Optimal Capital Structure in Perfect Markets

"How should we think about the many possible securities that we have talked about in the previous class?" Which add value?

Professor Ivo Welch's lecture notes, ©Ivo Welch, 2008. Based on textbook *Corporate Finance: An Introduction* (Welch, 2008).

Firm-Value or Equity-Value?

Presume we can increase equity value by throwing away some firm value. (I will later show you how you can do this.)

Q1: Ex-post, what will managers be more tempted to maximize: firm-value or equity-value? (OK, other than their own wealth!)

Q2: Up-front, what should managers maximize: firm-value or equity value?

The Modigliani-Miller Propositions

In a perfect market, the value of the firm is the discounted value of all claims,

$$\mathsf{PV} = \sum_t \frac{\mathcal{E}(\tilde{C}_t)}{(1+\mathcal{E}(\tilde{r}_{0,t}))}$$

and independent of

- split of claims into debt and equity;
- payout or reinvestment of dividends.

Q3: What matters?

Q4: What are the perfect market assumptions?

M&M #1: Capital Structure

IMPORTANT: Modigliani-Miller proposition # states that in a perfect market, capital structure should not matter.

(Real operations are held constant, possibly at first-best via perfect markets.)

In English, a firm with assets of $100 is worth $100, even if the firm borrows money.

Q5: An "ad absurdum" argument: The simplest way to see this is to consider the following argument: Say, there were an optimal capital structure of 25% debt and 75% equity. Firm value is $1,000. That is the value of the firm were higher if it were closer to this optimal capital structure, and lower if it were further from this capital structure. What could you do? What would everyone do?

Note that financial structure impacts the price of each individual security (i.e. the share of the pie); but it cannot possibly affect the price of the firm overall (i.e. the pie).

Q6: If financial markets are perfect, as treasurer of the company, you should worry about the optimal capital structure. Is too much or not enough debt harmful?

M&M #2: Dividends

IMPORTANT: Modigliani-Miller proposition #2 states that in a perfect market, dividend policy should not matter.

In English, this says that if a $100 stock pays $10 dividends, it will trade for exactly $90 the instant after.

Also, by arbitrage conditions, the value of the company must be equal to the properly discounted sum of all its payouts:

$$V = \sum_t \frac{\mathcal{E}(\widetilde{\text{Payouts}}_t)}{(1+\mathcal{E}(\tilde{r}_t))}$$

where payouts can be dividends, interest, principal, etc. This V is also equal to

$$V = \sum_t \frac{\mathcal{E}(\tilde{C}_t)}{(1+\mathcal{E}(\tilde{r}_{0,t}))}$$

Where would the money go otherwise?

Q7: What happens when a company decides not to pay its previously announced dividends today?

Q8: What happens when it decides not to pay dividends *today*?

Q9: What happens if an investor needs to consume today?

M&M—So what?

Q10: What happens if there are transaction costs?

Q11: What happens if there are information differences?

IMPORTANT: **The Modigliani-Miller propositions teach us that we must look for where the distortions are in the real world if we want to know which capital structure is best. They also teach us how important capital structure or dividend policy can possibly be.**

M&M do not teach us that there are no distortions.

WACC **(w/o Taxes)**

WACC is important, not only in its own right, but also because new projects that the firm takes are often similar to old projects. Therefore, their cost of capital is likely similar to that of older projects. This is of course the cost of capital that has to be used in a capital budgeting (NPV application).

Work out:

- 1/2 prob of \$50k, 1/2 of \$150k.
- E(R) for firm: 10%.
- E(R) for debt that promises \$75k: 7%.
- **What is the price today of the equity?**
- **What is the weighted average cost of capital with debt?**

- What if E(R) for debt that promises \$80k: 7.2%.
- **What is the price today of the equity?**
- **What is the weighted average cost of capital with debt?**

Project Payoffs	Scheme 1	Scheme 2	
	Firm, FM (=100% Equity)	Bond, DT (Promise=$75k)	Levered Equity, EQ
prob(B)=1/2 $50k	$r=$ _____	$r=$ _____	$r=$ _____
prob(G)=1/2 $150k	$r=$ _____	$r=$ _____	$r=$ _____
$\mathcal{E}$(Payoff) $(=\mathcal{E}(\tilde{C}))$			
$\mathcal{E}$(Rate of Return) $(=\mathcal{E}(\tilde{r}))$	10%	7.0%	
Discounted Price P_0			
% Financing			

Project Payoffs	Scheme 1	Scheme 2	
	Firm, FM (=100% Equity)	Bond, DT (Promise=$80k)	Levered Equity, EQ
prob(B)=1/2 $50k	$r=$ _____	$r=$ _____	$r=$ _____
prob(G)=1/2 $150k	$r=$ _____	$r=$ _____	$r=$ _____
$\mathcal{E}$(Payoff) $(=\mathcal{E}(\tilde{C}))$			
$\mathcal{E}$(Rate of Return) $(=\mathcal{E}(\tilde{r}))$	10%	7.2%	
Discounted Price P_0			
% Financing			

Firm/Bond/Equity Risk

Q12: More debt increases the risk of debt. It also increases the risk of equity. Therefore, it increases the risk of the firm. True/False?

WACC

IMPORTANT:

- **Cost of Capital Blending in a Perfect World:**

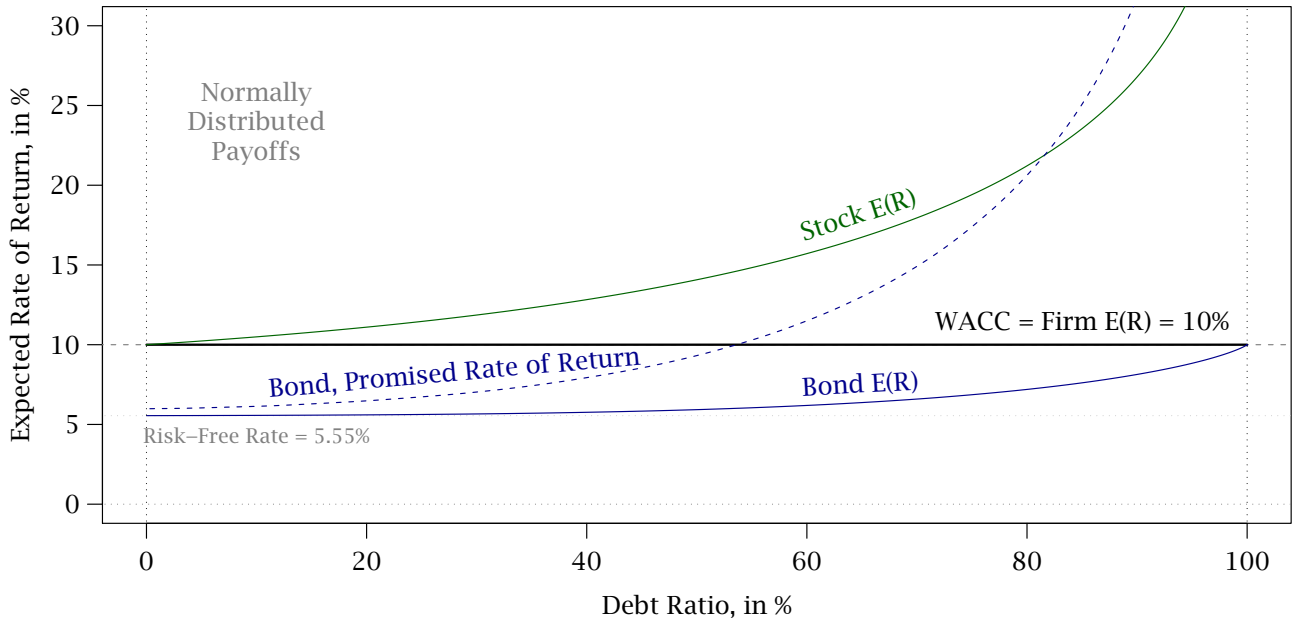
$$w_{\mathsf{EQ}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{EQ}}) + w_{\mathsf{DT}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) = \mathcal{E}(\tilde{r}_{\mathsf{FM}}) = \mathsf{WACC}$$

- **Under risk aversion, which means that expected rates of return (not promised rates!) are higher on the riskier equity than they are on debt.**
- **The reason why the expected cost of capital for the overall firm remains the same when the risk of both debt and equity go up is that the weighting factor itself changes.**
- **WACC in a perfect market does not depend on the debt-equity ratio.**

The basic idea on which this rests is that arbitrage constraints force the value of the securities to add up to the total value.

Graphing all Rates

16-4D



Q13: Do you care about the effect of debt on E/P or EPS? (16-4E)

With Non-Financial Liabilities

16-6

- M&M can break down if there is a non-breakable link between operational policy and financing options. (E.g., payables.)
- M&M requires a lot more leaning on the ability to change around the firm. Or think of M&M as irrelevance of debt+equity, but not debt+equity+other-liabilities.
- WACC: for marginal projects, financed with financial capital, you can use the debt+equity WACC.

Homework Assignment

1. Reread Chapter 16.
2. Read Chapter 17.
3. Hand in all Chapter 16 end-of-chapter problems, due in 7 days.