Capital Structure: Perfect Market

(Welch, Chapter 6 and 17)

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PCM Modigliani-Miller

- Perfect Capital Market, M&M:
  - No Taxes.
  - No X-Costs.
  - No Disagreements.
  - Competitive Markets.

plus

- Risk Neutral
- Time Value of Money of 20%

Main Example

- Firm value *next year*:
  - with Prob=1/4: \$60 (hurricane).
  - with Prob=3/4: \$100 (sun).

Raise $70 in Debt Today

- What interest rate must you promise to raise $70 in debt today?
  - $70 is not the promise but the **need today**!
  - PCM ok: Debt will be due, firm will be sold.
  - PCM ok: No liquidity vs value issue.
- Recall E(r)=20%.
- Prob 1/4 of $60, 3/4 of $100.
- Two Different Capital Structures:
  - [1] All Equity; [2] Debt + Equity

Payoff Table Template

Next Year's Payoffs	Prob	Meaning
\$100	3/4	Sunshine
\$60	1/4	Hurricane

Prob	Payoffs	Scheme 1	Scheme 2	Scheme 2
		Firm	Bond	Lev Eqty
		100% Eq	a Proms	
G=b		c	d	e
	r(G):	f	g	h
B=1/4		i	j	k
	r(B):	l	m	n
	E(Pay):	o	p	q
	E(RoR):	r	s	t
	P_0:	u	v	w

Prob	Payoffs	Scheme 1	Scheme 2	Scheme 2
		Firm 100% Eq	Bond	Lev Eqty
G=3/4				
	r(G):			
B=1/4				
	r(B):			
	E(Pay):			
	E(RoR):			
	P_0:			

Prob	Payoffs	Scheme 1	Scheme 2	Scheme 2
		Firm	Bond	Lev Eqty
		100% Eq	\$92 Proms	
G=3/4		\$100	\$92	\$8
	r(G):	+33%	+31%	+60%
B=1/4		\$60	\$60	\$0
	r(B):	–20%	–14%	–100%
	E(Pay):	\$90	\$84	\$6
	E(RoR):	20%	20%	20%
	P_0:	\$75	\$70	\$5

Arbitrage Pressure?

- In *a* PCM, if the value of the firm was \$76 under the debt-laden capital structure (say, \$70+\$6), but the managers chose the \$75 capital structure (say, *all* equity), what would you do?

Arbitrage Pressure?

- In a PCM, if the value of the firm was \$74 under the debt-laden capital structure (say, \$69+\$5), and the managers chose the \$74 capital structure, what would you do?

Debt and Equity

- How can the value of the *firm* depend on the value of debt and equity?

Maximized Firm Value

- Which share of debt or equity maximizes the firm's value?

Is This a General Insight?

- But the world is not anywhere near risk-neutral.
- Does this still work with risk-aversion,
- or only in (near-) risk-neutral cases?
- And how does leverage influence the CoC?

Same Example w/ Risk Aversion

- Perfect Markets (PCM): No Taxes. No X-Costs. No Disagreements. Competitive Markets.
- Prob 1/4, worth \$60 *next year*.
- Prob 3/4, worth \$100 *next year*.

Now the world is **NO LONGER** risk-neutral.

- The CoC for *this* risky *firm* overall is 20%,
- ...but not for its debt or equity!
- I-Banker: to raise \$65 in debt, you must *promise* investors a promised RoR of 16.92%.

Question of Interest

- What is your cost of capital on debt?
- What is your cost of capital on equity?
- What is your leverage ratio?

World Sketch Template

Prob	Payoffs	Scheme 1	Scheme 2	Scheme 2
		Firm	Bond	Lev Eqty
		100% Eq	a Proms	
G=b		c	d	e
	r(G):	f	g	h
B=1/4		i	j	k
	r(B):	l	m	n
	E(Pay):	o	p	q
	E(RoR):	r	s	t
	P_0:	u	v	w

Prob	Payoffs	Scheme 1	Scheme 2	Scheme 2
		Firm 100% Eq	Bond	Lev Eqty
G=3/4				
	r(G):			
B=1/4				
	r(B):			
	E(Pay):			
	E(RoR):			
	P_0:			

Prob	Payoffs	Scheme 1	Scheme 2	Scheme 2
		Firm	Bond	Lev Eqty
		100% Eq		
G=3/4		\$100	\$76	\$24
	r(G):	+33%	16.9%	
B=1/4		\$60	\$60	\$0
	r(B):	-20%	-7.7%	-100%
	E(Pay):	\$90	\$72	\$18
	E(RoR):	20%	10.8%	80%
	P_0:	\$75	\$65	\$10

WACC

- What is the weighted *average* cost of capital (WACC) of the debt+equity capital structure?

Leverage and Risk

- If only $0.01 in debt had been promised, what would have been the riskiness of (a) debt and (b) equity?

Maximized Firm Value

- Which share of debt or equity maximizes firm value?

Debt, Risk and CoC

- How does the risk and cost of capital of the **debt** depend on the firm's leverage ratio?

LR $\uparrow$:

Equity, Risk and CoC

- How does the risk and cost of capital of the **equity** depend on the firm's leverage ratio?

LR $\uparrow$:

Consequences for CoC

1. If the CoC (and risk) of equity goes up, and
2. the CoC (and risk) of debt goes up, and
3. the firm consists only of debt and equity, then

- **Does the CoC (and risk) of the firm go up?**

Leverage Ratio, CoC, and Risk

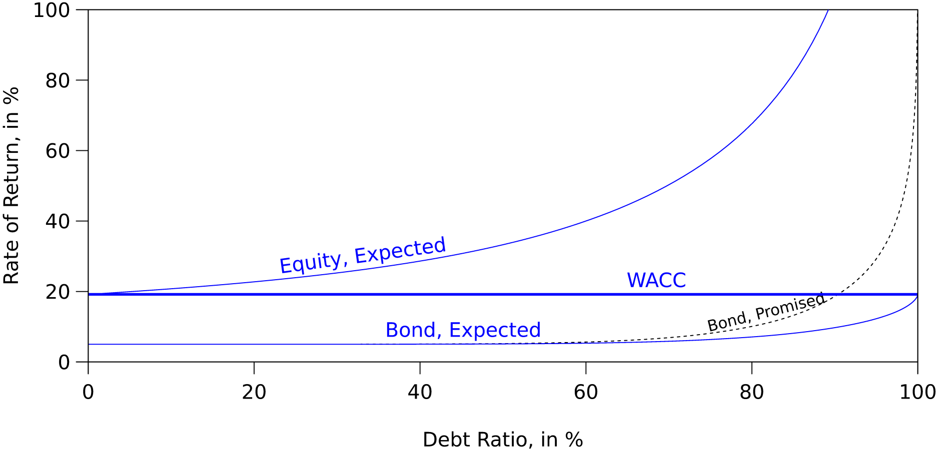
- How does the cost of capital (and risk) of the **firm** depend on the firm's leverage ratio?

- In the formula, as leverage goes up, what goes up, what goes down?

Risk Splitting Histogram

- In the above example (\$65 debt), what is the riskiness of the two claims and what is the riskiness of the firm?

Graph: Normally Distributed



Graph Footnotes

- The promised RoR on debt can be above the WACC!
- For reasonable debt ratios (say, 0% to 60%), the cost of the firm's debt really stays the same and hovers around the risk-free rate.
- However, the cost of the equity increases.