



Modigliani and Miller Propositions

Chapter 15

Capital Structures/ M&M Propositions

”Better make it six, I’m not that hungry.”

– Yogi Berra after being asked if he wanted his pizza in six or eight slices.

Obviously pizza can’t be made any larger or smaller based on how it’s divided, but what about firms?

The split we’re going to consider is the split between Stocks (S) and Bonds (B)

Maximizing Firm Value = Maximizing Shareholder Value

A firm has \$1000 in assets, and 100 shares selling at \$10. It considers selling \$500 in bonds and distributing that money to shareholders.

	Initial	Case I	Case II	Case III
Debt	0	500	500	500
Equity	1000	750	500	250
Value	1000	1250	1000	750
Cap. Gain		-250	-500	-750
Dividends		500	500	500
Net Gain		250	0	-250

Pre-M&M Ideas

Start by looking at Pre-M&M Ideas.
Earlier, we had:

$$R_{WACC} = \frac{S}{B+S} r_S + \frac{B}{B+S} r_B (1 - T_c)$$

More debt = lower R_{WACC} ?

If WACC is lower, will the firm's value will be higher?

What's wrong with this?

Example from Text

A firm has \$8000 in assets, currently with no debt. A proposal is to make the structure half debt, half equity. Start with 400 Shares outstanding (the stock are \$20/share).

	Recession	Expected	Boom
ROA	5%	15%	25%
Earnings	\$400	\$1200	\$2000
EPS	\$1.00	\$3.00	\$5.00
With Debt:			
Interest	-\$400	-\$400	-\$400
ROE	0%	20%	40%
EPS	0	\$4.00	\$8.00

We've seen this before though:

$$\beta_{Equity} = \frac{S + B}{S} \beta_{Assets}$$

From CAPM,

$$\begin{aligned} R_S &= R_{rf} + (R_M - R_{rf}) \beta_{Equity} \\ &= R_{rf} + (R_M - R_{rf}) \frac{S + B}{S} \beta_{Assets} \end{aligned}$$

Then,

$$\begin{aligned} R_{WACC} &= \frac{B}{B + S} R_{rf} + \frac{S}{B + S} R_S \\ &= R_{rf} + \frac{S}{B + S} (R_M - R_{rf}) \frac{S + B}{S} \beta_{Assets} \\ &= R_{rf} + (R_M - R_{rf}) \beta_{Assets} \end{aligned}$$

Homemade Leverage

Now suppose you are an investor who wants the leveraged firm, but are only offered the unlevered firm.

- A) buy \$1000 of the levered stock
- B) borrow \$1,000 and buy \$2,000 worth of the unlevered stock.

Both cases cost \$1000.

Homemade leverage II

	Recession	Expected	Boom
Levered \$1000			
EPS (x50)	\$0	\$200	\$400
Unlevered \$2k			
EPS (x100)	\$100	\$300	\$500
Interest Pmt.	-\$100	-\$100	-\$100
Net Earnings	\$0	\$200	\$400

This is the reasoning behind M&M I—the payoffs and costs are the same, so the firm is not helping the investor.

M&M First Proposition (no Taxes)

MM Proposition I (no taxes)

The value of the levered firm is the same as the value of the unlevered firm

So now what if we add in taxes?

Assume:

- Firm is a cash cow
- Debt payments will be interest only.

Tax Shield

The interest payments on debt are considered a cost, and thus reduce the final tax bill.

The tax shield will be worth $T_C R_B B$ each year.

The tax shield is worth $T_C B$.

M&M Prop I with Taxes

The value of an unlevered firm is:

$$V_U = \frac{EBIT(1 - T_C)}{r_0}$$

Where r_0 is the cost of capital to an all-equity firm. With a levered firm, we have the sum of two perpetuities:

$$\begin{aligned} V_L &= \frac{EBIT \cdot (1 - T_C)}{r_0} + \frac{T_C R_B B}{R_B} \\ &= V_U + T_C B \end{aligned}$$

This is M&M I with corporate taxes: The value of a levered firm equals the value of an unlevered firm *plus* the NPV of the tax shield.

A few Examples: RWJ 15.13

The market value of a firm with \$500,000 of debt is \$1.7 million. The pretax interest rate on debt is 10 percent per annum, and the company is in the 34 percent tax bracket. The company expects \$306,000 of earnings before taxes and interest every year in perpetuity.

- a. What would the value of the firm be if it were financed entirely with equity?

- b. What amount of the firm's annual earnings is available to stockholders?

RWJ 15.15

Strider Publishing Company, an all-equity firm, expects perpetual earnings before interest and taxes (EBIT) of \$2.5 million per year. Strider's after-tax, all-equity discount rate is 20 percent. The firm is subject to a 34% corporate tax rate.

- a. What is the value of Strider Publishing?
- b. If Strider issues \$600,000 of debt and uses the proceeds to repurchase stock, what will the value of the firm be?
- c. Explain any difference in your answers to (a) and (b).