Topics in Corporate Finance

Chapter 4: Taxes and Bankruptcy and the Trade-Off Theory

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Corporate Taxes

- Taxes have major effect on cash flows & capital structure
- M&M: without taxes, bankruptcy, etc,. companies should be indifferent between debt and equity
- Objective: minimise taxes
- Suppose for the moment that…
  - companies are taxed (interest is tax-deductible) but…
  - investors are not (e.g. pension funds)
- In order to minimize corporate taxes…
  - Interest payments are tax-deductible while dividends are not
  - Firms prefer debt to equity

Example: D.F. Builders (DFB)

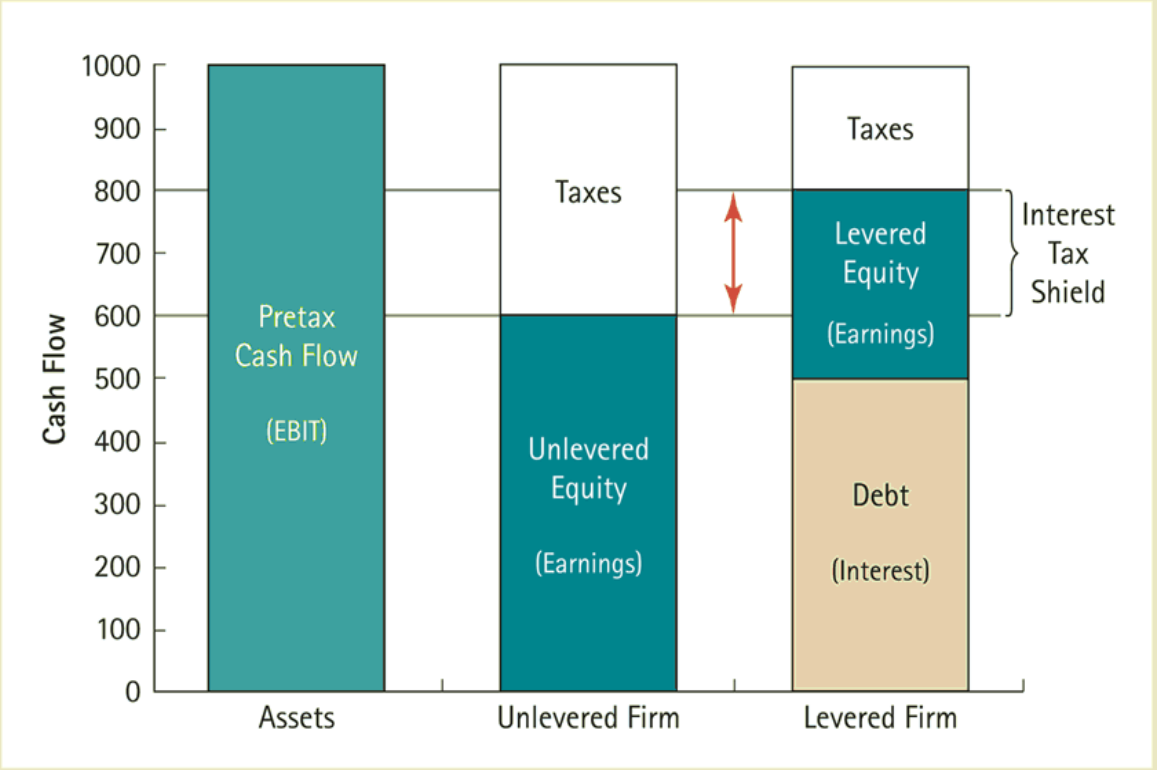
1	**DFB Income Statement ($ million)**	**2005**	**2006**	**2007**	**2008**
2	Total sales	$3,369	$3,706	$4,077	$4,432
3	Cost of sales	−2,359	−2,584	−2,867	−3,116
4	Selling, general, and administrative expense	−226	−248	−276	−299
5	Depreciation	−22	−25	−27	−29
6	**Operating income**	762	849	907	988
7	Other income	7	8	10	12
9	**EBIT**	769	857	917	1,000
10	Interest expense	−50	−80	−100	−100
11	**Income before tax**	719	777	817	900
12	Taxes (35%)	−252	−272	−286	−315
13	**Net income**	$467	$505	$531	$585

What was the amount available to investors in 2005?

Would it have been higher or lower without leverage?

The Cash Flows of the Unlevered and Levered Firm

By increasing the cash flows paid to debt holders through interest payments, a firm reduces the amount paid in taxes. The increase in total cash flows paid to investors is the interest tax shield. (The figure assumes a 40% marginal corporate tax rate.)



Valuing the Interest Tax Shield

- Assume that a firm is financed with equity and risk-free perpetuity bond (pays r_D forever)
- After-(corporate) tax payments are:

$$C_t = (X_t - r_D D)(1 - T_C) + r_D D = X_t(1 - T_C) + T_C\, r_D D$$

  where T_C are the corporate taxes
- Therefore..
  - Given that the cash flow that would be achieved by an unlevered firm is $X_1(1- T_C)$, $X_2(1- T_C)$, $X_3(1- T_C)$, and,
  - The second term of the period cash flow is constant, we have that $V_L = V_U + T_C D$
  - Present value of the interest tax shield: $T_C D$

    (if T_C=35%, for every pound in permanent debt, value increases by 35p)

Personal Taxes

- Most investors are taxed when they receive the cash
  - Interest income from debt taxed as income (T_D)
  - Equity investors pay taxes on dividends and capital gains (T_E)
- Typically…
  - $T_E < T_D$
  - Capital gains might be deferred

Personal and Corporate Taxes and Value

- Assuming all shareholders have identical tax rates, after-tax payments are:

$$C_t = (X_t - r_D D)(1 - T_C)(1 - T_E) + r_D D(1 - T_D)$$

or

$$C_t = X_t(1 - T_C)(1 - T_E) + r_D D[(1 - T_D) - (1 - T_C)(1 - T_E)]$$

- The present value of the second summand perpetual stream is $T_g D$ where

$$T_g = 1 - [(1 - T_C)(1 - T_E)/(1 - T_D)]$$

- Therefore, $V_L = V_U + T_g D$

Illiquidity vs. Insolvency

- Firm is not obliged to pay dividends to equity holders, but…
- Firm failing to make debt payments is in default

- Example: Armin (10m shares outstanding)…
  - New product can make it worth (a) £150m or (b) £80m at the end of the year
  - Can use (U) all-equity or (L) debt maturing at the end of the year with a total £100m due

- If success (a):
  - How much equity and debt holders own for each case (U and L)?
  - What if the company chooses L and does not have £100m in cash? Will it default?
- If not successful (b):
  - How much equity and debt holders own for each case?

Bankruptcy in perfect capital markets

TABLE 16.1 **Value of Debt and Equity with and without Leverage ($ million)**

	Without Leverage		With Leverage	
	Success	**Failure**	**Success**	**Failure**
Debt value	—	—	100	80
Equity value	150	80	50	0
Total to all investors	150	80	150	80

Bankruptcy costs

- Important only if bankruptcy (or the threat of bankruptcy) affects revenues or costs
- Classification:
  - Direct costs: legal process of restructuring (court costs, advisory fees) (on average 2-3% of the assets)
  - Examples:
    - Enron $30m per month, $750 in total
    - Worldcom (reorganisation to become MCI) $657m
    - United Airlines, 8.6m per month for legal and professional services related to chapter 11 reorganisation
  - Indirect costs:
    - Loss of customers, suppliers, employees, fire sales of assets,…

Example: direct costs of bankruptcy

- Westlake…
  - wants to borrow $1m for one year from a bank
  - has 10% of going bankrupt, in which case assets can be sold for $600,000
  - Legal costs would be $100,000
- Then,…
  - How much interest will the bank charge if it wants an average return of 10%?
  - How much is this is due to the costs of bankruptcy?

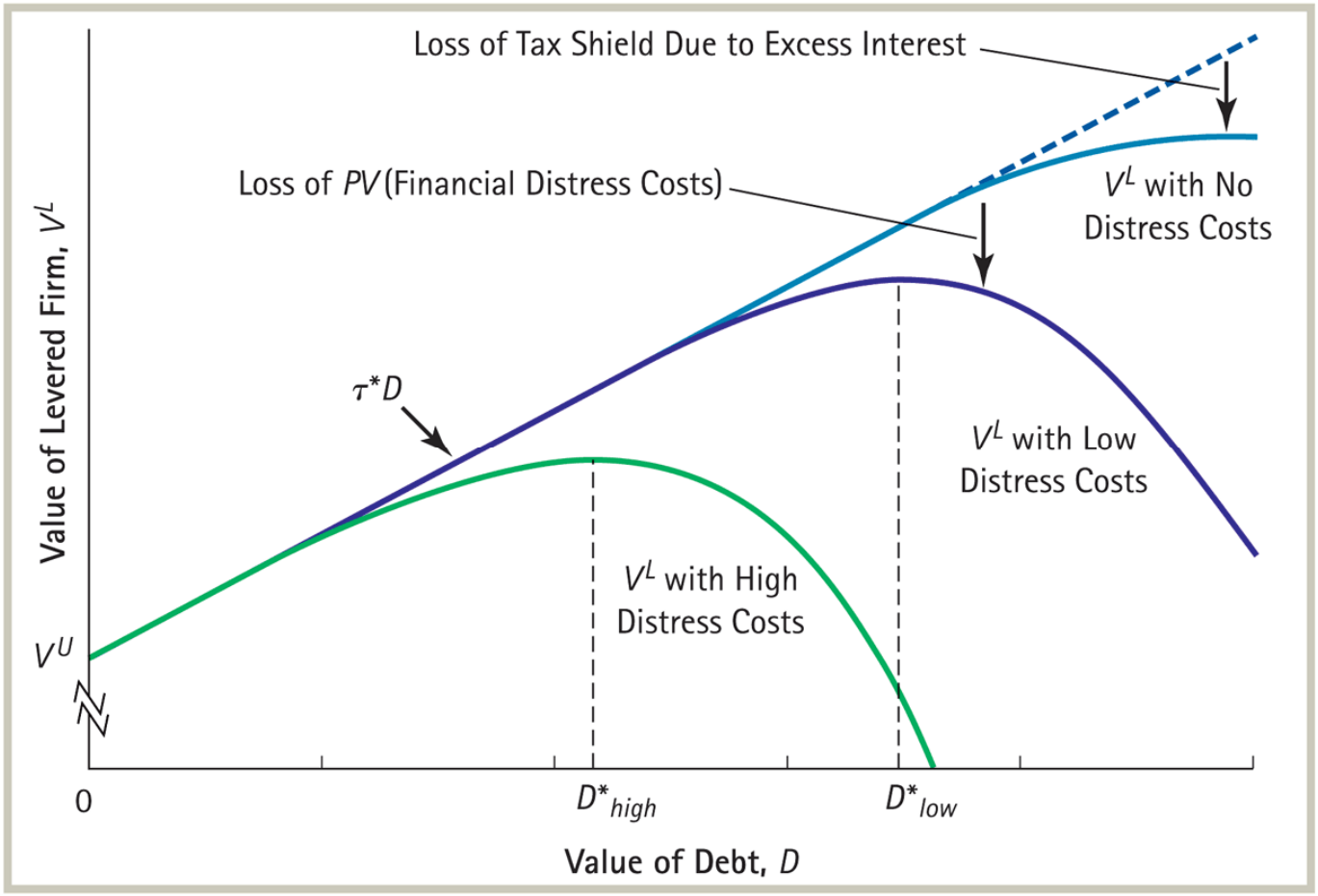
Summing up: the trade-off theory

- Tax benefits vs costs of financial distress costs:

$$V^L = V^U + PV(\text{Interest Tax Shield}) - PV(\text{Financial Distress Costs})$$

- To determine the PV(Financial distress costs), need to compute…
  1. Probability, which:
     - increases with the amount of a firm's liabilities, relative to assets.
     - increases with the volatility of a firm's cash flows and asset values
  2. Magnitude of costs once in distress, which depends on industry:
     - Technology: high (loss of customers, key personnel, lack of tangible assets being liquidated)
     - Real estate: low (assets can (in normal times) be sold relatively easily)

Optimal Leverage



Agency costs of leverage (an introduction)

- Conflict of interests between debt holders and shareholders
- Managers maximise shareholder's wealth, often at the expense of debt holders and even at the expense of the value of the firm
- However, debt holders take into account this possibility when asking for a return rate and the costs are then shared

How equity holders can expropriate debt holder wealth

- Debt overhang problem: underinvestment, when benefits will mostly go to debt holders
- Asset substitution problem: take too much risk
- Shortsighted investment problem: tendency to take up projects that pay up early
- Reluctance to liquidate problem: keep operating even when its liquidation value exceeds its operation value

WACC with taxes

- Effective cost of debt is r(1- T_C)

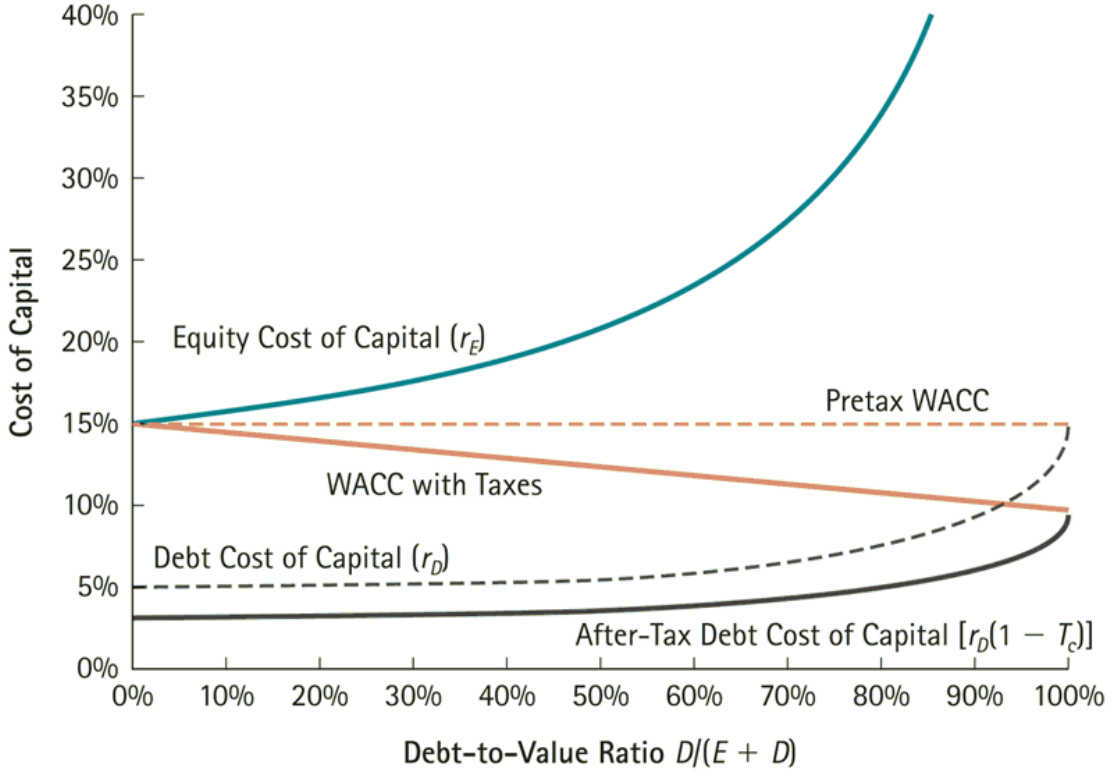
$$r_{wacc} = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D (1 - T_C)$$

- Hence, cost of capital decreases with debt
- If debt-to-equity ratio is constant, levered value of any project can be computed using r_{wacc}
- Project is profitable if rate or return is higher than WACC, which represents average return to be paid to investors (equity + debt holders) after-tax
- If there are personal taxes, the cost of debt and equity will adjust

WACC with corporate taxes

The WACC with and without Corporate Taxes

We compute the WACC as a function of leverage using Eq. 15.9. Whereas the pretax WACC remains constant, with taxes the WACC declines as the firm increases its reliance on debt financing and the benefit of the interest tax deduction grows. The figure assumes a marginal corporate income tax rate of 35%.



Avco's new line of packaging, RFX

- Technology expected obsolete after four years
- Expected sales of $60 million per year over the next four years
- Manufacturing costs and operating expenses expected to be $25 million and $9 million, respectively, per year
- Upfront R&D and marketing expenses of $6.67 million
- $24 million investment in equipment (depreciated via the straight-line method over four years)

- Avco pays a corporate tax rate of 40%

Example

TABLE 18.1 SPREADSHEET

Expected Free Cash Flow from Avco's RFX Project

	Year	0	1	2	3	4
Incremental Earnings Forecast ($ million)						
1	Sales	–	60.00	60.00	60.00	60.00
2	Cost of Goods Sold	–	(25.00)	(25.00)	(25.00)	(25.00)
3	**Gross Profit**	–	35.00	35.00	35.00	35.00
4	Operating Expenses	(6.67)	(9.00)	(9.00)	(9.00)	(9.00)
5	Depreciation	–	(6.00)	(6.00)	(6.00)	(6.00)
6	**EBIT**	(6.67)	20.00	20.00	20.00	20.00
7	Income Tax at 40%	2.67	(8.00)	(8.00)	(8.00)	(8.00)
8	**Unlevered Net Income**	(4.00)	12.00	12.00	12.00	12.00
Free Cash Flow						
9	Plus: Depreciation	–	6.00	6.00	6.00	6.00
10	Less: Capital Expenditures	(24.00)	–	–	–	–
11	Less: Increases in NWC	–	–	–	–	–
12	**Free Cash Flow**	**(28.00)**	**18.00**	**18.00**	**18.00**	**18.00**

Avco's Market Value Balance Sheet

TABLE 18.2 **Avco's Current Market Value Balance Sheet ($ million) and Cost of Capital Without the RFX Project**

Assets		Liabilities		Cost of Capital	
Cash	20	Debt	320	Debt	6%
Existing Assets	600	Equity	300	Equity	10%
Total Assets	620	Total Liabilities and Equity	620		

- Net debt: D=320m - 20m=300m
- Suppose further…
  - Project has similar risk than the company
  - Debt/equity ratio constant

Is RFX a good idea?

- Avco's WACC:

$$r_{wacc} = \frac{E}{E + D} r_E + \frac{D}{E + D} r_D (1 - \tau_c) = \frac{300}{600}(10\%) + \frac{300}{600}(6\%)(1 - 0.40)$$
$$= 6.8\%$$

- Project's value:

$$V_0^L = \frac{18}{1.068} + \frac{18}{1.068^2} + \frac{18}{1.068^3} + \frac{18}{1.068^4} = \$61.25 \text{ million}$$

- NPV= 61.25m – 28m = 33.25m > 0

Reading

- Miller, “Debt and Taxes”, Journal of Finance 1977
- Berens and Cuny “The Capital Structure Puzzle Revisited”, Review of Financial Studies, 1995