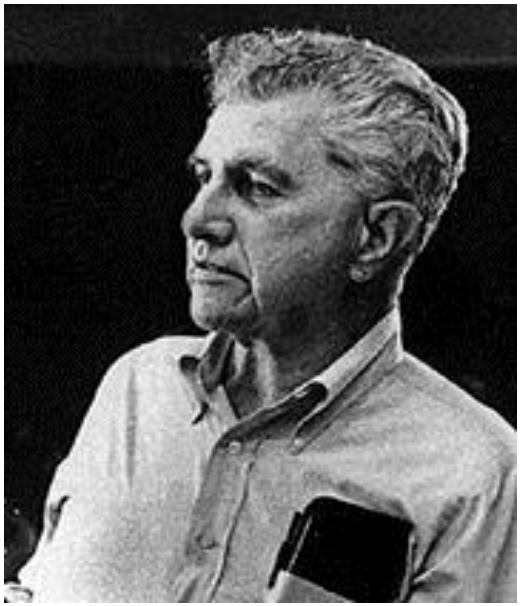
Capital Structure in Perfect Market

Outline

- Equity versus Debt Financing
- Modigliani-Miller I: Leverage, Arbitrage, and Firm Value
- Modigliani-Miller II: Leverage, Risk, and the Cost of Capital

MM

- Nobel Prize laureates： Franco Modigliani and Merton Miller



Equity Versus Debt Financing

- Capital Structure
  - The relative proportions of debt, equity, and other securities that a firm has outstanding
- Financing a Firm with Equity
- Financing a Firm with Debt and Equity

The Project Cash Flows

Date 0	Date 1	
	Strong Economy	Weak Economy
−$800	$1400	$900

The cost of capital for this project is 15%. What is the NPV of this investment opportunity?

The Project Cash Flows

- The expected cash flow in one year is:
  - ½($1400) + ½($900) = $1150.
- The NPV of the project is:

$$NPV = -\$800 + \frac{\$1150}{1.15} = -\$800 + \$1000 = \$200$$

Financing a Firm with Equity

- Unlevered Equity
  - Equity in a firm with no debt
- If you finance this project using only equity, how much would you be willing to pay for the project?

$$PV(\text{equity cash flows}) = \frac{\$1150}{1.15} = \$1000$$

TABLE 14.2 Cash Flows and Returns for Unlevered Equity

	Date 0	Date 1: Cash Flows		Date 1: Returns	
	Initial Value	Strong Economy	Weak Economy	Strong Economy	Weak Economy
Unlevered equity	$1000	$1400	$900	40%	−10%

Financing a Firm with Debt and Equity

TABLE 14.3 **Values and Cash Flows for Debt and Equity of the Levered Firm**

	Date 0	Date 1: Cash Flows	
	Initial Value	Strong Economy	Weak Economy
Debt	$500	$525	$525
Levered equity	$E = ?$	$875	$375
Firm	$1000	$1400	$900

What price *E* should the levered equity sell for?

Financing a Firm with Debt and Equity

- Because the cash flows of the debt and equity sum to the cash flows of the project, by the Law of One Price the combined values of debt and equity must be $1000.
  - Therefore, if the value of the debt is $500, the value of the levered equity must be $500.
    - E = $1000 – $500 = $500.

Which is the best capital structure choice?

	Date 0	Date 1: Cash Flows		Date 1: Returns	
	Initial Value	Strong Economy	Weak Economy	Strong Economy	Weak Economy
Unlevered equity	$1000	$1400	$900	40%	−10%

	Date 0	Date 1: Cash Flows	
	Initial Value	Strong Economy	Weak Economy
Debt	$500	$525	$525
Levered equity	$E = ?$	$875	$375
Firm	$1000	$1400	$900

Which is the best capital structure choice?

- You would be indifferent between these two choices for the firm's capital structure.
- Modigliani and Miller argued that with perfect capital markets, the total value of a firm should not depend on its capital structure.

The Effect of Leverage on Risk and Return

TABLE 14.4 **Returns to Equity with and without Leverage**

	Date 0	Date 1: Cash Flows		Date 1: Returns		
	Initial Value	Strong Economy	Weak Economy	Strong Economy	Weak Economy	Expected Return
Debt	$500	$525	$525	5%	5%	**5%**
Levered equity	$500	$875	$375	75%	−25%	**25%**
Unlevered equity	$1000	$1400	$900	40%	−10%	**15%**

TABLE 14.5 **Systematic Risk and Risk Premiums for Debt, Unlevered Equity, and Levered Equity**

	Return Sensitivity (Systematic Risk)	Risk Premium
	$\Delta R = R(\text{strong}) - R(\text{weak})$	$E[R] - r_f$
Debt	5% − 5% = 0%	5% − 5% = 0%
Unlevered equity	40% − (−10%) = 50%	15% − 5% = 10%
Levered equity	75% − (−25%) = 100%	25% − 5% = 20%

The Effect of Leverage on Risk and Return

- In summary:
  - If the firm is 100% equity financed, the equity holders will require a 15% expected return.
  - If the firm is financed 50% with debt and 50% with equity, the debt holders will receive a return of 5%, while the levered equity holders will require an expected return of 25% (because of their increased risk).
  - *Leverage increases the risk of equity.*

Example

Leverage and the Equity Cost of Capital

Problem

Suppose the entrepreneur borrows only $200 when financing the project. According to Modigliani and Miller, what should the value of the equity be? What is the expected return?

	Date 0	Date 1: Cash Flows	
	Initial Value	Strong Economy	Weak Economy
Debt	200	210	210
Levered equity	$E = ?$	1190	690
Firm	$1000	$1400	$900

Example

Solution

Because the value of the firm's total cash flows is still \$1000, if the firm borrows \$200, its equity will be worth \$800. The firm will owe \$200 × 1.05 = \$210 in one year. Thus, if the economy is strong, equity holders will receive \$1400 − \$210 = \$1190, for a return of \$1190 / \$800 − 1 = 48.75%. If the economy is weak, equity holders will receive \$900 − \$210 = \$690, for a return of \$690 / \$800 − 1 = −13.75%. The equity has an expected return of $\frac{1}{2}(48.75\%) + \frac{1}{2}(-13.75\%) = 17.5\%$.

Note that the equity has a return sensitivity of 48.75% − (−13.75%) = 62.5%, which is 62.5% / 50% = 125% of the sensitivity of unlevered equity. Its risk premium is 17.5% − 5% = 12.5%, which is also 125% of the risk premium of the unlevered equity, so it is appropriate compensation for the risk.

Modigliani-Miller I (MM第一定理)

- Leverage will not affect the total value of the firm given the Law of One Price.
  - It merely changes the allocation of cash flows between debt and equity, without altering the total cash flows of the firm.

Modigliani-Miller I (MM第一定理)

- Modigliani and Miller (MM) showed that this result holds under 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.

Modigliani-Miller I (MM第一定理)

- MM Proposition I:
  - *In a perfect capital market, the total value of a firm is equal to the market value of the total cash flows generated by its assets and is not affected by its choice of capital structure.*

Homemade Leverage(自制杠杆)

- Homemade Leverage
  - When investors use leverage in their own portfolios to adjust the leverage choice made by the firm.
- MM demonstrated that if investors would prefer an alternative capital structure to the one the firm has chosen, investors can borrow or lend on their own and achieve the same result.

Homemade Leverage(自制杠杆)

- Assume you use no leverage and create an all-equity firm.
  - An investor who would prefer to hold levered equity can do so by using leverage in his own portfolio.

Homemade Leverage(自制杠杆)

TABLE 14.6 **Replicating Levered Equity Using Homemade Leverage**

	Date 0	Date 1: Cash Flows	
	Initial Cost	Strong Economy	Weak Economy
Unlevered equity	$1000	$1400	$900
Margin loan	−$500	−$525	−$525
Levered equity	$500	$875	$375

Homemade Leverage(自制杠杆)

TABLE 14.7 **Replicating Unlevered Equity by Holding Debt and Equity**

	Date 0	Date 1: Cash Flows	
	Initial Cost	Strong Economy	Weak Economy
Debt	$500	$525	$525
Levered equity	$500	$875	$375
Unlevered equity	$1000	$1400	$900

Homemade Leverage(自制杠杆)

- In each case, your choice of capital structure does not affect the opportunities available to investors.
  - Investors can alter the leverage choice of the firm to suit their personal tastes either by adding more leverage or by reducing leverage.
  - With perfect capital markets, different choices of capital structure offer no benefit to investors and does not affect the value of the firm.

Example

Homemade Leverage and Arbitrage

Problem

Suppose there are two firms, each with date 1 cash flows of $1400 or $900 (as in Table 14.1). The firms are identical except for their capital structure. One firm is unlevered, and its equity has a market value of $990. The other firm has borrowed $500, and its equity has a market value of $510. Does MM Proposition I hold? What arbitrage opportunity is available using homemade leverage?

	Date 0	Date 1: Cash Flows	
	Cash Flow	**Strong Economy**	**Weak Economy**
Borrow	$500	−$525	−$525
Buy unlevered equity	−$990	$1400	$900
Sell levered equity	$510	−$875	−$375
Total cash flow	$20	$0	$0

Modigliani-Miller II: Leverage, Risk, and the Cost of Capital

- Leverage and the Equity Cost of Capital
- Weighted Average Cost of Capital (WACC)
- Levered and Unlevered Betas

Modigliani-Miller II:MM第二定理

- Leverage and the Equity Cost of Capital
  - E: Market value of equity in a levered firm.
  - D: Market value of debt in a levered firm.
  - U: Market value of equity in an unlevered firm.
  - A: Market value of the firm's assets.

Modigliani-Miller II:MM第二定理

- Leverage and the Equity Cost of Capital
  - MM Proposition I states that:

$$E + D = A = U$$

    - The total market value of the firm's securities is equal to the market value of its assets, whether the firm is unlevered or levered.

Modigliani-Miller II:MM第二定理

- Leverage and the Equity Cost of Capital
  - The return on unlevered equity (R_U) is related to the returns of levered equity (R_E) and debt (R_D):

$$\frac{E}{E+D}R_E + \frac{D}{E+D}R_D = R_U$$

$$R_E = \underbrace{R_U}_{\text{Risk without leverage}} + \underbrace{\frac{D}{E}(R_U - R_D)}_{\text{Additional risk due to leverage}}$$

Modigliani-Miller II:MM第二定理

$$R_E = \underbrace{R_U}_{\text{Risk without leverage}} + \underbrace{\frac{D}{E}(R_U - R_D)}_{\text{Additional risk due to leverage}}$$

The levered equity return equals the unlevered return, plus a premium due to leverage.

The amount of the premium depends on the amount of leverage, measured by the firm's market value debt-equity ratio, D/E.

Modigliani-Miller II:MM第二定理

MM Proposition II:

- *The cost of capital of levered equity is equal to the cost of capital of unlevered equity plus a premium that is proportional to the market value debt-equity ratio.*
- Cost of Capital of Levered Equity

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

Modigliani-Miller II:MM第二定理

- Leverage and the Equity Cost of Capital
  - Recall from above:
    - If the firm is all-equity financed, the expected return on unlevered equity is 15%.
    - If the firm is financed with $500 of debt, the expected return of the debt is 5%.

$$r_E = 15\% + \frac{500}{500}(15\% - 5\%) = 25\%$$

Example

Problem

Suppose the entrepreneur of Section 14.1 borrows only $200 when financing the project. According to MM Proposition II, what will the firm's equity cost of capital be?

Solution

Because the firm's assets have a market value of $1000, by MM Proposition I the equity will have a market value of $800. Then, using Eq. 14.5,

$$r_E = 15\% + \frac{200}{800}(15\% - 5\%) = 17.5\%$$

This result matches the expected return calculated in Example 14.1.

Modigliani-Miller II:MM第二定理

- If a firm is unlevered, all of the free cash flows generated by its assets are paid out to its equity holders.
  - The market value, risk, and cost of capital for the firm's assets and its equity coincide and, therefore:

$$r_U = r_A$$

Modigliani-Miller II:MM第二定理

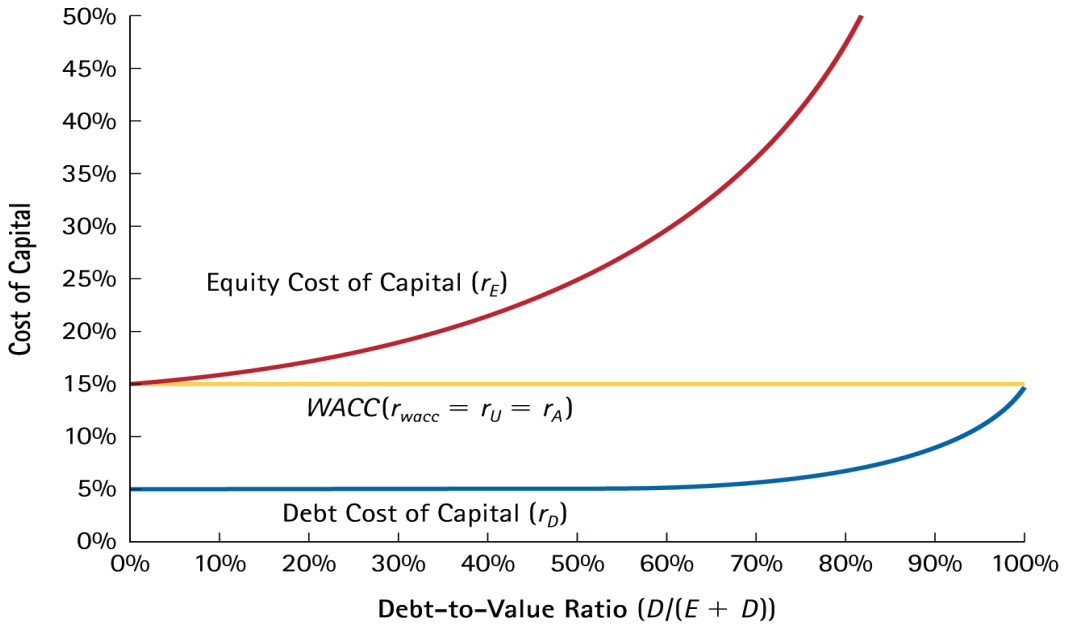
- If a firm is levered, project r_A is equal to the firm's weighted average cost of capital.
  - Weighted Average Cost of Capital (No Taxes)

$$r_{wacc} \equiv \begin{pmatrix}\text{Fraction of Firm Value}\\ \text{Financed by Equity}\end{pmatrix}\begin{pmatrix}\text{Equity}\\ \text{Cost of Capital}\end{pmatrix} + \begin{pmatrix}\text{Fraction of Firm Value}\\ \text{Financed by Debt}\end{pmatrix}\begin{pmatrix}\text{Debt}\\ \text{Cost of Capital}\end{pmatrix}$$

$$= \frac{E}{E+D} r_E + \frac{D}{E+D} r_D$$

$$r_{wacc} = r_A = r_U$$

完美资本市场中的WACC与财务杠杆



(a) Equity, debt and weighted average costs of capital for different amounts of leverage. The rate of increase of r_D and r_E, and thus the shape of the curves, depends on the characteristics of the firm's cash flows.

E	D	r_E	r_D	$\frac{E}{E+D} r_E + \frac{D}{E+D} r_D$	$= r_{wacc}$
1000	0	15.0%	5.0%	$1.0 \times 15.0\% + 0.0 \times 5.0\%$	$= 15\%$
800	200	17.5%	5.0%	$0.8 \times 17.5\% + 0.2 \times 5.0\%$	$= 15\%$
500	500	25.0%	5.0%	$0.5 \times 25.0\% + 0.5 \times 5.0\%$	$= 15\%$
100	900	75.0%	8.3%	$0.1 \times 75.0\% + 0.9 \times 8.3\%$	$= 15\%$

(b) Calculating the WACC for alternative capital structures. Data in this table correspond to the example in Section 14.1.

Example

Problem

The El Paso Corporation (EP) is a natural gas firm with a market debt-equity ratio of 2. Suppose its current debt cost of capital is 6%, and its equity cost of capital is 12%. Suppose also that if EP issues equity and uses the proceeds to repay its debt and reduce its debt-equity ratio to 1, it will lower its debt cost of capital to 5.5%. With perfect capital markets, what effect will this transaction have on EP's equity cost of capital and WACC?

Example

Solution

We can calculate EP's initial WACC using Eq. 14.7:

$$r_{wacc} = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D = \frac{1}{1+2}(12\%) + \frac{2}{1+2}(6\%) = 8\%$$

With perfect capital markets, EP's WACC will be unchanged by a change in its capital structure. Thus EP's unlevered cost of capital $r_U = 8\%$. We can then use Eq. 14.5 to calculate EP's equity cost of capital after the reduction in leverage:

$$r_E = r_U + \frac{D}{E}(r_U - r_D) = 8\% + \frac{1}{1}(8\% - 5.5\%) = 10.5\%$$

The reduction in leverage will cause EP's equity cost of capital to fall to 10.5%. With perfect capital markets, EP's WACC remains unchanged at $8\% = \frac{1}{2}(10.5\%) + \frac{1}{2}(5.5\%)$, and there is no net gain from this transaction.

Computing the WACC with Multiple Securities

- If the firm's capital structure is made up of multiple securities, then the WACC is calculated by computing the weighted average cost of capital of all of the firm's securities.

Computing the WACC with Multiple Securities

Valuing Equity When There Are Multiple Securities

Problem

Suppose our entrepreneur decides to sell the firm by splitting it into three securities: equity, $500 of debt, and a third security called a warrant that pays $210 when the firm's cash flows are high and nothing when the cash flows are low. Suppose that this third security is fairly priced at $60. What will the value of the equity be in a perfect capital market?

Solution

According to MM Proposition I, the total value of all securities issued should equal the value of the assets of the firm, which is $1000. Because the debt is worth $500 and the new security is worth $60, the value of the equity must be $440. (You can check this result by verifying that at this price, equity has a risk premium commensurate with its risk in comparison with the securities in Table 14.5.)

WACC with Multiple Securities

Problem

Compute the WACC for the entrepreneur's project with the capital structure described in Example 14.3.

Solution

Because the firm has three securities in its capital structure (debt, equity, and the warrant), its weighted average cost of capital is the average return it must pay these three groups of investors:

$$r_{wacc} = \frac{E}{E+D+W} r_E + \frac{D}{E+D+W} r_D + \frac{W}{E+D+W} r_W$$

From Example 14.3, we know $E = 440$, $D = 500$, and $W = 60$. What are the expected returns for each security? Given the cash flows of the firm, the debt is risk free and has an expected return of $r_D = 5\%$. The warrant has an expected payoff of $\frac{1}{2}(\$210) + \frac{1}{2}(\$0) = \$105$, so its expected return is $r_w = \$105 / \$60 - 1 = 75\%$. Equity has a payoff of $(\$1400 - \$525 - \$210) = \$665$ when cash flows are high and $(\$900 - \$525) = \$375$ when cash flows are low; thus its expected payoff is $\frac{1}{2}(\$665) + \frac{1}{2}(\$375) = \$520$. The expected return for equity is then $r_E = \$520 / \$440 - 1 = 18.18\%$. We can now compute the WACC:

$$WACC = \frac{\$440}{\$1000}(18.18\%) + \frac{\$500}{\$1000}(5\%) + \frac{\$60}{\$1000}(75\%) = 15\%$$

Once again, the WACC is equal to the firm's unlevered cost of capital of 15%.

Levered and Unlevered Betas

- The effect of leverage on the risk of a firm's securities can also be expressed in terms of beta:

$$R_U = \frac{E}{E+D} R_E + \frac{D}{E+D} R_D$$

$$\beta_U = \frac{E}{E+D} \beta_E + \frac{D}{E+D} \beta_D$$

Levered and Unlevered Betas

$$\beta_U = \frac{E}{E + D}\beta_E + \frac{D}{E + D}\beta_D$$

$$\beta_E = \beta_U + \frac{D}{E}(\beta_U - \beta_D)$$

$$\beta_E = \beta_U + \frac{D}{E}\beta_U = (1 + \frac{D}{E})\beta_U$$

- Leverage amplifies the market risk of a firm's assets, β_U, raising the market risk of its equity.

Example

Airline Betas

Problem

Estimates of equity betas and market debt-equity ratios for several airline stocks in the fall of 2005 are shown below:

Ticker	Name	Equity Beta	Debt-Equity Ratio	Debt Beta
LUV	Southwest Airlines Co.	1.13	0.15	0.00
ALK	Alaska Air Group, Inc.	1.80	1.06	0.15
SKYW	SkyWest, Inc.	1.69	1.05	0.15
MESA	Mesa Air Group, Inc.	3.27	3.52	0.30
CAL	Continental Airlines, Inc.	3.76	5.59	0.40

Do the large differences in the equity betas of these firms reflect large differences in the market risk of their operations? What approximate beta would you use to evaluate projects in the airline industry?

Example

Solution

The market risk of equity is amplified by the firm's leverage. To assess the market risk of the airlines' operations, we should consider their unlevered betas, which we compute using Eq. 14.9:

Ticker	β_E	$E/(E+D)$	β_D	$D/(E+D)$	β_U
LUV	1.13	87%	0.00	13%	0.98
ALK	1.80	49%	0.15	51%	0.96
SKYW	1.69	49%	0.15	51%	0.90
MESA	3.27	22%	0.30	78%	0.95
CAL	3.76	15%	0.40	85%	0.90

While the airlines' equity betas vary considerably, their unlevered betas are similar. Thus the differences in the market risk of their equity are primarily due to differences in their capital structures. Based on this data, an unlevered beta in the range of 0.90–0.98 would be a reasonable estimate of the market risk of projects in this industry.

Levered and Unlevered Betas

- Unlevered Beta
  - A measure of the risk of a firm as if it did not have leverage, which is equivalent to the beta of the firm's assets.
- If you are trying to estimate the unlevered beta for an investment project, you should base your estimate on the unlevered betas of firms with comparable investments.

Cash and Net Debt

- Holding cash has the opposite effect of leverage on risk and return and can be viewed as equivalent to negative debt.

$$\text{Net Debt} = \text{Debt} - \text{Cash and Risk-Free Securities}$$

Cash and Net Debt

Cash and Beta

Problem

In mid-2005, Cisco Systems had no debt, total equity capitalization of $110 billion, and a beta of 2.2. Included in Cisco's assets was $16 billion in cash and risk-free securities. What was the market value of Cisco's business assets excluding its cash—that is, its enterprise value—at this time, and what was the beta of these business assets?

Cash and Net Debt

Solution

Because Cisco had no debt and \$16 billion in cash, Cisco's net debt = 0 − \$16 billion = −\$16 billion. Its enterprise value was therefore \$110 billion − \$16 billion = \$94 billion. To determine the beta of its business assets, we can apply Eq. 14.9 to compute Cisco's unlevered beta (using the fact that because Cisco's cash is risk free, its net debt has a beta of 0):

$$\begin{aligned}\beta_U &= \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D \\ &= \frac{110}{110-16}(2.20) + \frac{-16}{110-16}(0) \\ &= 2.57\end{aligned}$$

In other words, Cisco's market capitalization consists of business assets worth \$94 billion plus \$16 billion in cash. The business assets have a beta of 2.57. Because the cash has a beta of 0, Cisco's equity has lower market risk than its business assets, with a beta of 2.20. To check this result, note that the portfolio of Cisco's business assets plus its cash has a beta of (94 / 110)(2.57) + (16 / 110)(0) = 2.20.

Capital Structure Fallacies

- Leverage and Earnings per Share
  - Leverage can increase a firm's expected earnings per share. Thus leverage should also increase the firm's stock price.

- Equity Issuances and Dilution
  - Issuing equity will dilute existing shareholders' ownership, so debt financing should be used instead

Example

LVI is currently an all-equity firm. It expects to generate earnings before interest and taxes (EBIT) of $10 million over the next year. Currently, LVI has 10 million shares outstanding, and its stock is trading for a price of $7.50 per share. LVI is considering changing its capital structure by borrowing $15 million at an interest rate of 8% and using the proceeds to repurchase 2 million shares at $7.50 per share.

Example

Suppose LVI has no debt. Since there is no interest and no taxes, LVI's earnings would equal its EBIT and LVI's earnings per share without leverage would be:

$$EPS = \frac{\text{Earnings}}{\text{Number of Shares}} = \frac{\$10 \text{ million}}{10 \text{ million}} = \$1$$

Example

- If LVI recapitalizes, the new debt will obligate LVI to make interest payments each year of $1.2 million/year.
  - $15 million × 8% = $1.2 million
- As a result, LVI will have expected earnings after interest of $8.8 million.
  - Earnings = EBIT – Interest
  - Earnings = $10 million – $1.2 million = $8.8 million
- Earnings per share rises to $1.10
  - $8.8 million ÷ $8 million shares = $1.10
- LVI's expected earnings per share increases with leverage.

Example

- Are shareholders better off?
  - NO! Although LVI's expected EPS rises with leverage, the risk of its EPS also increases. While EPS increases on average, this increase is necessary to compensate shareholders for the additional risk they are taking, so LVI's share price does not increase as a result of the transaction.

Example

The MM Propositions and Earnings per Share

Problem

Assume that LVI's EBIT is not expected to grow in the future and that all earnings are paid as dividends. Use MM Propositions I and II to show that the increase in expected EPS for LVI will not lead to an increase in the share price.

Example

Solution

Without leverage, expected earnings per share and therefore dividends are \$1 each year, and the share price is \$7.50. Let r_U be LVI's cost of capital without leverage. Then we can value LVI as a perpetuity:

$$P = 7.50 = \frac{Div}{r_U} = \frac{EPS}{r_U} = \frac{1.00}{r_U}$$

Therefore, LVI's current share price implies $r_U = 1/7.50 = 13.33\%$.

The market value of LVI stock without leverage is \$7.50 per share $\times$ 10 million shares = \$75 million. If LVI uses debt to repurchase \$15 million worth of the firm's equity (that is, 2 million shares), then the remaining equity will be worth \$75 million $-$ \$15 million = \$60 million according to MM Proposition I. After the transaction, LVI's debt-equity ratio is \$15 million $\div$ \$60 million $= \frac{1}{4}$. Using MM Proposition II, LVI's equity cost of capital with leverage will be

$$r_E = r_U + \frac{D}{E}(r_U - r_D) = 13.33\% + \frac{1}{4}(13.33\% - 8\%) = 14.66\%$$

Given that expected EPS is now \$1.10 per share, the new value of the shares equals

$$P = \frac{1.10}{r_E} = \frac{1.10}{14.66\%} = 7.50 \text{ per share}$$

Thus, even though EPS is higher, due to the additional risk, shareholders will demand a higher return. These effects cancel out, so the price per share is unchanged.

Equity Issuances and Dilution

- Dilution
  - An increase in the total of shares that will divide a fixed amount of earnings
- It is sometimes (incorrectly) argued that issuing equity will dilute existing shareholders' ownership, so debt financing should be used instead

Example

- Suppose Jet Sky Airlines (JSA) currently has no debt and 500 million shares of stock outstanding, currently trading at a price of $16.
- Last month the firm announced that it would expand and the expansion will require the purchase of $1 billion of new planes, which will be financed by issuing new equity.

Example

- The current (prior to the issue) value of the the equity and the assets of the firm is $8 billion.
  - 500 million shares × $16 per share = $8 billion
- Suppose JSA sells 62.5 million new shares at the current price of $16 per share to raise the additional $1 billion needed to purchase the planes.

Example

Assets ($ million)	Before Equity Issue	After Equity Issue
Cash		1000
Existing assets	8000	8000
	8000	9000
Shares outstanding (million)	500	562.5
Value per share	$16.00	$16.00

Example

- Results:
  - The market value of JSA's assets grows because of the additional $1 billion in cash the firm has raised.
  - The number of shares increases.
    - Although the number of shares has grown to 562.5 million, the value per share is unchanged at $16 per share.

Equity Issuances and Dilution

- As long as the firm sells the new shares of equity *at a fair price*, there will be no gain or loss to shareholders associated with the equity issue itself.
- Any gain or loss associated with the transaction will result from the NPV of the investments the firm makes with the funds raised.

MM: Beyond the Propositions

- Conservation of Value Principle for Financial Markets
  - *With perfect capital markets, financial transactions neither add nor destroy value, but instead represent a repackaging of risk (and therefore return).*

Summary and Conclusions

MM第一定理

$$E + D = A = U$$

MM第二定理

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

$$r_{wacc} = r_U = r_A$$