Financing decisions (3)

Class 17
Financial Management, 15.414
Today

Financing decisions

- Debt, taxes, and the after-tax WACC
- Financial distress

Reading

- Brealey and Myers, Chapter 18, 19.1 – 19.4
Financing decisions

M&M theorem

Financing decisions don’t affect firm value if …

(1) the market is efficient and no asymmetric information
(2) tax considerations are unimportant
(3) transaction and distress costs are small
(4) they do not affect the firm’s investment policies
Trade-off theory

Firm value

$V_U$ + tax shields of debt

$V_L$ with tax shields and distress

$V_L$ according to MM

Optimal capital structure

Leverage
Debt and taxes

Tax effects of financing

➤ Corporate taxes
  Interest is treated as an expense for corporate tax purposes, dividends are not

➤ Personal taxes
  Interest is taxed at the full income tax rate, while equity income is taxed at a lower rate

Capital gains and international tax rules

➤ Overall, debt typically has tax advantages
  Lower overall taxes
Debt and taxes

Pie theory
Debt and taxes

Pie theory
Example

In 2000, Microsoft had sales of $23 billion, earnings before taxes of $14.3 billion, and net income of $9.4 billion. Microsoft paid $4.9 billion in taxes, had a market value of $423 billion, and had no long-term debt outstanding.

Bill Gates is thinking about a recapitalization, issuing $50 billion in long-term debt ($d = 7\%) and repurchasing $50 billion in stock. How would this transaction affect Microsoft’s after-tax cashflows and shareholder wealth?
# Microsoft

## Balance sheet ($ millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>8,966</td>
<td>13,927</td>
<td>17,236</td>
<td>23,798</td>
</tr>
<tr>
<td>Current assets</td>
<td>10,373</td>
<td>15,889</td>
<td>20,233</td>
<td>30,308</td>
</tr>
<tr>
<td>Current liabs</td>
<td>3,610</td>
<td>5,730</td>
<td>8,718</td>
<td>9,755</td>
</tr>
<tr>
<td>LT debt</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bk equity</td>
<td>9,797</td>
<td>15,647</td>
<td>27,485</td>
<td>41,368</td>
</tr>
<tr>
<td>Mkt equity</td>
<td>155,617</td>
<td>267,700</td>
<td>460,770</td>
<td>422,640</td>
</tr>
<tr>
<td>Sales</td>
<td>11,358</td>
<td>14,484</td>
<td>19,747</td>
<td>22,956</td>
</tr>
<tr>
<td>EBIT</td>
<td>5,314</td>
<td>7,117</td>
<td>11,891</td>
<td>14,275</td>
</tr>
<tr>
<td>Taxes</td>
<td>1,860</td>
<td>2,627</td>
<td>4,106</td>
<td>4,854</td>
</tr>
<tr>
<td>Net income</td>
<td>3,454</td>
<td>4,490</td>
<td>7,785</td>
<td>9,421</td>
</tr>
<tr>
<td>Oper CF</td>
<td>4,689</td>
<td>6,880</td>
<td>10,003</td>
<td>13,961</td>
</tr>
</tbody>
</table>
## Microsoft

### Income statement, 2000 ($ millions)

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>w/ Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>$14,275</td>
<td>$14,275</td>
</tr>
<tr>
<td>Interest ($r \times 50,000)</td>
<td>0</td>
<td>3,500</td>
</tr>
<tr>
<td>Earnings before taxes</td>
<td>$14,275</td>
<td>$10,775</td>
</tr>
<tr>
<td>Taxes (34%)</td>
<td>4,854</td>
<td>3,664</td>
</tr>
<tr>
<td>Net income</td>
<td>$9,421</td>
<td>$7,111</td>
</tr>
<tr>
<td>Cashflow to debtholders</td>
<td>$0</td>
<td>$3,500</td>
</tr>
<tr>
<td>Cashflow to equityholders*</td>
<td>$9,421</td>
<td>$7,111</td>
</tr>
<tr>
<td>Total cashflows to D &amp; E</td>
<td>$9,421</td>
<td>$10,611</td>
</tr>
</tbody>
</table>

*before reinvestment
Debt and taxes

Tax savings of debt

Marginal tax rate = $\tau$

Taxes for unlevered firm ............ $\tau \text{ EBIT}$
Taxes for levered firm .............. $\tau (\text{EBIT} - \text{interest})$

Interest tax shield ................. $\tau \text{ interest}$

$\text{Interest} = r_d D$

$\text{Interest tax shield (each year)} = \tau r_d D$

[Only interest, not principal, payments reduce taxes]
Debt and taxes

Value implication 1

With corporate taxes (but no other complications), the value of a levered firm equals

\[ V_L = V_U + \text{PV(interest tax shields)} \]

If debt is a perpetuity

\[ \text{PV(tax shields)} = \frac{\text{tax shields per year}}{\text{interest rate}} = \frac{\tau r_d D}{r_d} = \tau D \]

\[ V_L = V_U + \tau D \]
Leverage and firm value

Firm value

$V_U$

$V_L$ with tax shields

$V_L$ without tax shields (MM)

Leverage
Microsoft

In 2000, Microsoft had EBIT of $14.3 billion. Microsoft paid $4.9 billion in taxes, had a market value of $423 billion, and had no long-term debt outstanding. Bill Gates is considering a recapitalization, issuing $50 billion in long-term debt ($r_d = 7\%) and repurchasing $50 billion in stock.

Recapitalization

- Interest expense = $50 \times 0.07 = $3.5 billion
- Tax shield = $3.5 \times 0.34 = $1.19 billion annually
- \( PV(\text{tax shields}) = \frac{1.19}{0.07} \times 0.34 = $17 \text{ billion}^* \)
- \( V_L = V_u + PV(\text{tax shields}) = $440 \text{ billion} \)
Microsoft

Current

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liab &amp; Eq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Assets $423 billion</td>
<td>Long-Term Debt $0</td>
</tr>
<tr>
<td></td>
<td>Equity $423 billion</td>
</tr>
</tbody>
</table>

After recap

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liab &amp; Eq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Assets $440 billion</td>
<td>Long-Term Debt $50 billion</td>
</tr>
<tr>
<td></td>
<td>Equity $390 billion</td>
</tr>
</tbody>
</table>
Debt and taxes

Value implication 2

With corporate taxes (but no other complications), the firm’s WACC declines as leverage increases.

Firm value goes up because WACC drops.

No taxes: \( \text{WACC} = \frac{D}{A} r_D + \frac{E}{A} r_E \quad [\text{WACC} = r_A] \)

With taxes: \( \text{WACC} = \frac{D}{V} (1 - \tau) r_D + \frac{E}{V} r_E \quad [\text{WACC} < r_A] \)
Leverage and the cost of capital

\[ r_E \text{ w/o taxes} \]
\[ r_E \text{ with taxes} \]
\[ r_A \]
\[ WACC \text{ with taxes} \]
\[ r_D \]
Financing decisions

Advantages of debt

- Taxes
- Signaling
- Corporate control
- Lower issue costs

Should firms be 100% debt financed?

What are the costs?
Financial distress

Direct costs

Managers’ time and effort
Legal costs

Indirect costs

Foregone positive NPV projects
Loss of competitive position
Lost customers
Lost suppliers
Asset fire sales and liquidation
Loss of interest tax shields
Summary

Costs of financial distress

Leverage
Trade-off theory

Firm value

\[ V_U \]

\[ V_U + \text{tax shields of debt} \]

\[ V_L \text{ with tax shields and distress} \]

\[ V_L \text{ according to MM} \]

Optimal capital structure

Leverage
Summary

Financing checklist

➢ **Taxes**
  Does the firm benefit from interest tax shields?

➢ **Signaling and mispricing**
  Is our equity fairly valued? How will investor react?

➢ **Expected distress costs**
  What are our cash needs going forward (FCFs)?
  Cashflow volatility?
  How costly is it to cut back on expenditures?
  Customer and supplier concerns?
  Is renegotiation possible?
  Asset sales?
  Financially strong competitors?
Summary

Who should have low debt?

- **Firms with high costs of financial distress**
  Assets cannot be sold easily, high intangibles, high growth options, time-sensitive investment

- **Firms with risky earnings and cashflows**
  High probability of distress

- **Firms with financially strong competitors**
  Predatory pricing, exploiting downturns

- **Firms with low earnings and cumulative losses**
  Tax shields small
## Capital structure, 1997

<table>
<thead>
<tr>
<th>Industry</th>
<th>Debt / (Debt + Equity)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High leverage</strong></td>
<td></td>
</tr>
<tr>
<td>Building construction</td>
<td>60.2%</td>
</tr>
<tr>
<td>Hotels and lodging</td>
<td>55.4</td>
</tr>
<tr>
<td>Air transport</td>
<td>38.8</td>
</tr>
<tr>
<td>Primary metals</td>
<td>29.1</td>
</tr>
<tr>
<td>Paper</td>
<td>28.2</td>
</tr>
<tr>
<td><strong>Low leverage</strong></td>
<td></td>
</tr>
<tr>
<td>Drugs and chemicals</td>
<td>4.8</td>
</tr>
<tr>
<td>Electronics</td>
<td>9.1</td>
</tr>
<tr>
<td>Management services</td>
<td>12.3</td>
</tr>
<tr>
<td>Computers</td>
<td>9.6</td>
</tr>
<tr>
<td>Health services</td>
<td>15.2</td>
</tr>
</tbody>
</table>
Summary

Target: Single A rated debt

➢ Tax shields

➢ Prob of default and credit spreads: AAA vs. A vs. BBB

➢ Access to credit markets
  Regulation
  International capital markets

➢ Competitors

➢ Bond covenants
## Bond ratings

### Default probabilities for S&P ratings

<table>
<thead>
<tr>
<th>Original rating</th>
<th>1 year</th>
<th>5 years</th>
<th>10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>0.00</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>AA</td>
<td>0.00</td>
<td>0.67</td>
<td>0.74</td>
</tr>
<tr>
<td>A</td>
<td>0.00</td>
<td>0.22</td>
<td>0.64</td>
</tr>
<tr>
<td>BBB</td>
<td>0.03</td>
<td>1.64</td>
<td>2.80</td>
</tr>
<tr>
<td>BB</td>
<td>0.37</td>
<td>8.32</td>
<td>16.37</td>
</tr>
<tr>
<td>B</td>
<td>1.47</td>
<td>21.95</td>
<td>33.01</td>
</tr>
<tr>
<td>CCC</td>
<td>2.28</td>
<td>35.42</td>
<td>47.46</td>
</tr>
</tbody>
</table>
## Bond ratings

### Credit spreads*

<table>
<thead>
<tr>
<th>Rating</th>
<th>1 year</th>
<th>5 years</th>
<th>10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>.53</td>
<td>.94</td>
<td>1.11</td>
</tr>
<tr>
<td>AA</td>
<td>.66</td>
<td>1.10</td>
<td>1.39</td>
</tr>
<tr>
<td>A</td>
<td>.83</td>
<td>1.37</td>
<td>1.93</td>
</tr>
<tr>
<td>BBB</td>
<td>1.20</td>
<td>1.84</td>
<td>2.46</td>
</tr>
<tr>
<td>BB</td>
<td>2.25</td>
<td>3.00</td>
<td>4.50</td>
</tr>
<tr>
<td>B</td>
<td>4.00</td>
<td>5.25</td>
<td>8.00</td>
</tr>
<tr>
<td>CCC</td>
<td>5.25</td>
<td>6.50</td>
<td>9.75</td>
</tr>
</tbody>
</table>

*Yield relative to Tbonds