Key Concepts and Skills
Understand the effect of financial leverage on cash flows and the cost of equity
Understand the impact of taxes and bankruptcy on capital structure choice
Understand the basic components of the bankruptcy process

Definition of Capital Structure
A firm's capital structure is the relative proportions of debt, equity, and other securities that a firm has outstanding.
Or
How a firm pays for its assets.

The Capital Structure Question
What is the optimal Capital Structure?

Firm Value and Stock Value
The value of the firm equals the market value of the debt plus the market value of the equity (firm value identity). This is just \( V = D + E \). When the market value of debt is given and constant, any change in the value of the firm results in an identical change in the value of the equity. The key to this reasoning lies in the fixed nature of debt and the derivative nature of stock.

Capital Structure and the Cost of Capital
The “optimal” or “target” capital structure is that debt/equity mix that simultaneously (a) maximizes the value of the firm, (b) minimizes the weighted average cost of capital, and (c) maximizes the market value of the common stock.

Maximizing the value of the firm is the goal of managing capital structure.

The Effect of Financial Leverage
The Basics of Financial Leverage
How does leverage affect the EPS and ROE of a firm? When we increase the amount of debt financing, we increase the fixed interest expense. If we have a really good year, then we pay our fixed cost and we have more left over for our stockholders. If we have a really bad year, we still have to pay our fixed costs and we have less left over for our stockholders.

Raven Roost Corporation currently has no debt in its capital structure. The firm is considering issuing debt to buy back some of its equity. Both its current and proposed capital structures are
presented in the following table. The interest rate is 10 percent. We will ignore the effect of taxes at this stage.

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>$5,000,000</td>
<td>$5,000,000</td>
</tr>
<tr>
<td>Debt</td>
<td>$0</td>
<td>$2,500,000</td>
</tr>
<tr>
<td>Equity</td>
<td>$5,000,000</td>
<td>$2,500,000</td>
</tr>
<tr>
<td>Debt/Equity Ratio</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Share Price</td>
<td>$10</td>
<td>$10</td>
</tr>
<tr>
<td>Shares Outstanding</td>
<td>500,000</td>
<td>250,000</td>
</tr>
<tr>
<td>Interest rate</td>
<td>N/A</td>
<td>10%</td>
</tr>
</tbody>
</table>

Current Capital Structure: No Debt

<table>
<thead>
<tr>
<th></th>
<th>Recession</th>
<th>Expected</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>$300,000</td>
<td>$650,000</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Interest</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Income</td>
<td>$300,000</td>
<td>$650,000</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>ROE</td>
<td>6.00%</td>
<td>13.00%</td>
<td>20.00%</td>
</tr>
<tr>
<td>EPS</td>
<td>$0.60</td>
<td>$1.30</td>
<td>$2.00</td>
</tr>
</tbody>
</table>

Proposed Capital Structure: Debt = $2.5 million

<table>
<thead>
<tr>
<th></th>
<th>Recession</th>
<th>Expected</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>$300,000</td>
<td>$650,000</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Interest</td>
<td>250,000</td>
<td>250,000</td>
<td>250,000</td>
</tr>
<tr>
<td>Net Income</td>
<td>$50,000</td>
<td>$400,000</td>
<td>$750,000</td>
</tr>
<tr>
<td>ROE</td>
<td>2.00%</td>
<td>16.00%</td>
<td>30.00%</td>
</tr>
<tr>
<td>EPS</td>
<td>$0.20</td>
<td>$1.60</td>
<td>$3.00</td>
</tr>
</tbody>
</table>

What happens to EPS and ROE when we issue debt and buy back shares of stock?

What happens to the variability of EPS and ROE when we issue debt and buy back shares of stock?

Variability in ROE

Current: ROE ranges from 6% to 20%
Proposed: ROE ranges from 2% to 30%

Variability in EPS

Current: EPS ranges from $0.60 to $2.00

Proposed: EPS ranges from $0.20 to $3.00

The variability in both ROE and EPS increases when financial leverage is increased.

What is the difference between ROE and ROA for an all equity firm given various sales levels? It’s easy to show that ROE = ROA in this case because total equity = total assets. The substitution of debt for equity results in ROE equaling ROA at only one level of sales. The fixed interest expense and lower number of common shares outstanding cause ROE to change by a larger percentage than the change in ROA, for any given change in sales.

Break-Even EBIT

Find EBIT where EPS is the same under both the current and proposed capital structures. If we expect EBIT to be greater than the break-even point, then leverage may be beneficial to our stockholders and if we expect it to be less than the break-even point, then leverage is detrimental to our stockholders.

Break-Even EBIT Example

\[
\frac{EBIT}{500,000} = \frac{EBIT - 250,000}{250,000}
\]

\[
EBIT = \left[ \frac{500,000}{250,000} \right] \times (EBIT - 250,000)
\]

EBIT = \(2 \times EBIT - 500,000\)

EBIT = $500,000

EPS = \(\frac{500,000}{500,000}\) = $1.00

We can conclude that:

The effect of financial leverage depends on EBIT. Financial leverage increases ROE and EPS when EBIT is greater than the cross-over point and decreases ROE and EPS when it is less than the cross-over point.
If a company expects to achieve the break-even EBIT, should it automatically issue debt?

This is a break-even point relative to EBIT and EPS. Beyond this point, EPS will be larger under the debt alternative, but with additional debt, the firm will have additional financial risk that would increase the required return on its common stock. A higher required return might offset the increase in EPS, resulting in a lower firm value despite the higher EPS. The M&M models, described in upcoming sections, will offer key points to make about this relationship.

Corporate Borrowing and Homemade Leverage

Homemade leverage – if all market participants have equal access to the capital markets, there’s nothing special about corporate borrowing.
Homemade Leverage and ROE Example

Suppose Raven Roost does not change its capital structure. An investor can replicate the returns of the proposed borrowing by making her own D/E ratio equal to 1 for the investment. Suppose an investor buys 50 shares with her own money and 50 shares by borrowing $500 at 10% interest. The payoffs are:

<table>
<thead>
<tr>
<th></th>
<th>Recession</th>
<th>Expected</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS – unlevered firm</td>
<td>$0.60</td>
<td>$1.30</td>
<td>$2.00</td>
</tr>
<tr>
<td>Earnings for 100 shares</td>
<td>$60.00</td>
<td>$130.00</td>
<td>$200.00</td>
</tr>
<tr>
<td>Less interest on $500 at 10%</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
</tr>
<tr>
<td>Net earnings</td>
<td>$10.00</td>
<td>$80.00</td>
<td>$150.00</td>
</tr>
<tr>
<td>Return on investment = net earnings / $500</td>
<td>2%</td>
<td>16%</td>
<td>30%</td>
</tr>
</tbody>
</table>

The investor has been able to convert her return to what she would have gotten if the company had undertaken the proposed capital structure and she had just purchased $500 worth of stock.

Suppose instead the firm does switch to the proposed capital structure. An investor can “unlever” the firm by purchasing both the firm’s stock and bonds. Consider an investor who invests $250 in the stock and $250 in the bonds paying 10%. (Note that in both situations, the investor’s total cash outlay is $500.)

<table>
<thead>
<tr>
<th></th>
<th>Recession</th>
<th>Expected</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS – levered firm</td>
<td>$0.20</td>
<td>$1.60</td>
<td>$3.00</td>
</tr>
<tr>
<td>Earnings for 25 shares</td>
<td>5.00</td>
<td>40.00</td>
<td>75.00</td>
</tr>
<tr>
<td>Plus interest on $250 at 10%</td>
<td>25.00</td>
<td>25.00</td>
<td>25.00</td>
</tr>
<tr>
<td>Net earnings</td>
<td>$30.00</td>
<td>$65.00</td>
<td>$100.00</td>
</tr>
<tr>
<td>Return on investment = net earnings / $500</td>
<td>6%</td>
<td>13%</td>
<td>20%</td>
</tr>
</tbody>
</table>

In this case, the investor is able to earn the same return as she would have earned if the firm did not change capital structure and she just invested in stock.
Capital Structure and the Cost of Equity Capital

Modigliani and Miller (MM) developed a theory of Capital Structure. They received the Nobel Prize in Economics in 1990.

The value of the firm is determined by the cash flows to the firm and the risk of the assets.

To change the firm value, you must change the cash flows or the risk.

**MM Proposition I: Examines firm value**

**MM Proposition II: Examines the WACC**

**MM Assumptions:**

Capital markets are frictionless.

Firms and individuals can borrow and lend at the risk-free rate.

There are no costs to bankruptcy.

Firms issue two types of claims: risk-free debt and risky equity.

All firms are assumed to be in the same risk class.

Corporate and personal taxes are zero.

All cash flow streams are perpetuities (i.e., no growth).

Corporate insiders and outsiders have the same information (i.e., no signaling opportunities).

Managers always maximize shareholders’ wealth (i.e., no agency costs).

Why are we even considering a situation in which taxes do not exist? We are trying to determine what risk-return trade-off is best for the firm’s stockholders. One way to get a good understanding of what is relevant to the capital structure decision is to start in a “perfect” world and then relax assumptions as we go. By relaxing one assumption at a time, we can get a better idea of the impact on the capital structure decision. This is the classic process of “model building” in economics – start simple and add complexity one step at a time.
MM Proposition I:

\[ V_U = V_L \]

“The market value of any firm is independent of its capital structure”

or:

“Financial leverage has no effect on shareholders’ wealth.”
MM Proposition 2:

“The rate of return they can expect to receive on their shares increases as the firm’s debt-equity ratio increases.”

\[
\text{WACC} = r_A = (E/V)R_E + (D/V)R_D
\]

\[r_E = r_A + (r_A - r_D) \left( \frac{D}{E} \right)\]

- \(r_E\): cost of equity
- \(r_D\): cost of debt
- \(r_A\): return on assets or cost of equity in an all equity firm (the “cost” of the firm’s business risk, i.e., the risk of the firm’s assets)

\((r_A - r_D)(D/E)\) is the “cost” of the firm’s financial risk, i.e., the additional return required by stockholders to compensate for the risk of leverage.

An alternative explanation is as follows: In the absence of debt, the required return on equity equals the return on the firm’s assets, \(R_A\). As we add debt, we increase the variability of cash flows available to stockholders, thereby increasing stockholder risk.

Business and Financial Risk

The key point is that Proposition II shows that return on equity depends on both business risk and financial risk.
Business risk: The risk inherent in a firm’s operations; it depends on the systematic risk of the firm’s assets and it determines the first component of the required return on equity, $R_A$.

Financial risk: The extra risk to stockholders that results from debt financing; it determines the second component of the required return on equity, $(R_A - R_D)(D/E)$.

Therefore, the systematic risk of the stock depends on:
- Systematic risk of the assets, $\beta_A$, (Business risk)
- Level of leverage, D/E, (Financial risk)

Proposition II suggests that even if a firm could issue risk-free debt, its financial risk would exceed zero. The focus here is on the risk (and required return) to the shareholder. Regardless of the certainty associated with the promised returns to bondholders (default risk), higher levels of debt imply greater volatility of earnings to stockholders.

**Fans Example**

Fans, Inc. is an all-equity firm with 1,000 shares of common stock outstanding. Investors require a 20 percent return on Frodo’s unlevered equity. The company distributes all of its earnings to equity holders as dividends at the end of each year. Fans estimates that its annual earnings before interest and taxes (EBIT) will be $1,000, $2,000, or $4,200 with probabilities of 0.1, 0.4, and 0.5 respectively. The firm’s expectations about earnings will be unchanged in perpetuity. There are no corporate or personal taxes.

What is the value of the firm?

Suppose Fans issues $7,500 of debt at an interest rate of 10 percent and uses the proceeds to repurchase 500 shares of common stock.

What is the new value of the firm?
What is the new value of the firm's equity?

What is the required return on the firm's levered equity?

What is the firm's weighted average cost of capital?
The CAPM, the SML and Proposition II

How does financial leverage affect systematic risk?

CAPM: \( R_A = R_f + \beta_A(R_m - R_f) \)

Where \( \beta_A \) is the firm’s asset beta and measures the systematic risk of the firm’s assets

Proposition II

Replace \( R_A \) in the CAPM equation with the WACC equation and assume that the debt is riskless \( (R_D = R_f) \)

\( R_E = R_f + \beta_A(1+D/E)(R_m - R_f) \)

\( \beta_E = \beta_A(1 + D/E) \)

Therefore, the systematic risk of the stock depends on:

- Systematic risk of the assets, \( \beta_A \) (Business risk)
- Level of leverage, \( D/E \) (Financial risk)

Intuitively, an increase in financial leverage should increase systematic risk since changes in interest rates are a systematic risk factor and will have more impact the higher the financial leverage.

The assumption that debt is riskless is for simplicity and to illustrate that even if debt is default risk-free, it still increases the variability of cash flows to the stockholders, and thus increases the systematic risk.

M&M Propositions I and II with Corporate Taxes

The Interest Tax Shield

Interest is tax deductible

Therefore, when a firm adds debt, it reduces taxes, all else equal

The reduction in taxes increases the cash flow of the firm

Tax savings arise from the deductibility of interest. It is the key benefit from borrowing over issuing equity.

How should an increase in cash flows affect the value of the firm?
### Taxes and M&M Proposition I

<table>
<thead>
<tr>
<th></th>
<th>Unlevered Firm</th>
<th>Levered Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Interest</td>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>Taxable Income</td>
<td>5,000</td>
<td>4,500</td>
</tr>
<tr>
<td>Taxes (34%)</td>
<td>1,700</td>
<td>1,530</td>
</tr>
<tr>
<td>Net Income</td>
<td>3,300</td>
<td>2,970</td>
</tr>
<tr>
<td>CFFA</td>
<td>3,300</td>
<td>3,470</td>
</tr>
</tbody>
</table>

Annual interest tax savings = \( D(R_D)(T_C) \)

If we assume perpetual debt, then the present value of the interest tax savings = \( D(R_D)(T_C) / R_D = DT_C \)

We also assume perpetual cash flows to the firm. This is done for simplicity, but the ultimate result is the same even if you use cash flows that change through time.

Value of an unlevered firm, \( V_U = EBIT(1 - T_C)/R_U \), where \( R_U \) is the cost of capital for an all equity firm.

Value of a levered firm = value of an unlevered firm + PV of interest tax shield

Value of a levered firm, \( V_L = V_U + DT_C \)

The levered firm has 6,250 in 8% debt, interest expense = \( .08(6,250) = 500 \)

Annual tax shield = \( .34(500) = 170 \)

Present value of annual interest tax shield

Assume perpetual debt for simplicity

\( PV = 170 / .08 = 2,125 \)

\( PV = D(R_D)(T_C) / R_D = DT_C = 6,250(.34) = 2,125 \)

The value of the firm increases by the present value of the annual interest tax shield
Value of equity = Value of the firm – Value of debt

$$V_L = V_U + T_c D$$
Taxes, The WACC, and Proposition II

The WACC decreases as D/E increases because of the government subsidy on interest payments

\[ R_A = \frac{E}{V} R_E + \frac{D}{V} (R_D)(1 - T_C) \]

\[ R_E = R_U + (R_U - R_D)(D/E)(1 - T_C) \]

Example

\[ R_U = 12 \quad R_D = 9 \]

\[ D = 75 \quad E = 86.67 \quad T = 35\% \]

\[ R_E = 12 + (12 - 9)(75/86.67)(1 - .35) = 13.69\% \]

\[ R_A = \frac{86.67}{161.67}(13.69) + \frac{75}{161.67}(9)(1 - .35) = 10.05\% \]

Suppose that the firm changes its capital structure so that the debt-to-equity ratio becomes 1.

What will happen to the cost of equity under the new capital structure?

\[ R_E = 12 + (12 - 9)(1)(1 - .35) = 13.95\% \]

What will happen to the weighted average cost of capital?

\[ R_A = .5(13.95) + .5(9)(1 - .35) = 9.9\% \]

Can financing decisions generate positive NPVs? Put simply, a positive NPV decision is one for which the firm obtains something for less than market value. Just as the relative inefficiency of the physical asset markets makes the search for positive NPV projects worthwhile, the efficiency of the financial markets makes positive NPV financing projects unlikely. This can change in the presence of financial market imperfections; and differential tax treatment between MM Proposition 1 with Corporate Taxes: interest and dividends is a big market imperfection. Further discussion of the successes and failures of financial engineering in the last two decades may serve to illustrate the core concepts:

1. firm value comes largely from the asset side of the balance sheet
2. positive NPV financing projects can also be created, but in general, financing is a zero-NPV proposition.
MM Proposition II with Corporate Taxes:

Fans Example (Continued)

Suppose that Fans’s earnings are subject to a corporate tax rate of 40 percent.

Will the presence of corporate taxes increase or decrease the value of the firm? Why?

What is the value of the firm? What is the price of a share of stock?
What is the required return on the firm’s levered equity?

Bankruptcy Costs

Now we add bankruptcy costs

As the D/E ratio increases, the probability of bankruptcy increases

This increased probability will increase the expected bankruptcy costs

At some point, the additional value of the interest tax shield will be offset by the increase in expected bankruptcy cost

At this point, the value of the firm will start to decrease, and the WACC will start to increase as more debt is added

The key disadvantage of the use of debt is bankruptcy costs.

Direct bankruptcy costs are the legal and administrative expenses directly associated with bankruptcy. Generally, these costs are quantifiable and measurable.

Direct Bankruptcy Costs

- Legal and administrative costs
- Ultimately cause bondholders to incur additional losses
- Disincentive to debt financing

Financial distress

Financial distress – the direct and indirect costs of avoiding bankruptcy.

- Significant problems in meeting debt obligations
- Firms that experience financial distress do not necessarily file for bankruptcy

In 1997, the remaining assets of Fruehauf Corporation, described by Barrons as “the once-dominant” manufacturer of truck trailers, were sold off for a mere $50 million, bringing an end to the story of a great firm laid low by over-reliance on debt financing.
Founded in the 1940’s, the firm controlled one-third of the trailer market in the early 1980’s, but then went private in a leveraged buyout in 1986 to avoid a hostile takeover bid. Saddled with debt it found difficult to service, the firm went through a number of restructurings until the firm filed for chapter 11 in 1996. At that time its shares were delisted from the NYSE. And, as Barrons notes, “… the shareholders had been wiped out, leaving the carcass to be picked over by those with secure claims to Fruehauf’s assets … [b]lood was in the water.” By 1997, the last division was sold and the remaining assets were sold to Wabash National.

**Indirect Bankruptcy Costs**

Indirect bankruptcy costs (e.g., difficulties in hiring and retaining good people because the firm is in financial difficulty) are hard to measure and generally take the form of forgone revenues, opportunity costs, etc.

Larger than direct costs, but more difficult to measure and estimate

Stockholders want to avoid a formal bankruptcy filing
Bondholders want to keep existing assets intact so they can at least receive that money
Assets lose value as management spends time worrying about avoiding bankruptcy instead of running the business
The firm may also lose sales, experience interrupted operations and lose valuable employees

**MM Proposition 1 with Corporate Taxes and Bankruptcy Costs:**

\[ V_L = V_U + T_C D \]

Present Value of financial distress

Present Value of the Tax Shield
MM Proposition 11 with Corporate Taxes and Bankruptcy Costs:

Cost of Capital

Prop 2 with $T_c$ and
Financial Distress Costs

$r_A$

Min WACC

WACC

B'

D/E
Optimal Capital Structure

What is the primary goal of financial managers?

Maximize stockholder wealth

We want to choose the capital structure that will maximize stockholder wealth. We do this by maximizing the value of the firm or minimizing the WACC.

Why does minimizing WACC maximize firm value? Remember the WACC is the appropriate discount rate for the risk of the firm’s standard assets. We can find the value of the firm by discounting the firm’s expected future cash flows at the discount rate – the process is the same as finding the value of anything else. Since value and discount rate move in opposite directions, firm value will be maximized when WACC is minimized.

Remember, a firm is just a portfolio of projects, some with positive NPVs and some with negative NPVs when evaluated at the WACC. The value of the firm is the sum of the NPVs of its component projects. We already know that lower discount rates increase NPVs; consequently, decreasing the WACC will increase firm value.

The Static Theory of Capital Structure

Firms borrow because tax shields are valuable
The tax benefit is only important if the firm has a large tax liability
Risk of financial distress
The greater the risk of financial distress, the less debt will be optimal for the firm
The cost of financial distress varies across firms and industries, and as a manager you need to understand the cost for your industry
Borrowing is constrained by the costs of financial distress
The optimal capital structure balances the incremental benefits and costs of borrowing

Optimal Capital Structure and the Cost of Capital

The optimal capital structure is the debt-equity mix that minimizes the WACC.

Conclusions

No taxes or bankruptcy costs
  • No optimal capital structure; firm value is unaffected by the choice of capital structure
Corporate taxes but no bankruptcy costs
  • Optimal capital structure is almost 100% debt or firm value is maximized when the firm uses as much debt as possible due to the interest tax shield
  • Each additional dollar of debt increases the cash flow of the firm
Corporate taxes and bankruptcy costs

- Optimal capital structure is part debt and part equity
- Firm value is maximized where the additional benefit from the interest tax shield is just offset by the increase in expected bankruptcy costs – there is an optimal capital structure

Capital Structure: Some Managerial Recommendations

Taxes – tax shields are more important for firms with high marginal tax rates

Financial distress – the lower the risk (or cost) of distress, the more likely a firm is to borrow funds

In theory, the static model of capital structure described in this section applies to multinational firms as well as to domestic firms. The multinational firm should seek to minimize its global cost of capital by balancing the debt-related tax shields across all of the countries in which the firm does business against global agency and bankruptcy costs. However, this assumes that worldwide capital markets are well-integrated and that foreign exchange markets are highly efficient. In such an environment, financial managers would seek the optimal global capital structure. In practice, of course, the existence of capital market segmentation, differential taxes, and regulatory frictions make the determination of the global optimum much more difficult than the theory would suggest.

The Value of the Firm

Value of the Firm = Marketed Claims + Nonmarketed Claims

Marketed claims are claims against cash flow that can be bought and sold (bonds, stock).

Nonmarketed claims are claims against cash flow that cannot be bought and sold (taxes)

\[ V_M = \text{value of marketed claims} \]

\[ V_N = \text{value of nonmarketed claims} \]

\[ V_T = \text{value of all claims} = V_M + V_N = E + D + G + B + \ldots \]

Given the firm’s cash flows, the optimal capital structure is the one that maximizes \( V_M \) or minimizes \( V_N \).
The Pecking-Order Theory

Asymmetric information between buyers and sellers means that existing firm owners know more than potential investors. The view is that existing owners will sell equity when it is overvalued, which is a negative signal to investors. Thus, this is avoided at all costs, particularly since equity issuance is also costly.

Internal Financing and the Pecking Order

Rules of the pecking order:

#1: Use internal financing first

#2: Issue debt next and new equity last

Implications of the Pecking Order

The pecking-order theory is in contrast to the tradeoff theory in that:

- there is no target D/E ratio
- profitable firms will use less debt
- companies like financial slack