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Direcció Financera II

## Chapter 3: Firm's Capital Structure

Part (b): Taxes and Bankruptcy and the Trade-Off Theory

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# Departures from M&M

- In part (a), we showed that, in the M&M world...
  - Capital structure does not matter
  - Thus, investment & financing decisions independent
  
- In this part (b), we should consider...
  - Corporate taxes
  - Personal taxes
  - Costs of bankruptcy
  - Problems of asymmetric information

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# Corporate and personal taxes

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# Corporate Taxes

- M&M: without taxes (along with 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

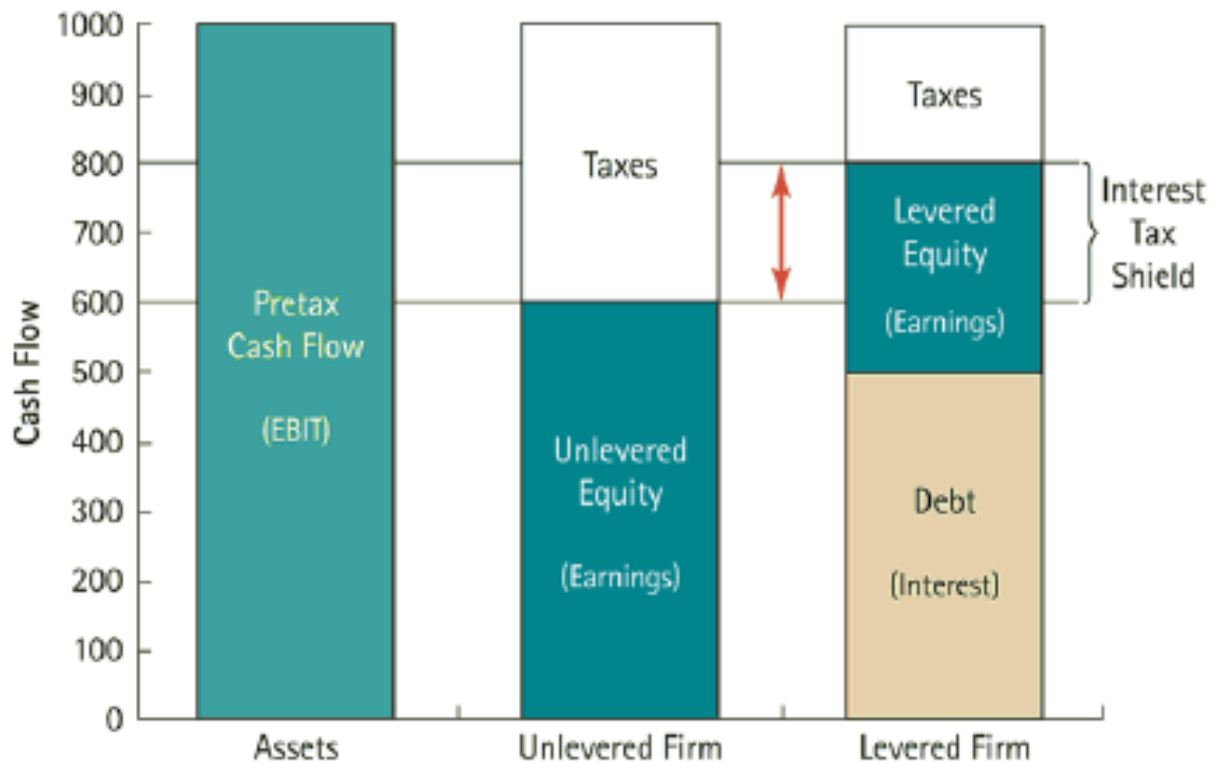
# Example: D.F. Builders (DFB)

1	<b>DFB Income Statement (\$ million)</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
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	<b>Operating income</b>	762	849	907	988
7	Other income	7	8	10	12
9	<b>EBIT</b>	769	857	917	1,000
10	Interest expense	-50	-80	-100	-100
11	<b>Income before tax</b>	719	777	817	900
12	Taxes (35%)	-252	-272	-286	-315
13	<b>Net income</b>	\$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.)



# Corporate Taxes, Cash Flows and Value

- Assume firm is financed with equity and risk-free perpetuity bond (pays  $r_D D$  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 payments of..
  - An unlevered firm would be  $X_1(1 - T_C)$ ,  $X_2(1 - T_C)$ ,  $X_3(1 - T_C)$ , and,
  - Second term of cash flow is constant, we have that...
  - $V_L = V_U + T_C D$  (present value of the interest tax shield is  $T_C D$ )  
(if  $T_C = 35\%$  for every euro in permanent debt, value increases by 35c)

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# Personal Taxes

- Most investors are taxed when they receive cash
  - Interest income from debt taxed as income ( $T_D$ )
  - Equity investors pay taxes on dividends & capital gains ( $T_E$ )
- Typically...
  - Capital gains are taxed at lower rates than dividends or interests
  - Capital gains (and therefore taxes on them) might be deferred
- As a result:  $T_E < T_D$



# Personal and Corporate Taxes and Value

- Assuming all shareholders have same tax rates:

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

or

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

- Discounted at the after-tax rate  $r_D (1 - T_D)$ , PV of second term is  $T_g D$ , where

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

- Therefore,  $V_L = V_U + T_g D$

# Relative advantage formula (RAF)

**(Debt vs. equity)**

$$\frac{1-T_d}{(1-T_e)(1-T_c)}$$

**Advantage**

**RAF > 1 ( $T_g > 0$ ) Debt**

**RAF < 1 ( $T_g < 0$ ) Equity**

# WACC with corporate taxes

- Suppose here that...
  - Project has average risk (=risk of the company)
  - Debt-equity ratio is constant
  - Corporate taxes is the only imperfection
- Cost of capital of the project is equal to the after-tax WACC:

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

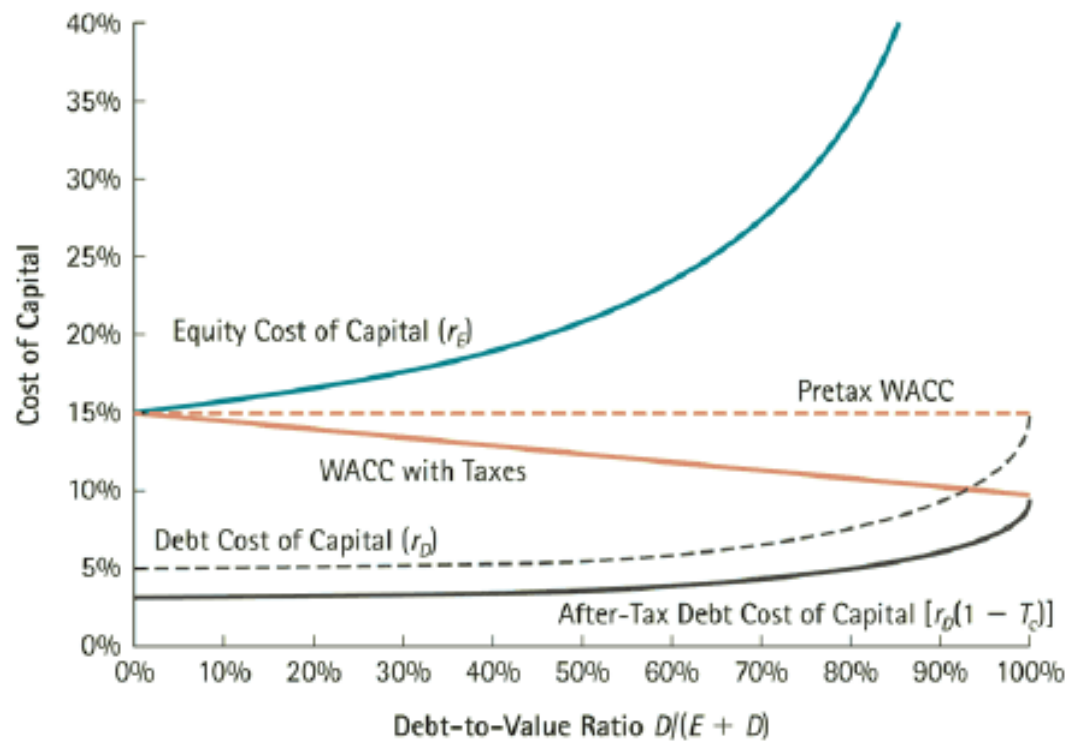
- After-tax borrowing is lower because interest is tax-deductible
- Hence, cost of capital decreases with debt
- It can then be shown that the levered value of an investment then is

$$V_o^L = \frac{C_1}{1 + r_{wacc}} + \frac{C_2}{(1 + r_{wacc})^2} + \frac{C_3}{(1 + r_{wacc})^3} + \dots + \frac{C_T}{(1 + r_{wacc})^T}$$

# 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%.



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# 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%

# Expected cash flows from the project

	Year	0	1	2	3	4
<b>Incremental Earnings Forecast (\$ million)</b>						
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
<b>Free Cash Flow</b>						
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 (\$ mill.) and cost of capital without the RFX project

<u>Assets</u>		<u>Liabilities</u>		<u>Cost of Capital</u>	
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:

$$r_{wacc} = \frac{300}{300 + 300} (10\%) + \frac{300}{300 + 300} (6\%)(1 - 0.40) = 6.8\%$$

## ■ Project's value:

$$V_o^L = \frac{18}{1+1.068} + \frac{18}{(1+1.068)^2} + \frac{18}{(1+1.068)^3} + \frac{18}{(1+1.068)^4}$$

## ■ NPV = 61.25m – 28m = 33.25m > 0



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# Costs of Bankruptcy

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# 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 makes it worth (a) £150m or (b) £80m at end of the year
  - Choose (U) all-equity or (L) debt maturing at 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 affects revenues or costs
- 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,... (see next slide)

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## Some indirect costs of financial distress

- **Loss of customers:**
  - Bankruptcy may enable firms to walk away from future commitments (support, future upgrades,...)
- **Loss of suppliers:**
  - Bankruptcy may enable firms not to pay for inventory
  - Swissair forced to shut because suppliers refuse to fuel planes
- **Loss of employees:**
  - Fear of job security
  - Pacific Gas and Electric Co. paid to retain 17 key employees
- **Loss of receivables:**
  - Debtors might have an opportunity to avoid obligations
- **Fire sales of assets:**
  - Companies need to sell assets quickly to raise cash

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# Who bears the cost? An example

- 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 of this is due to the costs of bankruptcy?

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# 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  $PV(\text{Financial distress costs})$ , need to compute...

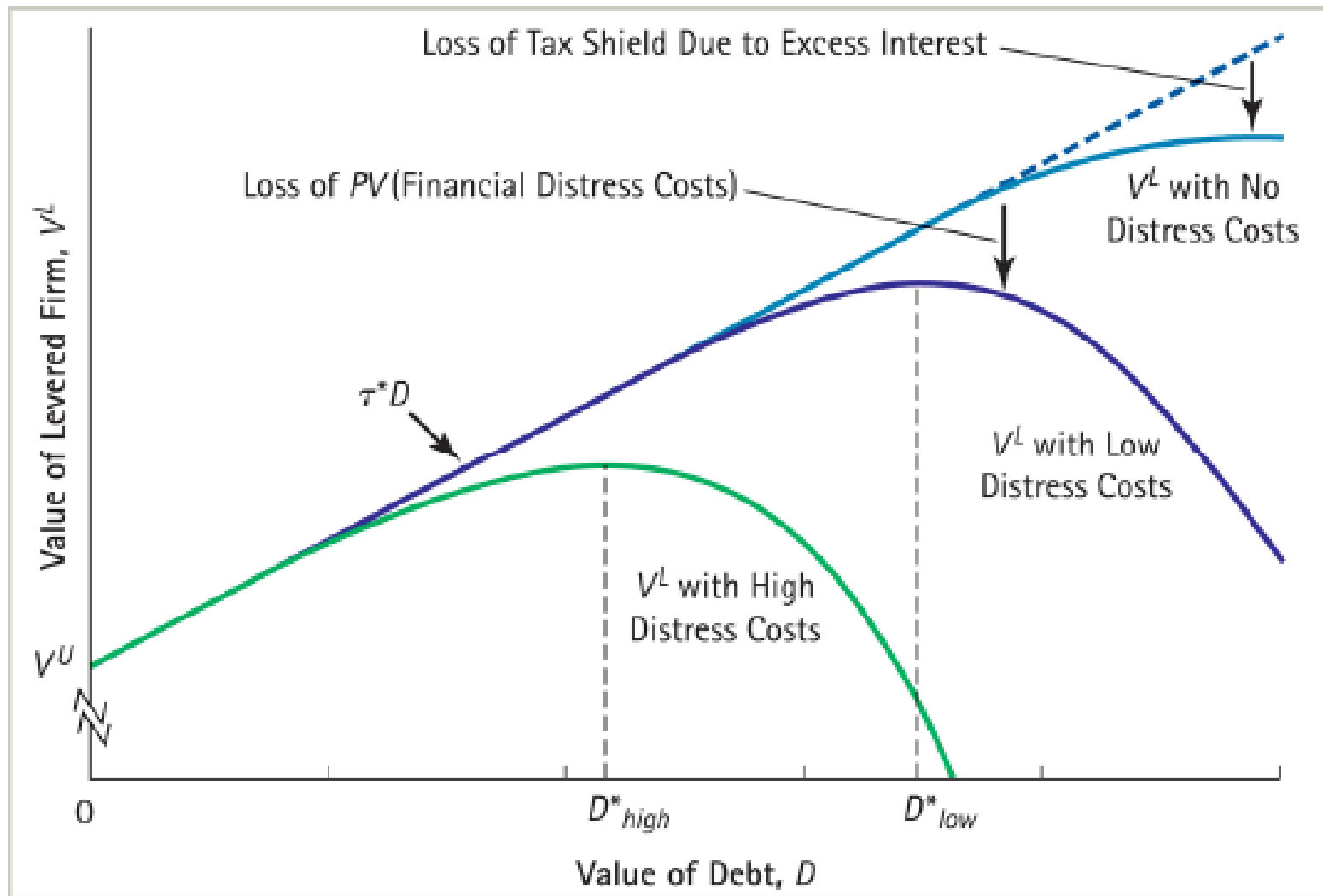
1. Probability, which:

- 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





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# Agency Costs

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# Agency costs of leverage

- Conflicts of interest between debt holders & shareholders
- Managers...
  - own shares and are elected by shareholders
  - maximise shareholder's wealth, sometimes at the expense of debt holders and even at expense of firm's value
  - more likely to occur if risk of financial distress is high
- Some examples:
  - Over-investment: Shareholders can gain by taking a negative-NPV project, if sufficiently risky
  - Under-investment (*debt overhang*): Shareholders might not invest in positive NPV projects because value of taking it goes to bondholders

## Over-investment at Baxter, Inc.?

- Loan of \$1 million due at the end of the year
- Without any change,...
  - market value of its assets will be \$900,000 at that time
  - Therefore the firm will default on its loan and go bankrupt
- New strategy is possible:
  - No upfront investment and 50% chance of success
  - If strategy is successful, value of the firm's assets: \$1.3 million
  - If not, value of the firm's assets: \$300,000
- Should Baxter change the strategy? According to...?

## Under-investment at Baxter, Inc.?

- Loan of \$1 million due at the end of the year
- Without any change,...
  - market value of its assets will be \$900,000
  - Therefore the firm will default on its loan and go bankrupt
- New strategy (2):
  - Initial investment: \$100,000 and risk-free 50% return
  - Risk free-interest rate: 5%
- Should Baxter change the strategy?
- If so, how to pay for it (no cash available)? New equity?

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# Other agency conflicts

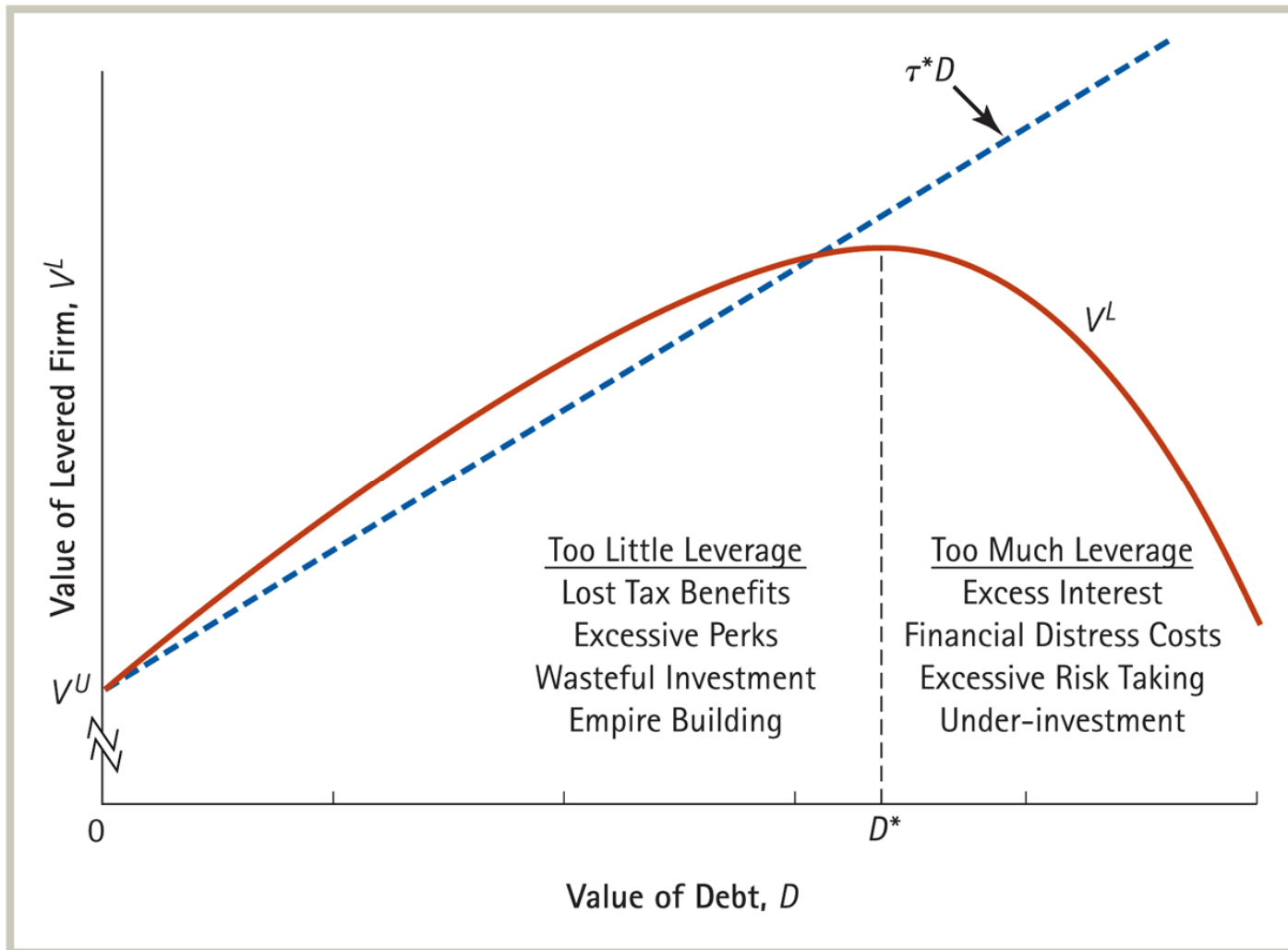
- **Cashing out:**
  - incentives to withdraw money just before default (e.g. sell assets below market value and use funds to pay immediate dividend)
- **Shortsighted investment problem:**
  - tendency to take up projects that pay up early
- **Reluctance to liquidate problem:**
  - keep firm operating even if liquidation exceeds operation value

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# Summarising Agency Conflicts

- Managers maximise shareholder's wealth, sometimes at the expense of debt holders and even at expense of firm's value
- Debt holders take this into account when buying debt and costs are ultimately paid by shareholders
- However, not everything can be taken into account
- Agency costs represent another cost of increasing the firm's leverage, affecting firm's choice of capital structure

# Leverage with Taxes, Financial Distress, & Agency Costs



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# The Optimal Debt Level

- R&D-intensive firms
  - High R&D costs and future growth opportunities, low debt levels
  - Low current free cash flows and risky business strategies
- Low-growth, mature firms:
  - Stable cash flows and tangible assets often carry high-debt
  - High free cash flows with few good investment opportunities
- Managers might not choose the (shareholder's) optimal:
  - Managerial entrenchment theory: managers choose a capital structure to avoid discipline of debt and maintain own job security



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# *Asymmetric information*

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# Asymmetric Information and Credibility

- Asymmetric Information:
  - A situation in which parties have different information
  - For example, managers have superior information to investors regarding the firm's future cash flows
  
- Credibility Principle:
  - One's self-interest claims are credible only if they are supported by actions that would be too costly to take if the claims were untrue
  - Managers avoid increasing leverage if the firm is in bad shape
    - Debt issue signals confidence about the firm
  - Managers do not issue equity if their stock is undervalued
    - Equity issue signals that stock may be overvalued

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# Increasing leverage

- In order to signal quality, managers have an additional incentive to increase their debt ratios:
  - If firm has good quality, no trouble paying debt interests
  - If not, financial distress and costs for the firm
- Important for the signal to be credible that
  - firms in bad shape cannot mimic behaviour of good firms
  - but indeed high debt ratio is costly for bad firms

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# Adverse selection and the lemons

- Adverse selection:
  - Buyers and sellers have different information
  - Average quality of assets in the market differ from average quality overall
- Lemons principle:
  - Seller has private information about the good's value
  - Buyers willing to pay less due to adverse selection

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# Selling Equity

- Firms that sell new equity have private information about the quality of the future projects:
  - Incentives to issue equity when stock is overvalued
- Buyers might only willing to buy the new equity at heavily discounted prices
- Insiders' job: convince investors that there are other reasons to sell equity costs are high
  - Willingness to diversify
  - Need of cash to fund new positive NPV investments
- Overall...
  - Stock price declines on the announcement of an equity issue

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# Pecking Order Hypothesis

## (Teoría de la clasificación jerárquica)

- Managers prefer to fund investments by...
  - first using retained earnings
  - then debt
  - and equity only as a last resort
- Firms with more retained earnings use less debt
  - Not because of lower optimal debt ratios but
  - because of asym. info, external financing more costly

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# Appendix

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# Valuing Perpetuities

A perpetuity is a constant level cash flow that continues forever.

- Examples:
- i) Firms
  - ii) Consol Bonds
  - iii) Preferred Stock
  - iv) Some specific Projects (e.g. rental arrangements)



## Valuing Perpetuities (2)

Present value of a perpetuity is (constant cash flows  $Cf$  and constant  $r$ ):

$$PV(\text{perp.}) = \sum_{t=1}^{\infty} \frac{Cf}{(1+r)^t} = \frac{Cf}{r}$$

Proof:

$$V = \frac{CF}{(1+r)} + \frac{CF}{(1+r)^2} + \frac{CF}{(1+r)^3} + \dots$$

$$(1+r)V = CF + \frac{CF}{(1+r)} + \frac{CF}{(1+r)^2} + \dots$$

subtract the first equation from the second

$$rV = CF \quad (\text{or}) \quad V = \frac{CF}{r}$$