

Capital Structure

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Advanced Financial Management

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Course Structure

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Key takeaways

Understand how to incorporate the value of new projects in the value of the firm.

02 Understand capital structure irrelevance under the assumptions of Modgliani and Miller model, and impact on returns of shareholders when debt is used to finance the firm's activities (propositions I and II).

O Recognize the impacts on firm value of the capital structures when allowing for corporate taxes.

1 Value the firm and projects undertaken by the firm with different capital structures.



NPV and the value of the firm

What is the effect on the market value balance sheet?



When the project is announced, the value of the firm immediately **increases by the amount of the NPV** (in an efficient market).



Then the firm issues shares (equity) to finance to project and invests.



The final value of the firm will have increased by the PV(CFs generated by the project).



Modigliani and Miller (MM) showed that:

Leverage does not affect the total value of the firm

under a set of conditions referred to as perfect capital markets:

- Investors and firms can trade the same set of securities at competitive market prices equal to the present value of their future cash flows.
- There are no taxes, transaction costs, or issuance costs associated with security trading.
- A firm's financing decisions do not change the cash flows generated by its investments, nor do they reveal new information about them.



Miller 1997

It's after the ball game, and the pizza man comes up to Yogi Berra and he says:

- Yogi, how do you want me to cut this pizza, into quarters?

Yogi says:

- No, cut it into eight pieces. I'm feeling hungry tonight."





Yogi Berra (1925 - 2015): American professional baseball catcher, who later took on the roles of manager, and coach. Famous for his amusing quotes.

Yogi Bear (1958 -): Bear that loves to steal "pic-a-nic baskets" from the tourists at Jellystone.



Exercise I

Consider two firms, With and Without, that have identical assets that generate identical cash flows. Without is an all-equity firm, with 1 million shares outstanding that trade for a price of \$24 per share. With has 2 million shares outstanding and \$12 million dollars in debt at an interest rate of 5%.

Assume that MM's perfect capital market conditions are met and that you can borrow and lend at the same 5% rate as With. You have \$5000 of your own money to invest and you plan on buying Without stock. Using homemade leverage you borrow enough in your margin account so that the payoff of your margined purchase of Without stock will be the same as a \$5000 investment in With stock.

Firm	Number of shares (mill)	Equity value (mill)	Debt value (mill)
Without	1	24	0
With	2		12

- a) What is the equity value of With
- b) How many shares of Without stock should you buy to replicate the \$5000 investment in With

MM Proposition II and WACC

- The red line depicts Proposition II: as D/E rises the return on equity will go up (and so will risk).
- The blue line is the return on assets which is equal to WACC:

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

 Notice that this is the same for all levels of D/E. This is because leverage does not affect the value of the firm.





Exercise II

Firm A and Firm B have identical cash flows. Firm A has a debt-to-equity ratio equal to 1 and Firm B has a debt-to-equity ratio equal to 2. Using bond and equity data for firm A, we know that the equity beta is 2 and the debt beta is 1. Unfortunately, Firm B's debt is not traded so we only know that the equity beta equals 2.3. The risk-free rate equals 5% and the market premium equals 3%.

- a) What is the asset beta (or unlevered beta) of Firm A
- b) What is the unlevered beta of Firm B
- c) What is the expected return on Firm B's debt



MM with taxes

- Income to the firm increases when the firm has debt.
- The increase in income is equal to the Interest Tax Shield = Interest . t

	Distribution of EBIT between parties				
Parties	No debt	With debt			
Stakeholders of the firm					
(1) Shareholders	EBIT(1 – t)	(EBIT – Interest)(1 – t)			
(2) Debtholders	0	Interest			
<u>Government</u>	EBIT.t	(EBIT – Interest) . t			
Total to the firm (1) + (2)	EBIT(1 – t)	EBIT(1 – t) + Interest . t			



Valuing the Interest Tax Shield (ITS)

$$V_L = V_U + PV(ITS)$$



Weighted average costs of capital and MM II

After-tax WACC

- The opportunity cost of debt is now r_D (1-t) due to the interest tax shield
- Then the weighted average cost of capital becomes:

$$r_{WACC}^{after-tax} = rac{D}{E+D}r_D(1-t) + rac{E}{E+D}r_E$$

MM Proposition II

Depends on the assumption about beta if ITS.

• If $\beta_{ITS} = \beta_D$ (when Debt is constant and permanent or low).

$$r_E = r_A + \frac{D}{E}(1-t)(r_A - r_D)$$

• If $\beta_{ITS} = \beta_A$ (when the firm is growing and/or maintains D/E constant)

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





Valuing ITS and WACC

From MM Proposition I:

$V_L = V_U + PV(ITS)$

- This is a general result under the MM assumptions with taxes
- We compute the value of the firm as if the firm is all-equity financed (as we have done so far)
- Then we add the PV value of the interest tax shield
- An alternative approach to compute V_L can be used if:
 - Taxes are the only deviation from MM
 - The firm continuously rebalances its leverage to a target ratio, D/(E+D)

$$V_L = \frac{FCF_1}{r_{WACC}^{after-tax}}$$
The value of the ITS is
automatically incorporated
by discounting using the
after tax WACC



Exercise 3

Your firm currently has \$250 million in outstanding debt with an 8% interest rate (APR=EAR). Suppose that the marginal corporate tax rate is 35% and that the interest tax shields have the same risk as the loan (use 85 as discount rate). What is the present value of the interest tax shields from this debt? Compute it for three different repayment options

- The firm pays the whole loan balance plus interest in two years.
- The firm pays just interest on the loan for 5 years and then pays the remaining balance.
- The terms of the loan require the firm to repay \$50 million of the balance each year.



Exercise 4

Firm Omicron has 1 million shares outstanding with a market price of \$1 per share and no debt. Firm Omicron's EBIT next year will be 0.3 million and it will decrease by 10% every year. Firm Omicron pays a 40% tax rate. Management plans to borrow \$1 million on a permanent basis through a leveraged recapitalization in which they would use the borrowed funds to repurchase outstanding shares. The cost of this new debt is 20%, which equals the risk-free rate and the discount rate used for the ITS. Debt payments are constant over the years.

- a) Compute the debt-to-value ratio after the recap.
- b) Compute the year after which Omicron cannot deduct the whole interest payments
- c) Calculate Firm Omicron's value after the recapitalization.