text{opm}(\text{rwc}) = 4\%$ (avg. during last recession)
- $h = 2$ (moderate vulnerability)
- $r = 10\%$
- $\text{sales/cap} = 1.5$ (historical avg.)

$$D/\text{cap} = (.5) * (.04) * (1.5) * (10) = 30\%$$

a typical US Firm

Notes

- OPM(RWC) is lower than opm during normal times
- coverage during normal times will thus be considerable larger than the target coverage during difficult times--a target coverage of 2.0 could correspond to a coverage ratio during normal times of 6.0 or larger

Summary

- optimal capital structure weighs off tax benefit with the cost of debt interfering with operations
- Theory implies that arguments for a financing strategy should involve this
- capital structure mainly affects operations during difficult times, so the capital structure decision must consider a reasonable worst case

- depending upon the firm's vulnerability, pick a target coverage in this RWC of 1, 2 or 3
- As sales grow, capital can be increased according to the target capital structure