

Chapter 16

Debt-Equity Mix

1. Divido Corporation is an all-equity financed firm with a total market value of \$100 million. The company holds \$10 million in cash-equivalents and has \$90 million in other assets. There are 1,000,000 shares of Divido common stock outstanding, each with a market price of \$100. Divido Corporation has decided to issue \$20 million of bonds and to repurchase \$20 million worth of its stock.

- a. What will be the impact on the price of its shares and on the wealth of its shareholders? Why?
- b. Assume that Divido's EBIT has an equal probability of being \$20 million, or \$12 million, or \$4million. Show the impact of the financial restructuring on the probability distribution of earnings per share in the absence of taxes. Why does the fact that the equity becomes riskier not necessarily affect shareholder wealth?

SOLUTION:

- a. In an M&M frictionless environment, where there are no taxes and contracts are costless to make and enforce, the wealth of shareholders is the same no matter what capital structure the firm adopts. In such an environment, neither the stock price nor shareholders' wealth would be affected. In the real world Divido's management might be able to create shareholder value by issuing debt and repurchasing shares in two ways:

By reducing tax costs

By reducing the free cash flow available to management and exposing itself to greater market discipline.

- b. The formula for *EPS without* debt is:

$$EPS_{all\ equity} = \frac{EBIT}{1,000,000\ shares}$$

The interest payments will be \$1.2 million per year (.06 x \$20 million) regardless of the realized value of *EBIT*. The number of shares outstanding after exchanging debt for equity will be 800,000. *EPS with* debt is therefore:

$$EPS_{with\ debt} = \frac{Net\ Earnings}{800,000\ shares} = \frac{EBIT - \$1.2\ million}{800,000\ shares}$$

Probability Distribution of Divido's *EBIT* and *EPS*

<i>State of the Economy</i>	<i>EBIT</i>	<i>All equity financing</i>	<i>With \$20 million of debt</i>	
		<i>EPS</i> (1 million shares)	<i>Net Earnings</i>	<i>EPS</i> (800,000 shares)
Bad business	\$4 million	\$4 per share	\$2.8 million	\$3.50 per share
Normal business	12	12	10.8	13.50
Good business	20	20	18.8	23.50
<i>Mean</i>	12	12	10.8	13.50
<i>Standard deviation</i>		\$6.53		\$8.16

Although the shares of stock become riskier with debt financing, the expected earnings per share go up. In a frictionless financial environment, the net effect is to leave the price of the stock unaffected.

Leasing

2. Plentilease and Nolease are virtually identical corporations. The only difference between them is that Plentilease leases most of its plant and equipment whereas Nolease buys its plant and equipment and finances it by borrowing. Compare and contrast their market-value balance sheets.

SOLUTION:

Market-Value Balance Sheets of Nolease and Plentilease Corporations

a. Nolease Corporation

<i>Assets</i>		<i>Liabilities and Shareholders' Equity</i>	
Plant and equipment		Bonds	
Other assets		Equity	
Total		Total	

b. Plentilease Corporation

<i>Assets</i>		<i>Liabilities and Shareholders' Equity</i>	
Plant and equipment		Lease	
Other assets		Equity	
Total		Total	

The main difference between the bonds and the lease as a form of debt financing is who bears the risk associated with the residual market value of the leased asset at the end of the term of the lease. Since Nolease Corporation has bought its equipment, it bears this risk. In Plentilease's case, however, it is the *lessor* that bears this residual-value risk.

Pension Liabilities

3. Europens and Asiapens are virtually identical corporations. The only difference between them is that Europens has a completely unfunded pension plan, and Asiapens has a fully funded pension plan. Compare and contrast their market-value balance sheets. What difference does the funding status of the pension plan make to the stakeholders of these two corporations?

SOLUTION:

Balance Sheets of Asiapens and Europens Corporations

a. Asiapens Balance Sheet

<i>Assets</i>		<i>Liabilities and Shareholders' Equity</i>	
Operating assets: Plant, equipment, etc.		Bonds	
		Pension liability	
Pension assets: stocks, bonds, etc.		Shareholders' Equity	
Total		Total	

b. Europens Balance Sheet

<i>Assets</i>		<i>Liabilities and Shareholders' Equity</i>	
Operating assets: Plant, equipment, etc.		Pension liability	
		Shareholders' Equity	
Total		Total	

Asiapens has funded its pension plan by issuing bonds and investing the funds raised in a segregated pool of pension fund assets. These pension assets take the form of a diversified portfolio of stocks and bonds issued by other companies and serve as collateral for the pension benefits promised by Asiapens to its employees. In the case of Europens, there is no segregated pool of pension assets. The pension promises of Europens are backed by the assets of the company itself. Therefore, the employees of Asiapens are more secure about receiving their promised pension benefits, since the benefits are collateralized by a more diversified portfolio of assets. In the case of both companies, however, any unfunded pension liability reduces shareholders equity.

4. Comfort Shoe Company of England has decided to spin off its Tango Dance Shoe Division as a separate corporation in the United States. The assets of the Tango Dance Shoe Division have the same operating risk characteristics as those of Comfort. The capital structure of Comfort has been 40% debt and 60% equity in terms of market values, and is considered by management to be optimal. The required return on Comfort's assets (if unlevered) is 16% per year, and the interest rate that the firm (and the division) must currently pay on their debt is 10% per year.

Sales revenue for the Tango Shoe Division is expected to remain indefinitely at last year's level of \$10 million. Variable costs are 55% of sales. Annual depreciation is \$1 million, which is exactly matched each year by new investments. The corporate tax rate is 40%.

- How much is the Tango Shoe Division worth in unlevered form?
- If the Tango Shoe Division is spun off with \$5 million in debt, how much would it be worth?
- What rate of return will the shareholders of the Tango Shoe Division require?
- Show that the market value of the equity of the new firm would be justified by the earnings to the shareholders.

SOLUTION:

- a. The unlevered free cash flow for the Tango Shoe Division would be (in \$millions):

Sales:		\$10.0
Var. Cost:		-5.5
<u>Depreciation</u>	<u>-1.0</u>	
Taxable Income		\$ 3.5
<u>Taxes (@40%)</u>	<u>-1.4</u>	
After-Tax Income		\$2.1
Depreciation		1.0
<u>Investment</u>	<u>-1.0</u>	
Free Cash Flow		\$2.1 million

Unlevered, Tango is worth: $\$2.1 \text{ million} / 0.16 = \13.125 million

- b. If Tango had \$5 million of debt, its total value would be:

Market Value with Debt = Market Value without Debt + PV of Interest Tax Shield

$$V_L = V_U + T \times B \\ = \$13.125 + (.4 \times 5) = \$15.125 \text{ million}$$

$$\text{Tango Equity} = \$15.125 - \$5 = \$10.125 \text{ million}$$

- c. Tango's cost of equity capital would be .1778

$$k_e = k + (1-T)(k - r)D/E = .16 + (1-.4)(.16-.10) \times 5/10.125 = .1778$$

- d. The value of the equity should be the present value of the expected net income discounted at the required rate of return on equity. The expected net income will be the unlevered cash flow less the after-tax cost of the interest of the debt:

$$\$2.1 - (.6)(.1 \times 5) = \$2.1 - \$0.3 = \$1.8 \text{ million per year}$$

$$S = \$1.8 \text{ million} / .1778 = \$10.125 \text{ million}$$

5. Based on the above problem, Suppose that Foxtrot Dance Shoes makes custom designed dance shoes and is a competitor of Tango Dance Shoes. Foxtrot has similar risks and characteristics as Tango except that it is completely unlevered. Fearful that Tango Dance Shoes may try to take over Foxtrot in order to control their niche in the market, Foxtrot decides to lever the firm to buy back stock.

- If there are currently 500,000 shares outstanding, what is the value of Foxtrot's stock?
- How many shares can Foxtrot buy back and at what value if it is willing to borrow 30% of the value of the firm?
- What if it is willing to borrow 40% of the value of the firm?
- Should Foxtrot borrow more?

SOLUTION:

- a. Current price per share: $\$13.125 \text{ million} / .5 \text{ million shares} = \26.25 per share

- b. @30% debt

Amount to borrow: 30% of 13.125 million = \$3.9375 million

PV of Tax Shield = $.4 \times \$3.9375 \text{ million} = \1.575 million

Value of levered firm = $\$13.125 + \$1.575 = \$14.7 \text{ million}$

Value of equity in levered firm = $\$14.7 \text{ million} - \$3.9375 \text{ million} = \10.7625 million

To compute the number of shares Foxtrot can repurchase, we need to know the price per share.

If Foxtrot can repurchase shares at the existing price of \$26.25 then the number of shares retired will be $\$3.9375 \text{ million} / \$26.25 \text{ per share} = .15 \text{ million shares}$. This will leave .35 million shares outstanding, and the price of each share will be $\$10.7625 \text{ million} / .35 \text{ million} = \30.75 .

If the PV of the tax shield gets incorporated in the price of the shares before the repurchase, then the price of the shares will increase by $\$1.575 \text{ million} / .5 \text{ million} = \3.15 . So the price of the repurchased shares will be $\$26.25 + \$3.15 = \$29.40$.

Then the number of shares retired will be $\$3.9375 \text{ million} / \$29.40 \text{ per share} = 133,929 \text{ shares}$. This will leave 366,071 shares outstanding each with a price of \$29.40.

c. @40% debt

Amount to borrow: 40% of \$13.125 million = \$5.25 million

PV of Tax Shield = .4 x \$5.25 million = \$2.1 million

Value of levered firm = \$13.125 + \$2.1 = \$15.225 million

Value of equity in levered firm = \$15.225 million – \$5.25 million = \$9.975 million

If Foxtrot can repurchase shares at the existing price of \$26.25 then the number of shares retired will be \$5.25 million/\$26.25 per share = .2 million shares. This will leave .3 million shares outstanding, and the price of each share will be \$9.975 million/.3 million = \$33.25.

If the PV of the tax shield gets incorporated in the price of the shares before the repurchase, then the price of the shares will increase by \$2.1 million/.5 million = \$4.20. So the price of the repurchased shares will be \$26.25 + \$4.20 = \$30.45.

Then the number of shares retired will be \$5.25million/\$30.45 per share = 172,414 shares. This will leave 327,586 shares outstanding each with a price of \$30.45.

d. Foxtrot's management must trade off the tax savings due to additional debt financing against the costs of financial distress that rise with the degree of debt financing.

6. Hanna-Charles Company needs to add a new fleet of vehicles for their sales force. The purchasing manager has been working with a local car dealership to get the best value for the company dollar. After some negotiations, a local dealer has offered Hanna-Charles two options: 1) a three year lease on the fleet of cars or 2) 15% off the top to purchase outright. Option 2 would cost Hanna-Charles company about 5% less than the lease option in terms of present value.

a. What are the advantages and disadvantages of leasing?

b. Which option should the purchasing manager at Hanna-Charles pursue and why?

SOLUTION:

a. Advantages:

The lessor bears all the residual-value risk

Tax Benefits

No disposal concerns (or resale) when life of equipment is expended.

Disadvantages:

No ownership while maintaining maintenance responsibility

b. Lease or Buy:

Hanna-Charles company should lease. Although they may spend more with the lease, they do not bear the residual-value risk.

7. Havem and Needem companies are exactly the same differing only in their capital structures. Havem is an unlevered firm issuing only stocks whereas Needem issues stocks and bonds. Neither firm pays corporate taxes. Havem pays out all of its yearly earnings in the form of dividends and has 1 million shares outstanding. Its market capitalization rate is 11% and the firm is currently valued at \$180 million. Needem is identical except that 40% of its value is in bonds and has 500,000 shares outstanding. Needem's bonds are risk free and pay a coupon of 9% per year and are rolled over every year.

a. What is the value of Needem's shares?

b. As an investor forecasting the upcoming year, you examine Havem and Needem using three possible states of the economy that are all equally likely: normal, bad, and exceptional. Assuming the earnings will be the same, one half, and one and a half respectively, produce a table that shows the earnings and the earnings per share for both Havem and Needem in all three scenarios.

SOLUTION:

a. Needem has \$72 million in debt and \$108 million in equity. Since there are 500,000 shares, the value of each share is \$216.

b. Expected EBIT = \$180 million x 11% = \$19.8 million per year

Interest expense for Needem = \$72 million x .09 = \$6.48 million per year

State of the Economy	EBIT	Havem	Needem	
		EPS (1 million shares)	Net Earnings ^b	EPS (500,000 shares)
Bad	\$9.9 million	\$9.90/share	\$3.42million	\$6.84/share
Normal	19.8 million	19.80	13.32 million	26.64
Exceptional	29.7 million	29.70	23.22 million	46.44
Mean		19.80		26.64
Std. Dev.		8.08		16.17

^b EBIT – Interest Expense

8. Using the foregoing example, let us now assume that Havem and Needem must pay taxes at the rate of 40% annually. Given the same distribution of possible outcomes as previously:

- a. What are the possible after-tax cash flows for Havem and Needem?
- b. What are the values of the shares?
- c. If one was not risk averse, which company would that person invest in?

SOLUTION:

- a. After-tax $CF_{Havem} = (1 - \text{Tax Rate}) \text{ EBIT} = \text{Net income}$
 $\text{Net income}_{Needem} = (1 - \text{Tax Rate}) (\text{EBIT} - \text{Int. Pmt.})$
 $CF_{Needem} = (1 - \text{Tax Rate}) (\text{EBIT}) + \text{Tax Rate} \times \text{Int. Pmt}$
 $CF_{Needem} (\text{bad}) = (.60) \$9.9 + (.40) \times 6.48 = \8.532 million
 $CF_{Needem} (\text{normal}) = (.60) \$19.8 + (.40) \times 6.48 = \14.472 million
 $CF_{Needem} (\text{except.}) = (.60) \$29.7 + (.40) \times 6.48 = \20.412 million

State of the Economy	Havem	Needem	
	After-Tax Cash Flow	Tax Shield on Debt	After-Tax Cash Flow
Bad	\$5.94 million	\$2.592 million	\$8.532 million
Normal	11.88 million	\$2.592 million	\$14.472 million
Exceptional	17.82 million	\$2.592 million	\$20.412 million

- b. The equity of Havem will be worth $\$11.88 \text{ million} / .11 = \108 million or \$108 per share
 The total value of Needem's debt + equity will be $\$108,000,000 + .4 \times \$72,000,000 = \$136.8 \text{ million}$.
 Needem's equity will be worth $\$136,800,000 - \$72,000,000 = \$64.8 \text{ million}$. Since there are .5 million shares of Needem, each will be worth \$129.60.
- c. Needem.

- 9. The Griffey-Lang Food Company faces a difficult problem. In management's effort to grow the business, they accrued a debt of \$150 million while the value of the company is only \$125 million. Management must come up with a plan to alleviate the situation in one year or face certain bankruptcy. Also upcoming are labor relations meetings with the union to discuss employee benefits and pension funds. Griffey-Lang at this time has three choices they can pursue: 1) Launch a new, relatively untested product that if successful (probability of .12) will allow G-L to increase the value of the company to \$200 million, 2) Sell off two food production plants in an effort to reduce some of the debt and the value of the company thus making it even (.45 probability of success), or do nothing (probability of failure = 1.0).**
- As a creditor, what would you like Griffey-Lang to do, and why?**
 - As an investor?**
 - As an employee?**

SOLUTION:

- As a Creditor:**
Option 2 best suits the creditor. Option 2 allows the creditor to regain some value through the sale of plant and equipment.
- As a shareholder:**
The shareholders have nothing to lose and everything to gain by taking a big chance with the new product.
- As an Employee:**
Selling off two production plants will eliminate jobs. Doing nothing means certain bankruptcy and may result in liquidation of the firm and the loss of all the jobs. For the employees, the best choice is option 1.