

MN50324: MAF Corporate Finance:

Semester 2, 2008/9

1. Investment Appraisal, decision trees, real options.
2. Cost of capital (Bridging section).
3. Capital Structure and Value of the Firm.
4. Optimal Capital Structure - Agency Costs, Signalling.
5. Mergers and Acquisitions.
6. Convertible Debt.
7. Payout Policy: Dividends/Share Repurchases.
8. Efficient Markets and corporate news.
9. Venture Capital/Private Equity.
10. Behavioral Corporate Finance.

“Skills” required for the course

- Numerical/analytical.
- Conceptual ability (Essays).
- Game Theory.

Assessment

- 100% Exam:
- - essay section.
- - Analytical Section (numerical/game theoretic).
- There are seminars (practice/feedback).
- There will be revision sessions: with analytical/ essay practice!

Game-Theory

- Game-theory has been used extensively in analysing corporate finance decisions.
- Particularly, game theory is used to analyse strategic interaction between ‘players’: eg competing firms (in real option to delay); eg: interactions between managers and investors (in capital structure), venture capitalists and managers.
- Games of asymmetric information: signalling games (debt/dividends etc)

Life-cycle of a Firm

- Start-up Finance (venture capital)
- IPOs.
- Financial decision-making of existing publically-listed firms (investment appraisal/capital structure/dividend policy).
- M and A/ private Equity.

Rational/behavioural debate

- Efficient markets hypothesis/ rational agents.
- Behavioural Corporate Finance =>
- Irrational/biased managers.
- Irrational/biased investors.

The Major Decisions of the Firm.

- Investment Appraisal (Capital Budgeting) – Which New Projects to invest in?
- Capital Structure (Financing Decision)- How to Finance the new projects – Debt or equity?
- Payout Policy – Dividends, Share Repurchases, Re-investment.
- => Objective: Maximisation of Shareholder Wealth.

Integrating these decisions

- Investment appraisal (NPV rule: discount rate required)
- Investors' required return \Rightarrow cost of capital (discount rate)/ cost of equity/cost of debt.
- Capital structure (mix of debt/equity) \Rightarrow WACC.
- \Rightarrow Firm value (shareholder wealth).
- Objective: maximise firm value!

1. Investment Appraisal.

- Objective: Take projects that increase shareholder wealth (Value-adding projects).
- Investment Appraisal Techniques: NPV, IRR, Payback, ARR, Real Options....
- Which one is the Best rule for shareholder wealth maximisation?

Choice of rules

- Net Present Value (NPV)
- Internal Rate of Return (IRR)
- Payback
- ARR
- You will already have learnt that NPV is the best rule: Discounts all future cashflows/
time value of money/ maximises
shareholder wealth.

Net Present Value

- $$NPV = -I + \frac{X_1}{1+r} + \frac{X_2}{(1+r)^2} + \frac{X_3}{(1+r)^3} + \dots$$

$$NPV = -I + \frac{X}{r} \quad \text{Perpetuities.}$$

IRR =>

$$NPV = -I + \frac{X_1}{1+IRR} + \frac{X_2}{(1+IRR)^2} + \frac{X_3}{(1+IRR)^3} + \dots = 0.$$

Take Project if $NPV > 0$, or if $IRR > r$.

DO WE INVEST IN THIS NEW PROJECT?

\$000		2007	2008	2009	2010	2011	2012	
SALES			14000	16000	18000	20000	22000	90000
VARIABLE COSTS			-9800	-11200	-12600	-14000	-15400	-63000
OPERATING EXPENSES			-200	-200	-200	-200	-200	-1000
EQUIPMENT COSTS		-15000						-15000
CASHFLOWS		-15000	4000	4600	5200	5800	6400	11000
DF @ 12%		1.00	0.893	0.797	0.712	0.636	0.567	
NPV		-15000	3571	3667	3701	3686	3632	3257
	19.75	1.00	0.84	0.70	0.58	0.49	0.41	
IRR = 19.75%		-15000	3340	3208	3028	2820	2599	-4

NPV > 0.

COST OF CAPITAL (12%) < IRR (19.75%).

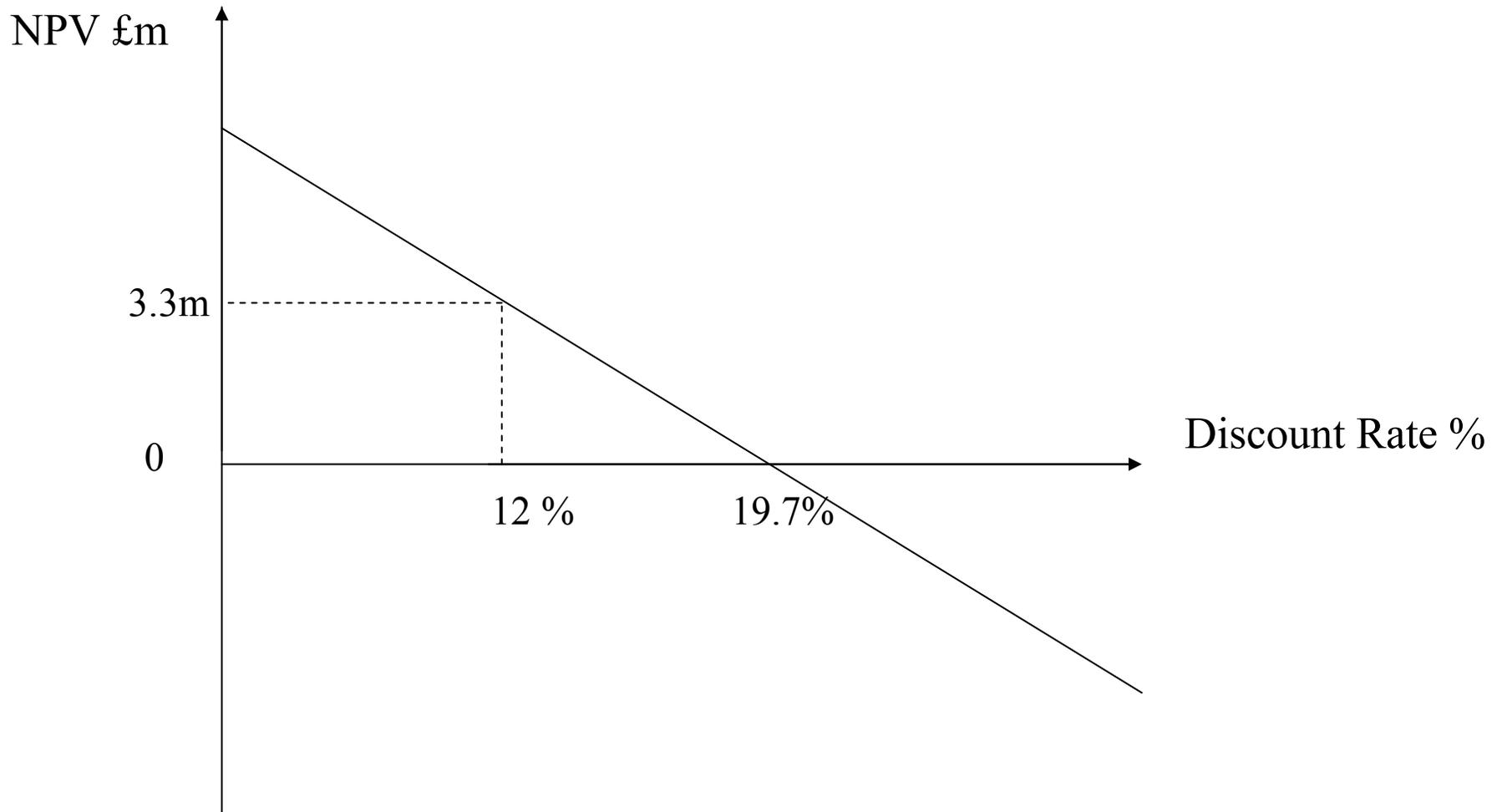
Summary of NPV for this project.

$$NPV = -I + \frac{X_1}{1+r} + \frac{X_2}{(1+r)^2} + \frac{X_3}{(1+r)^3} + \frac{X_4}{(1+r)^4} + \frac{X_5}{(1+r)^5}$$

$$\Rightarrow NPV = -15,000 + \frac{4000}{1.12} + \frac{4600}{1.12^2} + \frac{5200}{1.12^3} + \frac{5800}{1.12^4} + \frac{6400}{1.12^5} = 3257$$

- Firm announces to the market that it is investing in this project.
- Rational, efficient market: firm's market value immediately increases by £3,257 !!!
- Good for (existing) shareholders!!!

Note that if the NPV is positive, then the IRR exceeds the Cost of Capital.



CONFLICT BETWEEN APPRAISAL TECHNIQUES.

YEAR	A	B	C	D	DF: 10%
0	-1000	-1000	-1000	-1000	1
1	100	0	100	200	0.909
2	900	0	200	300	0.826
3	100	300	300	500	0.751
4	-100	700	400	500	0.683
5	-400	1300	1250	600	0.621

PAYBACK METHOD:

PROJECT A: 2 YEARS SELECT PROJECT A
 PROJECT B: 4 YEARS
 PROJECT C: 4 YEARS
 PROJECT D: 3 YEARS

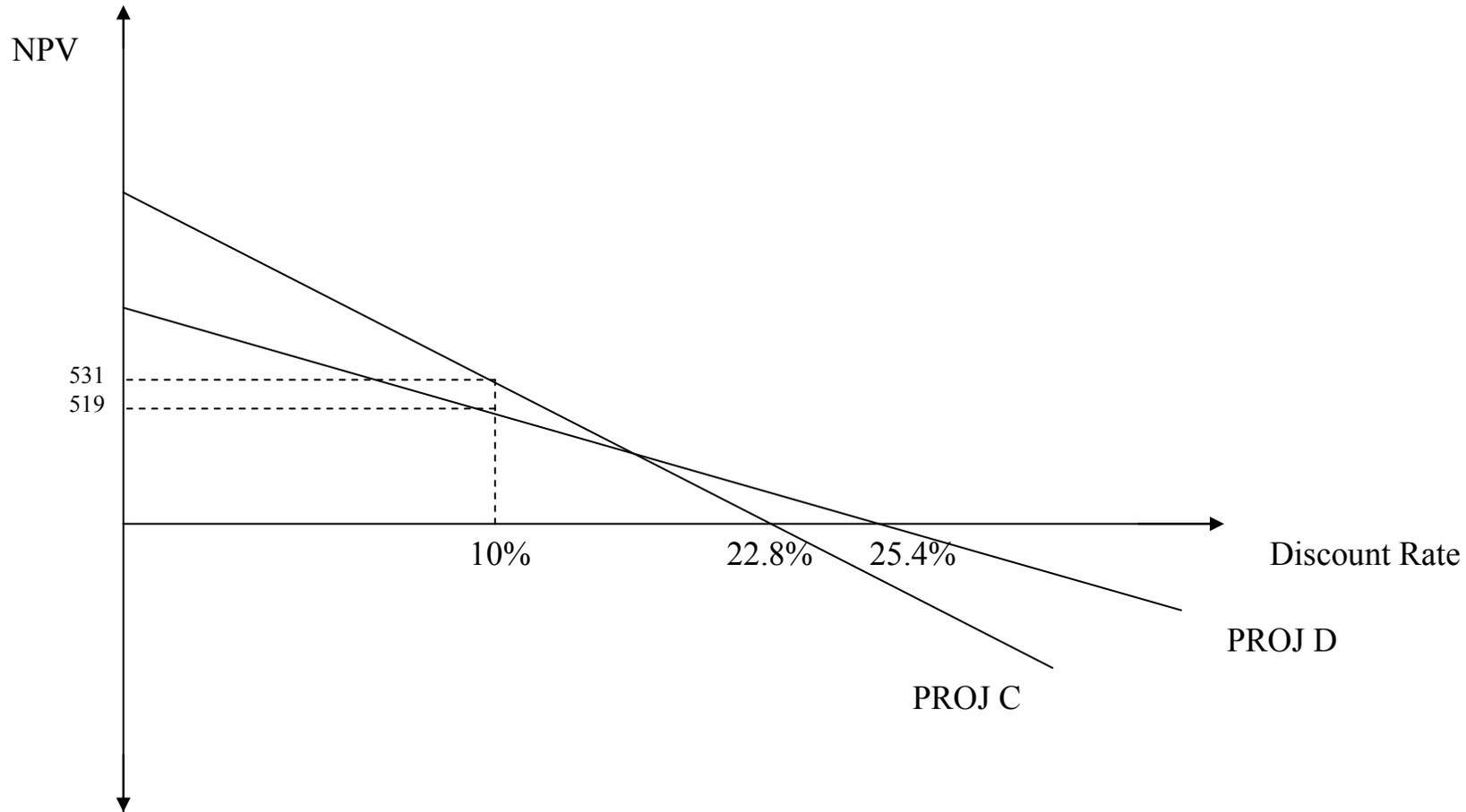
NPV:

PROJECT A: -407
 PROJECT B: 511
 PROJECT C: 531 **SELECT PROJECT C**
 PROJECT D: 519

IRR

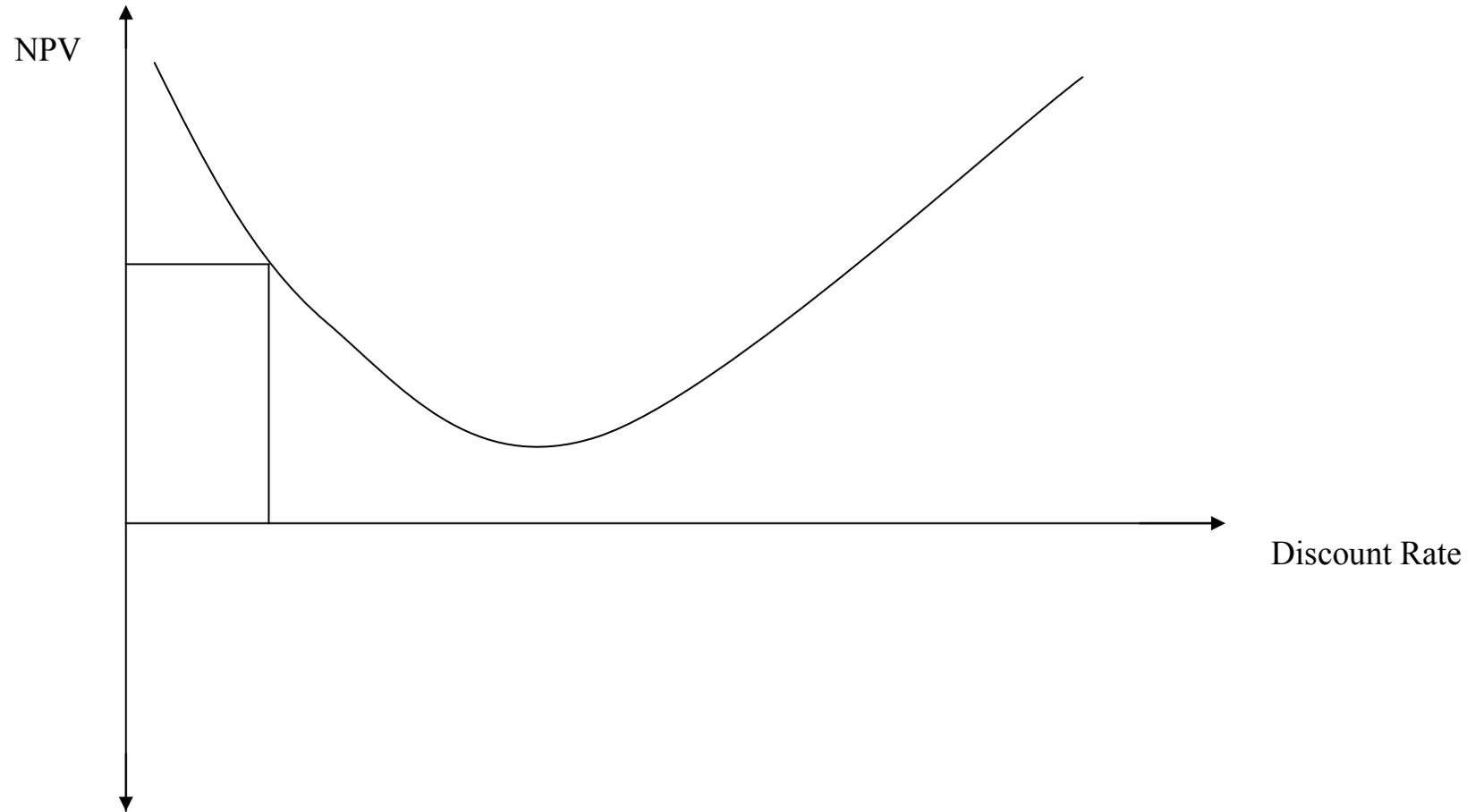
PROJECT A: -200%
 PROJECT B: 20.9%
 PROJECT C: 22.8%
 PROJECT D: 25.4% **SELECT PROJECT D**

COMPARING NPV AND IRR - 1



Select Project with higher NPV: Project C.

COMPARING NPV AND IRR -2



Impossible to find IRR!!! NPV exists!

COMPARING NPV AND IRR –3 Size Effect

- Discount Rate: 10%
- **Project A** : Date 0 Investment -£1000.
- Date 1 Cashflow £1500.
- NPV = £364.
- IRR = 50%
- **Project B:-** Date 0 Investment -£10
- Date 1 Cashflow £18.
- NPV = £6.36
- IRR = 80%.
- Which Project do we take?

The Investment Appraisal Debate.

Richard Pike:

Year of Survey	1975	1980	1986	1992
Technique	%	%	%	%
Payback	73	81	92	94
ARR	51	49	56	50
IRR	44	57	75	81
NPV	32	39	68	74

Sample size: 100 Large UK based Firms.

Combination of Techniques: Pike 1992:

Year	1975	1980	1986	1992
No Methods	2	0	0	0
Single Method	31 (0)	24 (1)	8 (0)	4 (= PB)
2	34 (6)	40 (11)	29 (9)	28 (11)
3	22 (15)	24 (14)	29 (24)	32 (27)
4	11	12	34	36
Total	100 (32)	100 (38)	100 (67)	100 (74)

() = NPV

Recent Developments in Investment Appraisal

- NPV is a static, now-or-never, method.
- => Decision Trees.
- => Monte Carlo Methods.
- => “Stage-Gate” Method (eg Qinetiq).
- => Real Options (Now-or-later: Option to delay, option to abandon, option to expand).

Decision Trees and Sensitivity Analysis

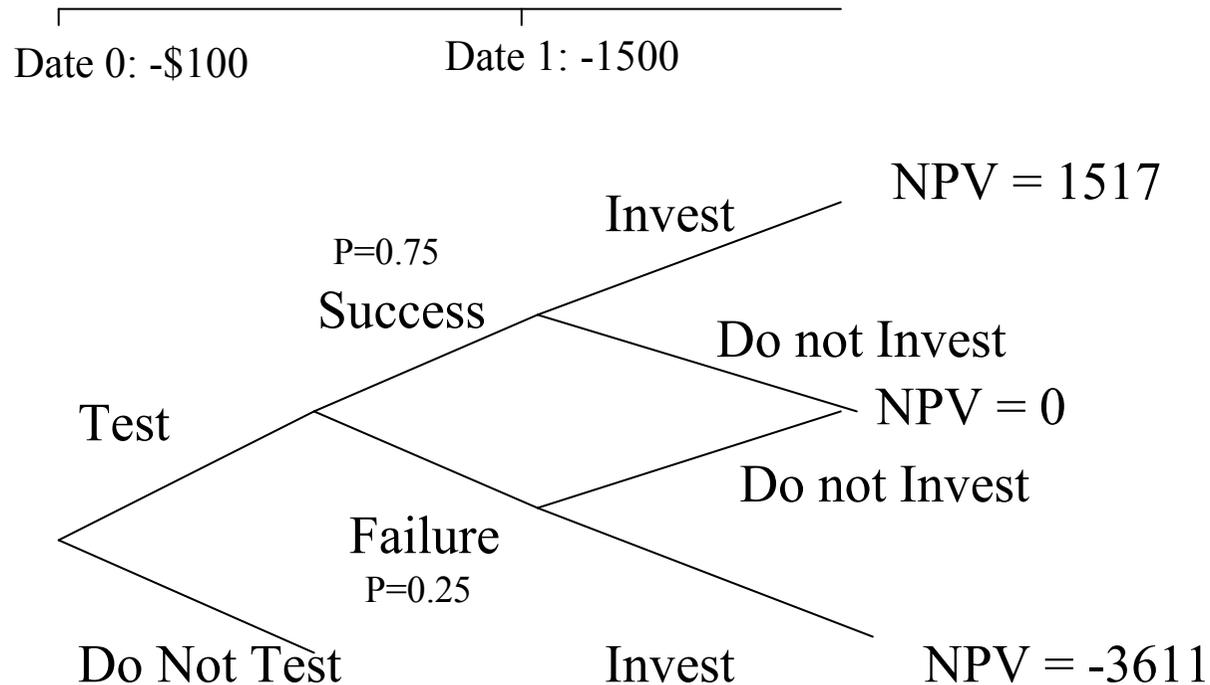
- Example: From RWJJ Page 229.
- New Project: Test and Development Phase: Investment \$100m.
- 0.75 chance of success.
- If successful, Company can invest in full scale production, Investment \$1500m.
- Production will occur over next 5 years with the following cashflows.

Production Stage: Base Case

\$000		Year 1	Year 2 - 6
Revenues			6000
Variable Costs			-3000
Fixed Costs			-1791
Depreciation			-300
Pretax Profit			909
Tax (34%)			-309
Net Profit			600
Cashflow			900
Initial Investment		-1500	

$$\begin{aligned} \text{Date 1 NPV} &= -1500 + \sum_{t=1}^5 \frac{900}{(1.15)^t} \\ &= 1517 \end{aligned}$$

Decision Tree.



Solve backwards: If the tests are successful, SEC should invest, since $1517 > 0$.

If tests are unsuccessful, SEC should not invest, since $0 > -3611$.

Now move back to Stage 1.

Invest \$100m now to get 75% chance of \$1517m one year later?

Expected Payoff = $0.75 * 1517 + 0.25 * 0 = 1138$.

NPV of testing at date 0 = $-100 + \frac{1138}{1.15} = \890

Therefore, the firm should test the project.

Sensitivity Analysis (What-if analysis or BOP analysis)

Examines sensitivity of NPV to changes in underlying assumptions (on revenue, costs and cashflows).

Sensitivity Analysis.

- NPV Calculation for all 3 possibilities of a single variable + expected forecast for all other variables.

NPV			Expected	
		Pessimistic	or Best	Optimistic
Market Size		-1802	1517	8154
Market Share		-696	1517	5942
Price		853	1517	2844
Variable Cost		189	1517	2844
Fixed Cost		1295	1517	1628
Investment		1208	1517	1903

Limitation in just changing one variable at a time.

Scenario Analysis- Change several variables together.

Break - even analysis examines variability in forecasts.

It determines the number of sales required to break even.

Monte Carlo Method (RWJJ pp 237-241).

- Monte-Carlo simulation: further attempt to model real-world uncertainty.
- Monte-Carlo? Analysing project uncertainty same way that you would analyse gambling strategies.

Monte Carlo (continued)

- 5 basic steps: **1. Specify the basic model** (annual revenue, annual costs, initial investment).
- Annual revenue: number of products sold by entire industry * firm's mkt share * selling price per unit.
- Annual Cost: $FC + VC + \text{Mktg cost} + \text{selling costs}$.
- Initial Investment = cost of patent + test mktg costs + cost of production facility.

Step 2: Specify a distribution for each variable.

- Revenue: probability distribution for next year's total industry sales, firm's market share, and selling price.
- Extend to other years.
- Repeat for cost and investment.
- Computer draws one outcome (combination of all distributions).
- Monte Carlo: repeat the procedure thousands of times.
- => expected cashflows each year => NPV.

Monte Carlo used in practice?

- RWJJ: Not likely to be the ‘wave of the future’.
- Graham and Harvey survey: only 15% of the firms use capital budgeting simulations.
- But pharmaceutical industry has pioneered its use (Merck: CFO Judy Lewent: Harvard Business Review Jan/Feb 1994).

“Stage-Gate”

- Similar to Monte Carlo: looks at distributions of outcomes:
- Different from MC: considers projects in stages (a la decision trees).
- Stage Gate is Proprietary method.
- Used by companies such as Qinetiq.
- See “The Valuation of projects” by Dr Tony Bishop (Google).

Real Options.

- Real Options recognise flexibility in investment appraisal decision.
- Standard NPV: static; “now or never”.

- Real Option Approach: “Now or Later”.
- -Option to delay, option to expand, option to abandon.

Types of Real Option

- Option to Delay (Timing Option).
- Option to Expand (eg R and D).
- Option to Abandon.

Valuation of Real Options

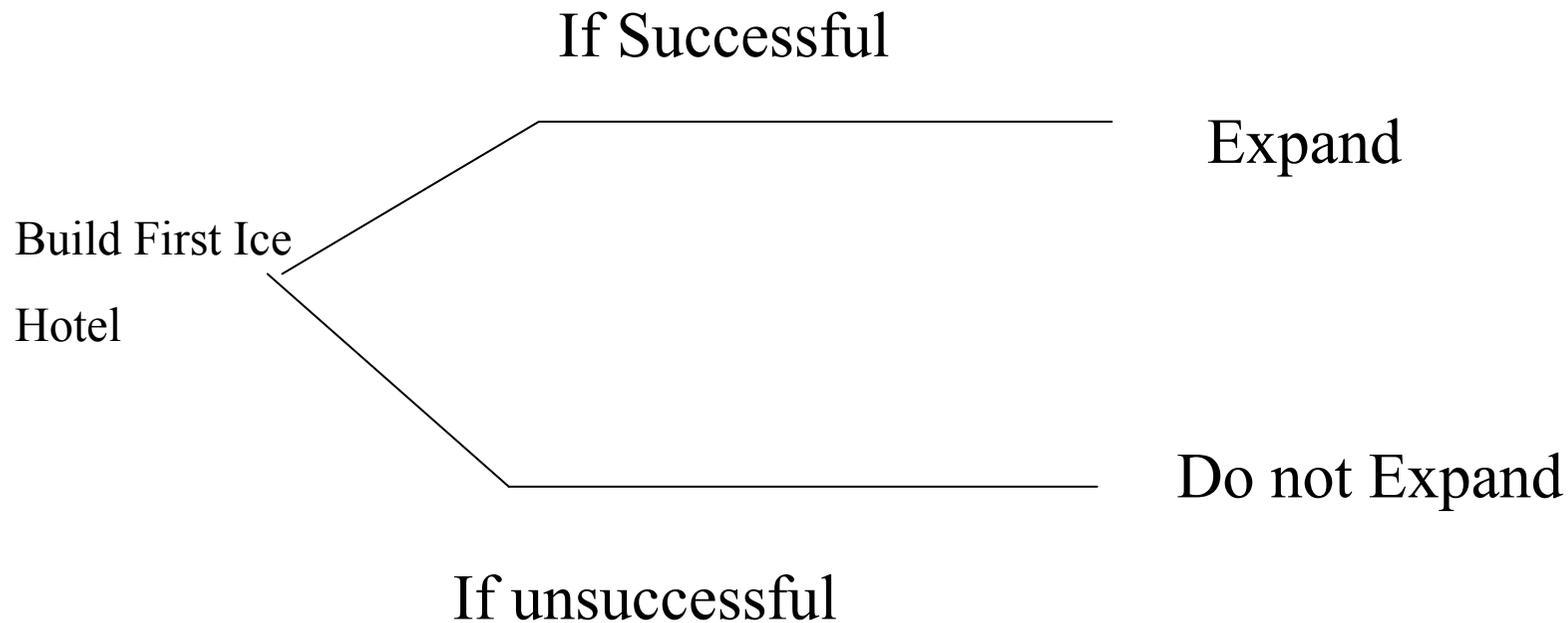
- Binomial Pricing Model
- Black-Scholes formula

Value of a Real Option

- A Project's Value-added = Standard NPV plus the Real Option Value.
- For given cashflows, standard NPV decreases with risk (why?).
- But Real Option Value increases with risk.
- R and D very risky: \Rightarrow Real Option element may be high.

Simplified Examples

- **Option to Expand (page 241 of RWJ)**



Option to Expand (Continued)

- NPV of single ice hotel
- $NPV = -12,000,000 + 2,000,000/0.20 = -2m$
- Reject?
- Optimistic forecast: $NPV = -12M + 3M/0.2$
- $= 3M$.
- Pessimistic: $NPV = -12M + 1M/0.2 = -7m$
- Still reject?

Option to expand (continued)

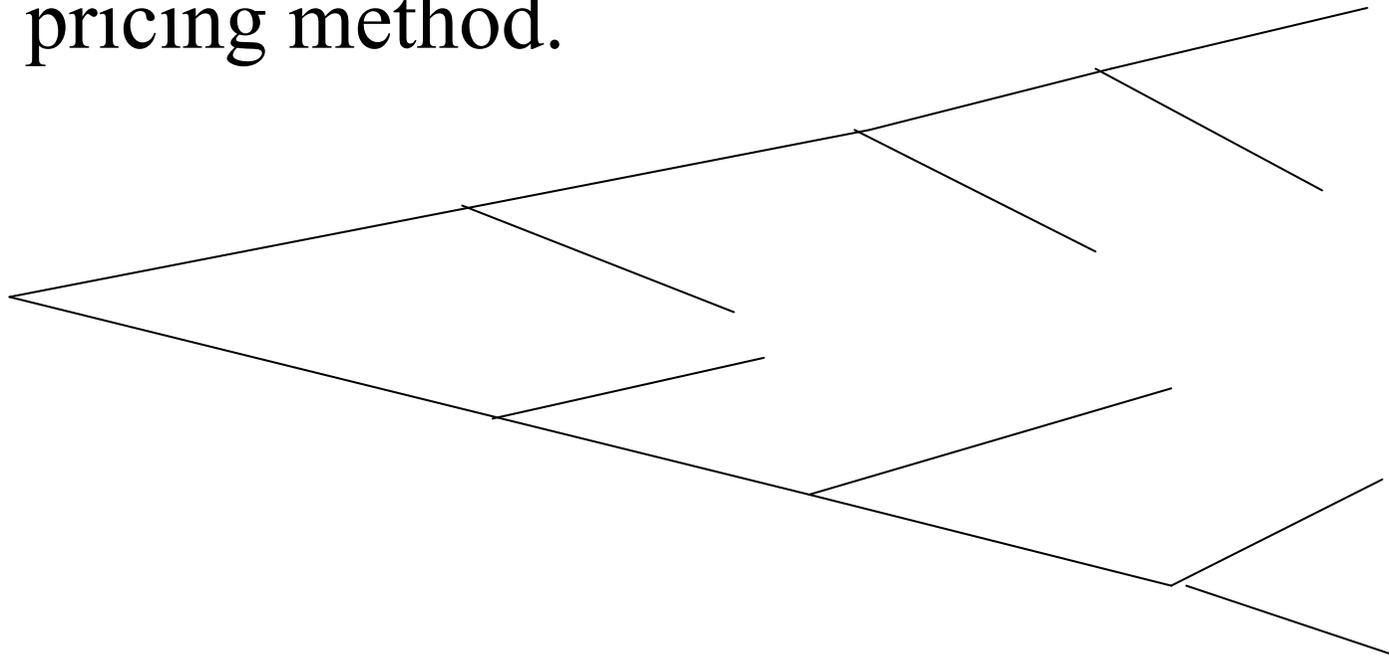
- Given success, the E will expand to 10 hotels
- \Rightarrow
- $NPV = 50\% \times 10 \times 3m + 50\% \times (-7m) = 11.5 \text{ m.}$
- Therefore, invest.

Option to abandon.

- $\text{NPV}(\text{opt}) = -12\text{m} + 6\text{m}/0.2 = 18\text{m}.$
- $\text{NPV}(\text{pess}) = -12\text{m} - 2\text{m}/0.2 = -22\text{m}.$
- $\Rightarrow \text{NPV} = -2\text{m}.$ Reject?
- But abandon if failure \Rightarrow
- $\text{NPV} = 50\% \times 18\text{m} + 50\% \times -12\text{m}/1.20$
- $= 2.17\text{m}$
- Accept.

Game-theoretic Approach to Real Options.

- Option to Delay in the Face of Competition (Smit and Ankum).
- Smit and Ankum employ binomial option-pricing method.



Option to delay and Competition (Smit and Ankum).

- 2 competing firms, deciding whether to invest now or delay.

benefit: wait to observe market demand.

-cost: Lost cash flows.

-cost: lost monopoly advantage, increasing competition.

-Value-added = Zero NPV plus economic rent;

Economic Rent: Innovation, barriers to entry, product differentiation, patents.

Long-run: $ER = 0$.

Firm faces trade-off between option value of waiting and loss from competition.

Other Papers analysing game theoretic approach to Real Options

- Smit and Trigeorgis (RFE 2006).
- Imai and Watanabe (Google 2004)
- => Class exercise.

In practice, NPV not always used: Why Not?.

-Agency (incentive) problems: eg Short-term compensation schemes => Payback.

Behavioural:-

Managers prefer % figures => IRR, ARR

-Managers don't understand NPV/ Complicated Calculations.

-Payback simple to calculate.

-Other Behavioural Factors (see later section on Behavioural Finance!!)

Increase in Usage of correct DCF techniques (Pike):

Computers.

Management Education.

Game-theoretic model of NPV.

- Israel and Berkovitch RFS 2004.
- NPV is seen as standard value-maximising technique.
- But IB's game-theoretic approach considers the impact of agency and asymmetric information problems

Israel and Berkovitch (continued)

- A firm consisting of two components:
- 1: Top management (Headquarters)
- 2. divisional managers (“the manager”).
- Objective of headquarters: Maximisation of shareholder value.
- Objective of manager: maximise her own utility.

Israel and Berkovitch (continued)

- HQ needs to design a monitoring and incentive mechanism to deal with these conflicting objectives.
- \Rightarrow capital allocation system specifying:
- A capital budgeting rule (eg NPV/IRR) and a wage compensation for divisional managers.

Israel and Berkovitch

- Paper demonstrates the ingredients of a game-theoretic approach.
- Players.
- Objectives (utility functions to maximise)
- Strategies.
- Payoffs.

2. Cost of Capital/discount rate/investors' required return.

- What discount rate to use in NPV/valuation?
- Portfolio analysis \Rightarrow Investors' required return as a compensation for risk
- \Rightarrow CAPM (capital asset pricing model) \Rightarrow cost of equity (risk-averse equity-holders' required return): increases with risk.

Cost of Capital/discount rate/investors' required return (continued).

- Cost of debt (debt-holders' required return).
- Capital structure (mix of debt and equity).
- => discount rate/cost of capital/investors' required return=>

$$WACC = \%debt * K_d + \%equity * K_e.$$

Example

- New project: initial investment $I = \text{£}1000$
- Project expected to generate $\text{£}150$ per year forever (perpetuity)
- $K_d = 5\%$, $K_e = 15\%$
- Consider Market Value of firm's debt = market value of firm's equity \Rightarrow WACC = 10%.

$$NPV = -1000 + \frac{150}{0.10} = 500$$

Link to Section 3: Link between Value of the firm and NPV.

Positive NPV project immediately increases current equity value (share price immediately goes up!)

Pre-project announcement $V = B_o + E_o$

New capital (all equity) I

New project: $NPV = V_n - I.$

Value of Debt B_o

Original equity holders $E_o + V_n - I$

New equity I

New Firm Value $V + V_n$

Example:

$$V = B_o + E_o = 500 + 500 = 1000.$$

$$I = 20$$

$$NPV = V_n - I = 60 - 20 = 40.$$

Value of Debt	B_o	= 500.
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Original Equity	$E_o + V_n - I$	= 500 + 40 = 540
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New Equity	I	= 20
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Total Firm Value	$V + V_n$	= 1000 + 60 = 1060.
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Positive NPV: Effect on share price.

Assume all equity.

£K	Market Value	No of Shares	Price per Share		Market Value	No of Shares	Price per Share
Current	1000	1000	1		1040	1000	1.04
<u>New Project</u>					20	19	1.04
Project Income	60				1060	1019	1.04
Required Investment	20						
NPV	40						

- For now, we assume rationality of agents, and efficient markets (\Rightarrow markets react immediately to news)!
- Analyse efficient markets in section 6
- And behavioural corporate finance in section 9.

SECTION 3: Value of the Firm and Capital Structure

Value of the Firm = Value of Debt + Value of Equity = discounted value of future cashflows available to the providers of capital.

(where values refer to **market** values).

Capital Structure is the amount of debt and equity: It is the way a firm finances its investments.

Unlevered firm = all-equity.

Levered firm = Debt plus equity.

Miller-Modigliani said that it does not matter how you split the cake between debt and equity, the value of the firm is unchanged (Irrelevance Theorem).

Allocation of Cashflows to investors.

- Firm generates NCF (net cash-flow)
- Debt-holders paid first (interest).
- Then government (corporation tax).
- Then equity-holders (residual claimants) get the remainder (net income): capital gains and dividends.
- => higher debt (higher interest) => less tax
- => higher debt => more volatile returns for shareholders.

Value of the Firm = discounted value of future cashflows available to the providers of capital.

-Assume Incomes are perpetuities.

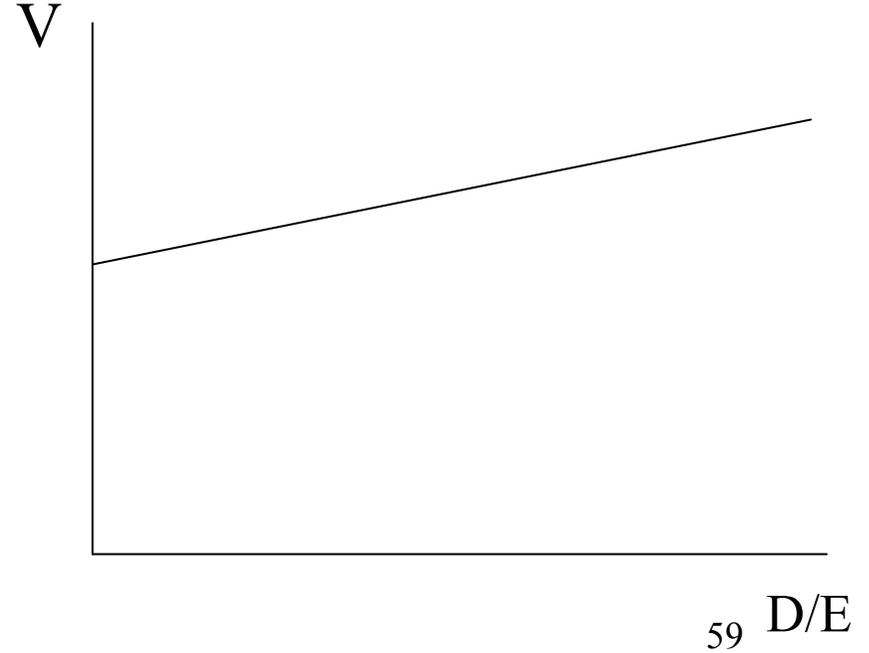
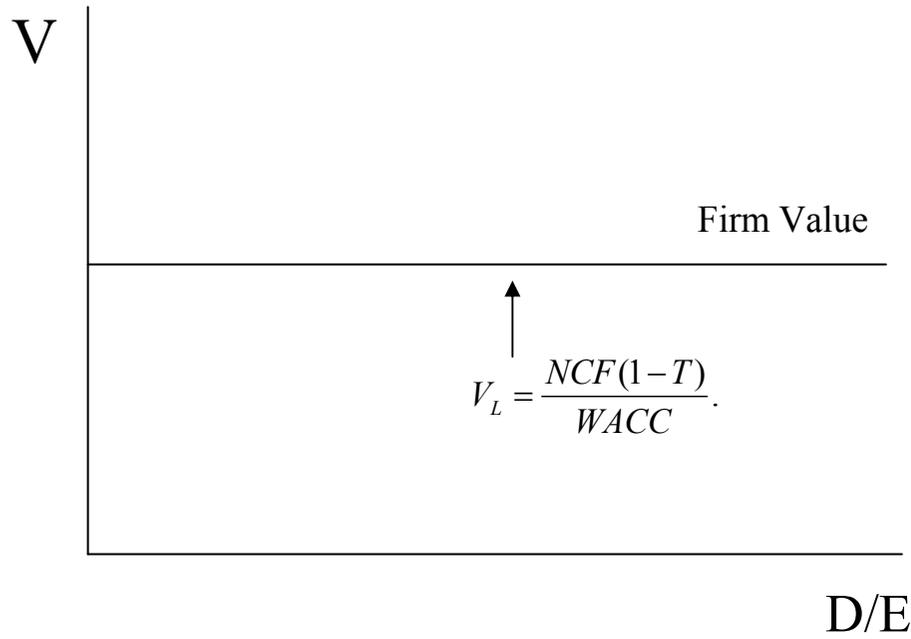
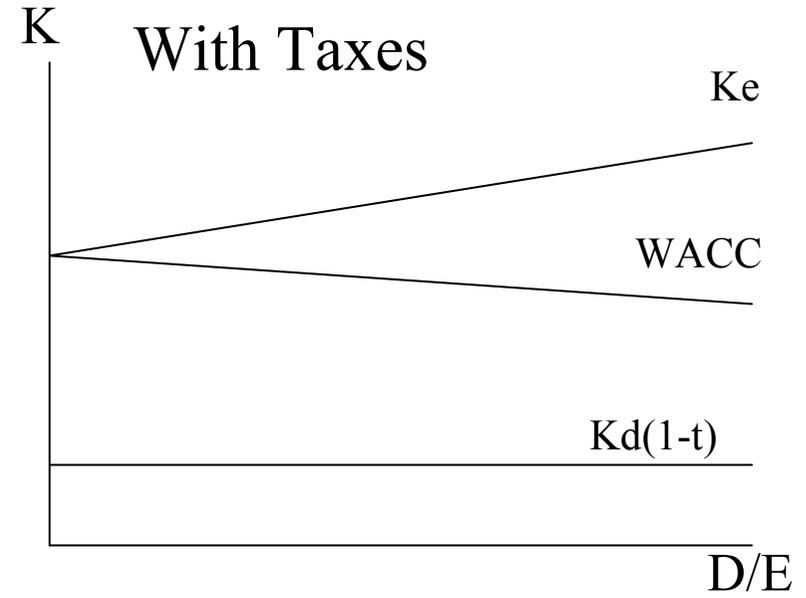
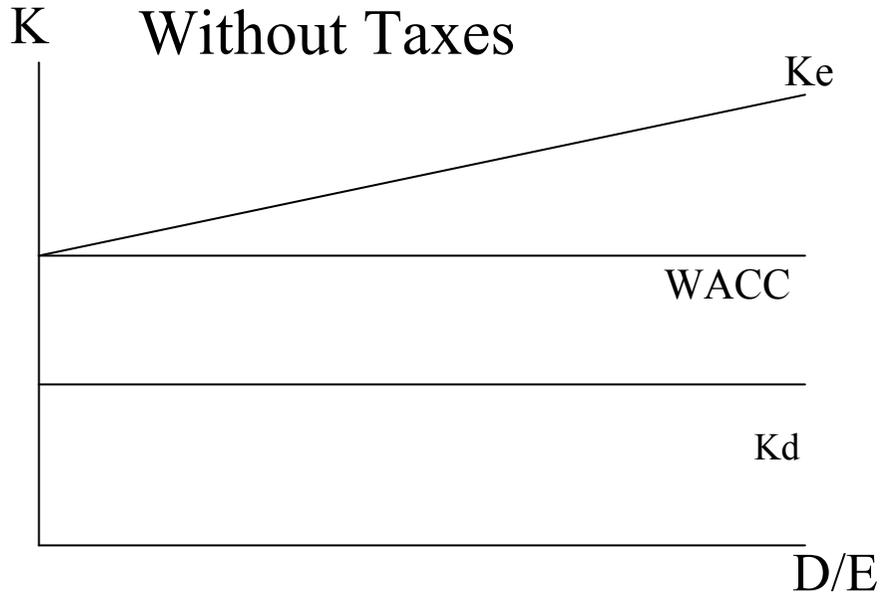
Miller- Modigliani Theorem:

$$V_U = \frac{NCF(1-T)}{\rho} = V_E$$

$$V_L = V_U + T.V_D = \frac{NCF(1-T)}{WACC} = V_E + V_D = \frac{NI}{K_e} + V_d.$$

Irrelevance Theorem: Without Tax, Firm Value is independent of the Capital Structure.

Note that $WACC = \%debt * K_d(1-t) + \%equity * K_e$

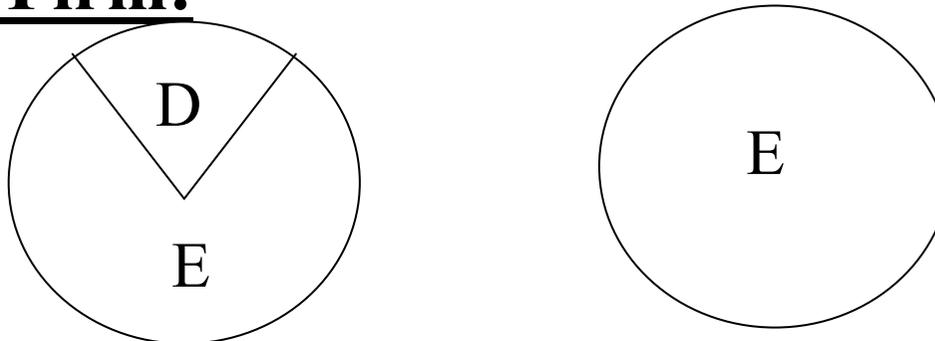


MM main assumptions:

- Symmetric information.
- Managers unselfish- maximise shareholders wealth.
- Risk Free Debt.

MM assumed that investment and financing decisions were separate. Firm first chooses its investment projects (NPV rule), then decides on its capital structure.

Pie Model of the Firm:



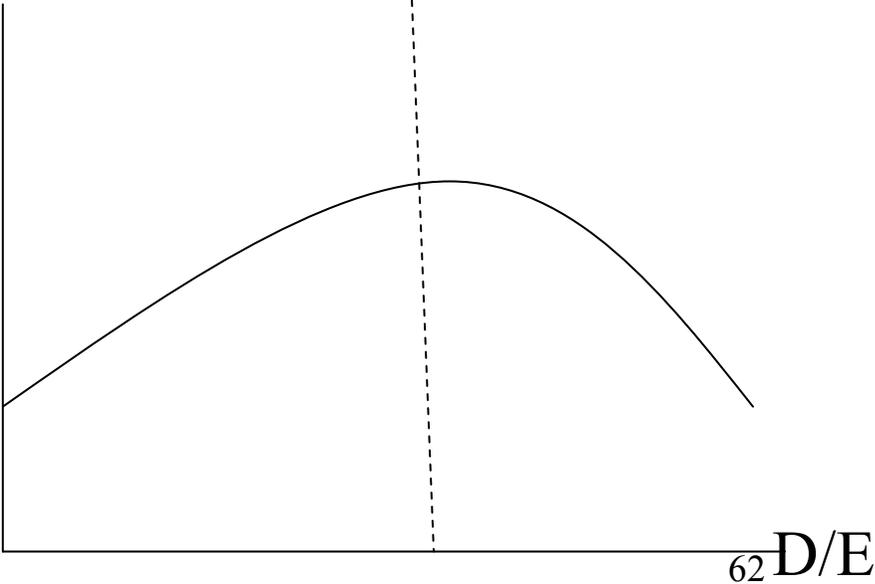
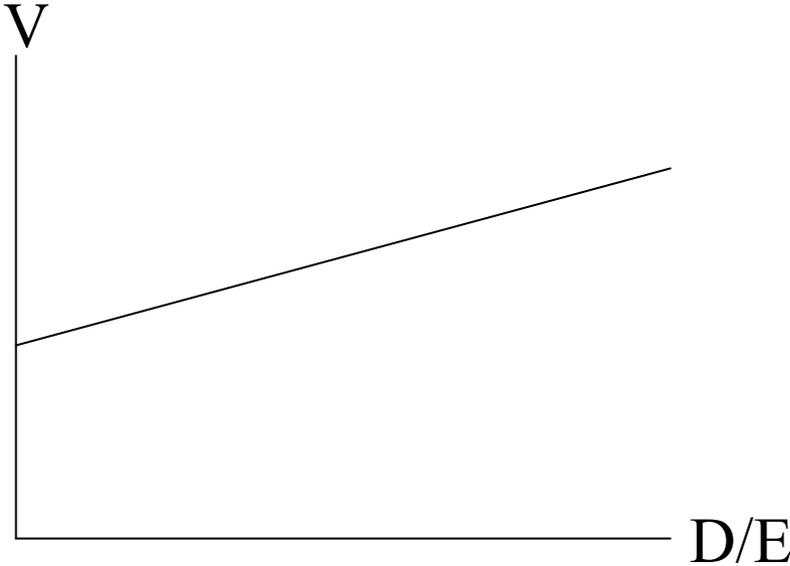
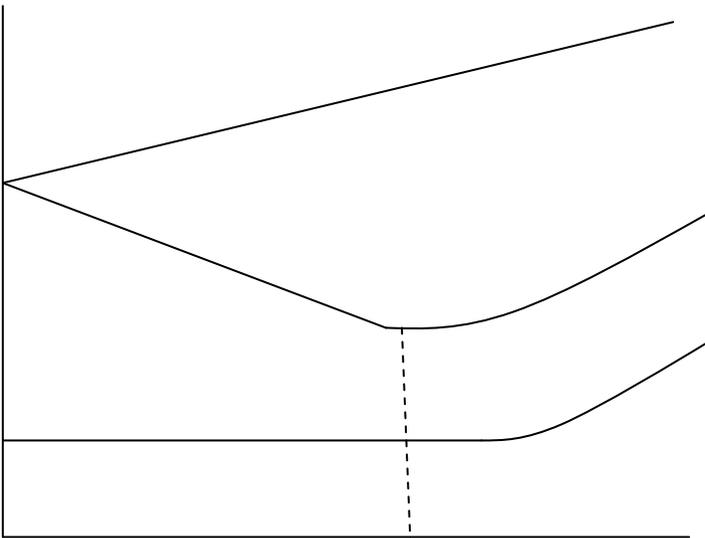
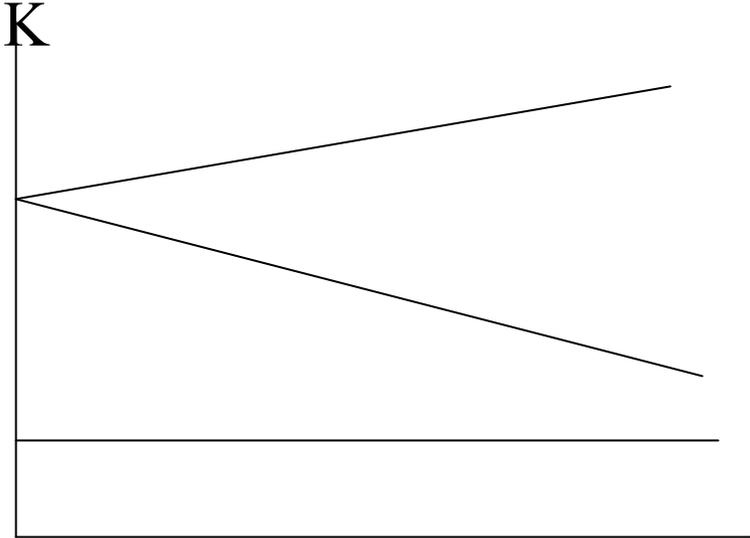
MM irrelevance theorem- firm can use any mix of debt and equity – this is unsatisfactory as a policy tool.

Searching for the Optimal Capital Structure.

- Tax benefits of debt.
- Asymmetric information- Signalling.
- Agency Costs (selfish managers).
- Debt Capacity and Risky Debt.

Optimal Capital Structure maximises firm value.

Combining Tax Relief and Debt Capacity (Traditional View).



Section 4: Optimal Capital Structure, Agency Costs, and Signalling.

Agency costs - manager's self interested **actions**.
Signalling - related to managerial **type**.

Debt and Equity can affect Firm Value because:

- Debt increases managers' share of equity.
- Debt has threat of bankruptcy if manager shirks.
- Debt can reduce free cashflow.

But- Debt - excessive risk taking.

AGENCY COST MODELS.

Jensen and Meckling (1976).

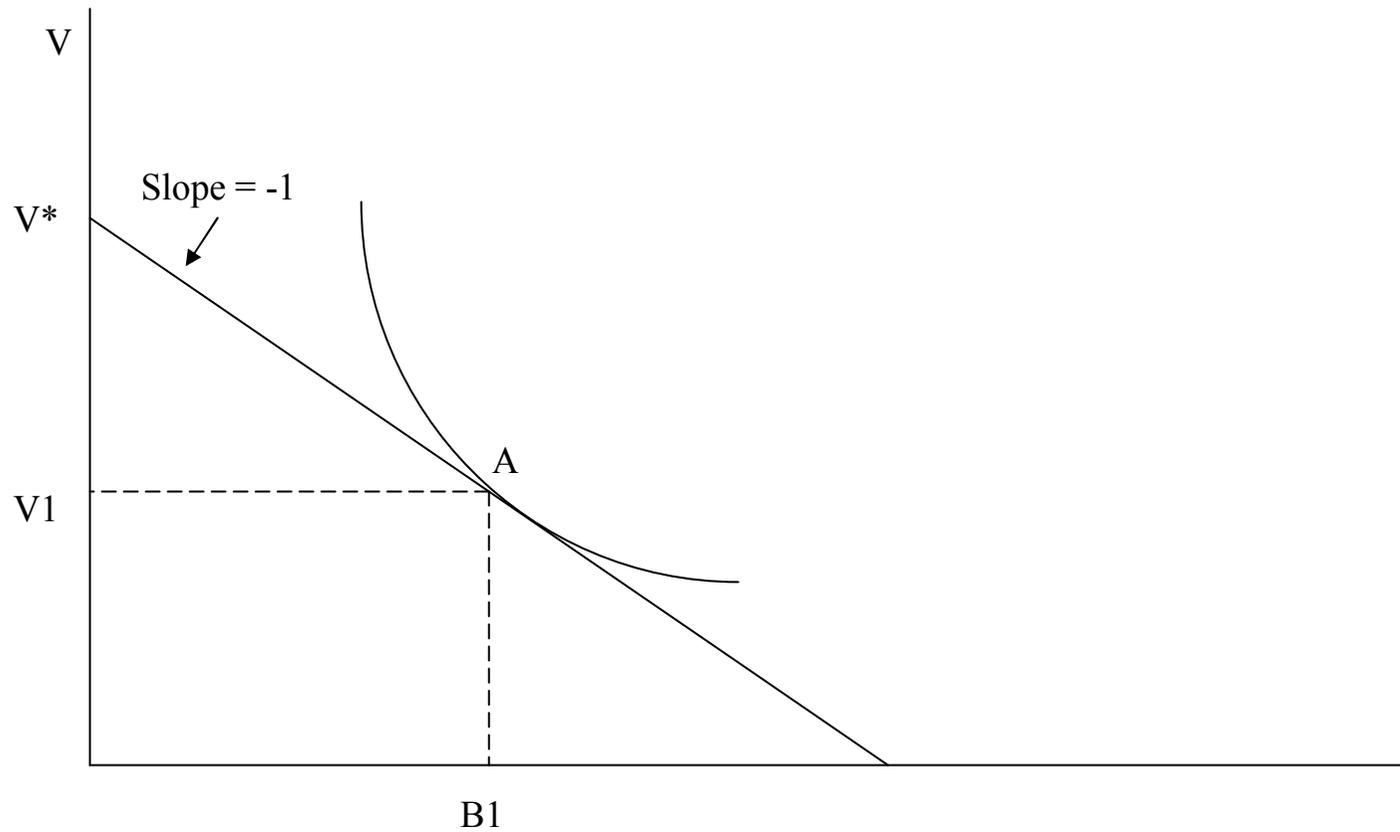
- **self-interested manager** - monetary rewards \vee private benefits.

- issues debt and equity.

Issuing equity \Rightarrow lower share of firm's profits for manager \Rightarrow he takes more perks \Rightarrow firm value \downarrow

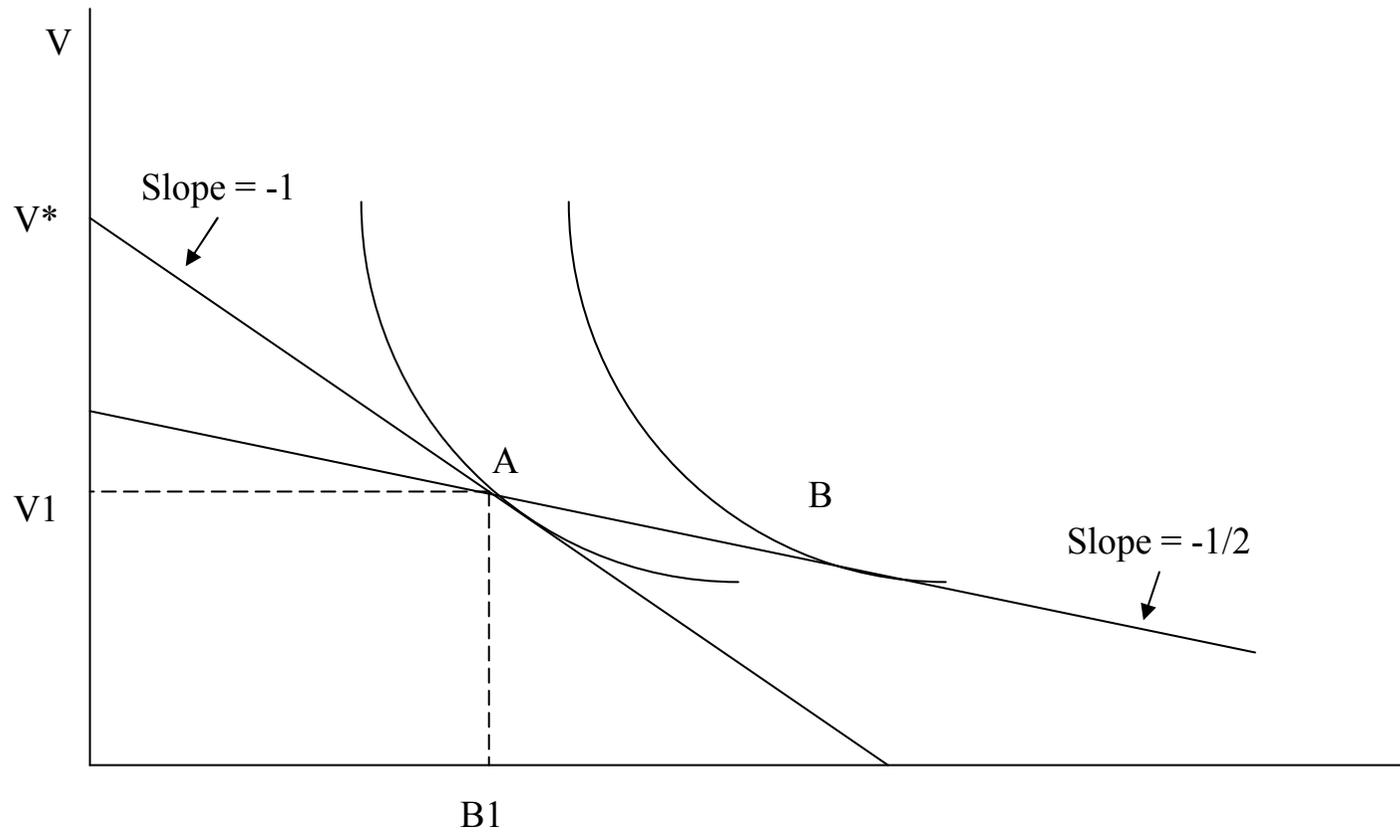
Issuing debt \Rightarrow he owns more equity \Rightarrow he takes less perks \Rightarrow firm value \uparrow

Jensen and Meckling (1976)



If manager owns all of the equity, equilibrium point A .

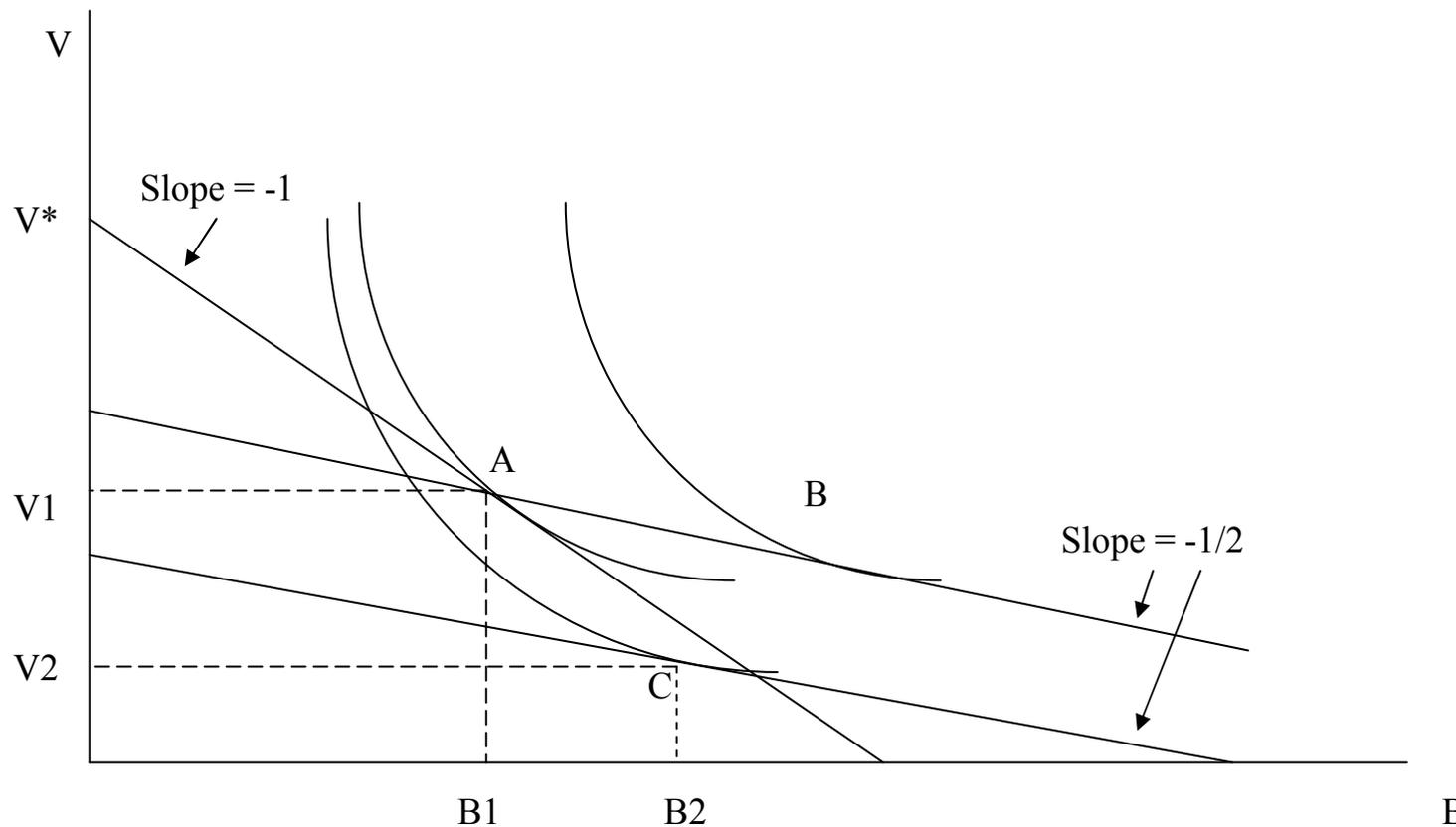
Jensen and Meckling (1976)



If manager owns all of the equity, equilibrium point A.

If manager owns half of the equity, he will get to point B if he can.

Jensen and Meckling (1976)



If manager owns all of the equity, equilibrium point A.

If manager owns half of the equity, he will get to point B if he can.

Final equilibrium, point C: value V_2 , and private benefits B_1 .⁶⁷

Jensen and Meckling - Numerical Example.

	PROJECT	PROJECT
	A	B
EXPECTED INCOME	500	1000
MANAGER'S SHARE:		
100%	500	1000
VALUE OF PRIVATE BENEFITS	800	500
TOTAL WEALTH	1300	1500
MANAGER'S SHARE:		
50%	250	500
VALUE OF PRIVATE BENEFITS	800	500
TOTAL WEALTH	1050	1000

Manager issues
100% Debt.

Chooses Project B.

Manager issues
some Debt and
Equity.

Chooses Project A.

Optimal Solution: Issue Debt?

Issuing debt increases the manager's fractional ownership => Firm value rises.

-But:

Debt and risk-shifting.

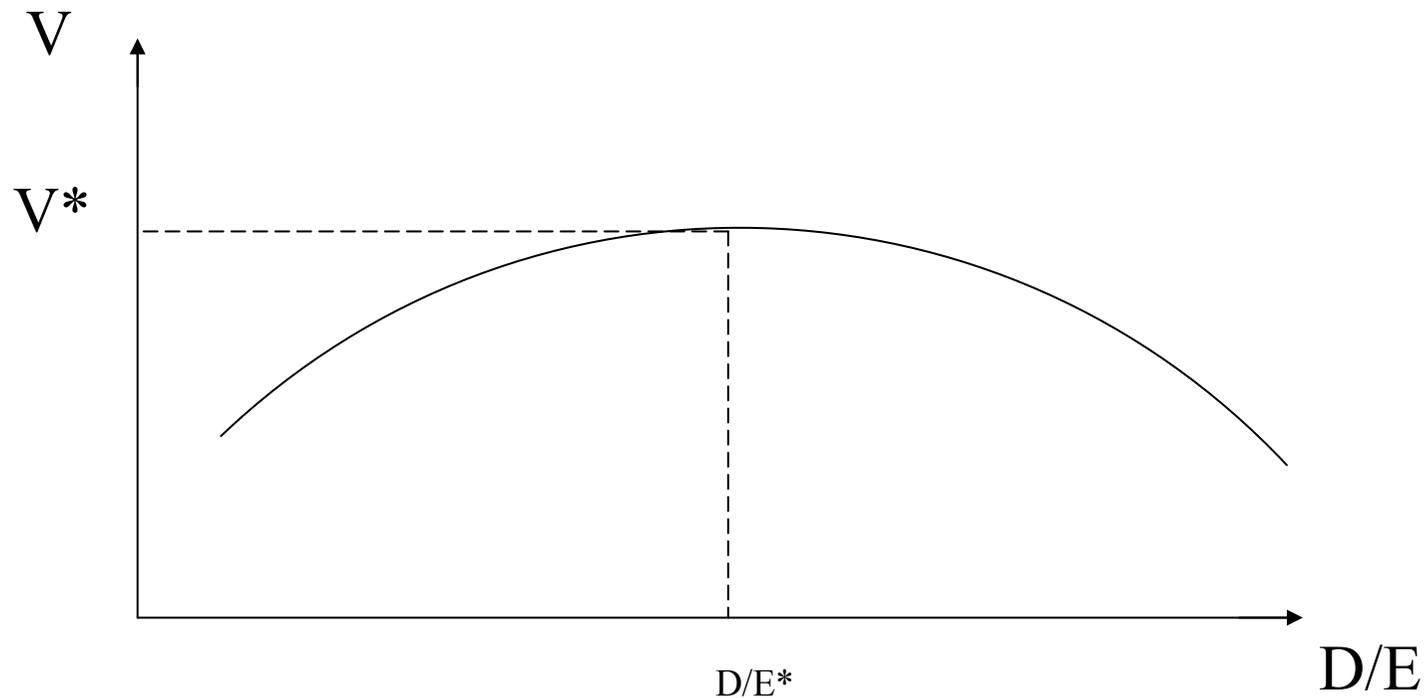
		Project 1	Project 2	Probability
State 1		100	0	0.5
State 2		100	160	0.5
		100	80	
Values:	Debt	50	25	
	Equity	50	55	

OPTIMAL CAPITAL STRUCTURE.

Trade-off: Increasing equity \Rightarrow excess perks.

Increasing debt \Rightarrow potential risk shifting.

Optimal Capital Structure \Rightarrow max firm value.



Other Agency Cost Reasons for Optimal Capital structure.

Debt - bankruptcy threat - manager increases effort level.
(eg Hart, Dewatripont and Tirole).

Debt reduces free cashflow problem (eg Jensen 1986).

Agency Cost Models – continued.

Effort Level, Debt and bankruptcy (simple example).

Debt holders are hard- if not paid, firm becomes bankrupt, manager loses job- manager does not like this.

Equity holders are soft.

Effort Level	High	Low	Required Funds
Income	500	100	200

What is Optimal Capital Structure (Value Maximising)?

Firm needs to raise 200, using debt and equity.

Manager only cares about keeping his job. He has a fixed income, not affected by firm value.

a) If debt < 100 , low effort. $V = 100$. Manager keeps job.

b) If debt > 100 : low effort, $V < D \Rightarrow$ bankruptcy.

Manager loses job.

So, high effort level $\Rightarrow V = 500 > D$. No bankruptcy \Rightarrow
Manager keeps job.

High level of debt \Rightarrow high firm value.

However: trade-off: may be costs of having high debt levels.

Free Cashflow Problem (Jensen 1986).

- Managers have (negative NPV) pet projects.
 - Empire Building.
 - => Firm Value reducing.
- Free Cashflow- Cashflow in excess of that required to fund all NPV projects.
- Jensen- benefit of debt in reducing free cashflow.

Jensen's evidence from the oil industry.

After 1973, **oil industry** generated **large free cashflows**.

Management **wasted money** on unnecessary R and D.

also started **diversification** programs outside the industry.

Evidence- McConnell and Muscerella (1986) – increases in R and D caused decreases in stock price.

Retrenchment- cancellation or delay of ongoing projects.

Empire building Management **resists** retrenchment.

Takeovers or threat => increase in debt => reduction in free cashflow => increased share price.

Jensen predicts:

young firms with lots of good (positive NPV) investment opportunities should have low debt, high free cashflow.

Old stagnant firms with only negative NPV projects should have high debt levels, low free cashflow.

Stultz (1990)- optimal level of debt => enough free cashflow for good projects, but not too much free cashflow for bad projects.

Income Rights and Control Rights.

Some researchers (Hart (1982) and (2001), Dewatripont and Tirole (1985)) recognised that securities allocate income rights **and** control rights.

Debtholders have a fixed first claim on the firm's income, and have liquidation rights.

Equityholders are residual claimants, and have voting rights.

Hart (2001)- What is the optimal allocation of control and income rights between a single investor and a manager?

How effective are control rights when there are different types of investors?

Why do we observe different types of outside investors- what is the optimal contract?

	Conflict	Benefits of Debt	Costs of Debt
Breaking MM		Tax Relief	Fin'l Distress/ Debt Capacity
Agency Models			
JM (1976)	Managerial Perks	Increase Mgr's Ownership	Risk Shifting
Jensen (1986)	Empire Building	Reduce Freecash	Unspecified.
Stultz	Empire Building	Reduce Freecash	Underinvestment .
Dewatripont and Tirole, Hart.	Low Effort level	Bankruptcy threat =>increased effort	DT- Inefficient liquidations.

Signalling Models of Capital Structure

Assymmetric info: Akerlof's (1970) Lemons Market.

Akerlof showed that, under assymmetric info, only bad things may be traded.

His model- two car dealers: one good, one bad.

Market does not know which is which: 50/50 probability.

Good car (peach) is worth £2000. Bad car (lemon) is worth £1000.

Buyers only prepared to pay average price £1500.

But: Good seller not prepared to sell. Only bad car remains.

Price falls to £1000.

Myers-Majuf (1984) – “securities may be lemons too.”

Asymmetric information and Signalling Models.

- managers have inside info, capital structure has signalling properties.

Ross (1977)

-manager's compensation at the end of the period is

$$M = (1 + r) \alpha_0 V_0 + \alpha_1 V_1 \quad \text{if } V_1 > D$$

$$M = (1 + r) \alpha_0 V_0 + \alpha_1 V_1 - C \quad \text{if } V_1 < D$$

D^* = debt level where bad firm goes bankrupt.

Result: Good firm $D > D^*$, Bad Firm $D < D^*$.

Debt level D signals to investors whether the firm is good or bad.

Myers-Majluf (1984).

-managers know the true future cashflow.

They act in the interest of initial shareholders.

P = 0.5	<u>Do Nothing:</u>		<u>Issue Equity</u>	
	Good	Bad	Good	Bad
Assets in Place	250	130	350	230
NPV of new project	0	0	20	10
Value of Firm	250	130	370	240

Expected Value 190 305

New investors 0 100

Old Investors 190 205

Consider old shareholders wealth:

Good News + Do nothing = 250.

$$\text{Good News + Issue Equity} = \frac{205}{305}(370) = 248.69.$$

Bad News and do nothing = 130.

$$\text{Bad News and Issue equity} = \frac{205}{305}(240) = 161.31.$$

Old Shareholders' payoffs

	Do nothing	Issue and invest
Good News	250 *	248.69
Bad News	130	161.31*

Equilibrium

	Do nothing	Issue and invest
Good News	250 *	248.69
Bad News	130	140 *

Issuing equity signals that the bad state will occur.

The market knows this - firm value falls.

Pecking Order Theory for Capital Structure => firms prefer to raise funds in this order:

Retained Earnings/ Debt/ Equity.

Evidence on Capital structure and firm value.

Debt Issued - Value Increases.

Equity Issued- Value falls.

However, difficult to analyse, as these capital structure changes may be accompanied by new investment.

More promising - Exchange offers or swaps.

Class discussion paper: Masulis (1980)- Highly significant Announcement effects:

+7.6% for leverage increasing exchange offers.

-5.4% for leverage decreasing exchange offers.

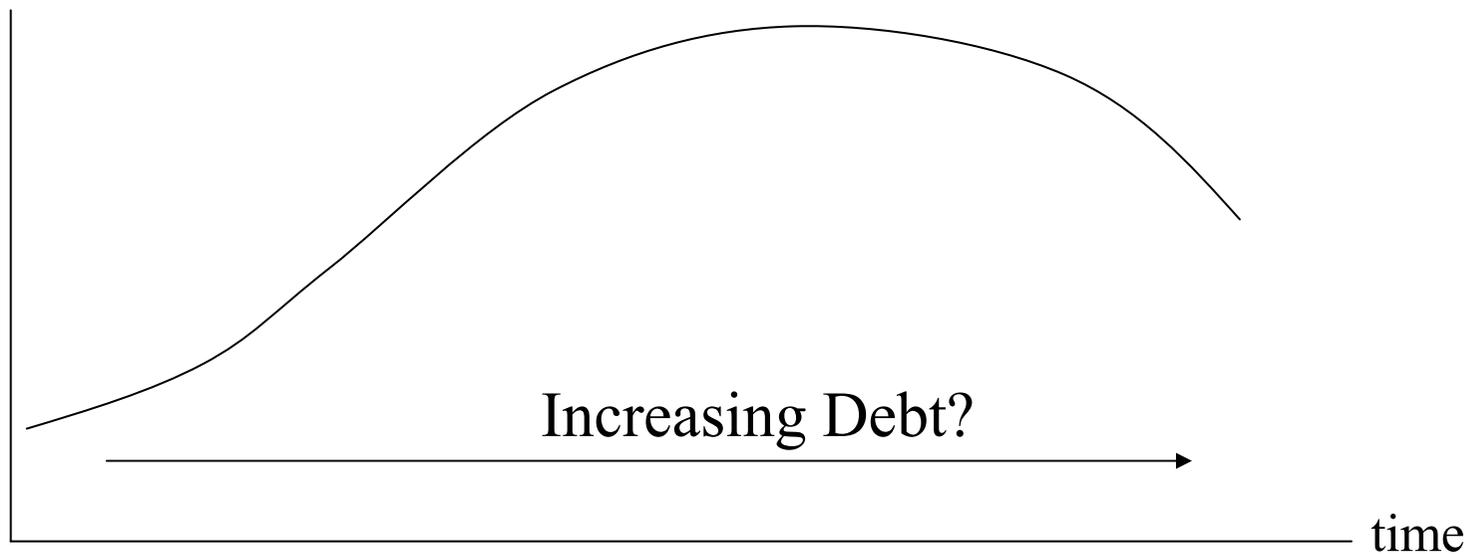
Practical Methods employed by Companies.

-Trade off models: PV of debt and equity.

-Pecking order.

-Benchmarking.

-Life Cycle.



Trade-off Versus Pecking Order.

- Empirical Tests.
- Multiple Regression analysis (firm size/growth opportunities/tangibility of assets/profitability.....
- \Rightarrow Relationship between profitability and leverage (debt): positive \Rightarrow trade-off.
- Or negative \Rightarrow Pecking order:
- Why?

Capital Structure and Product Market Competition.

- Research has recognised that firms' financial decisions and product market decisions not made in isolation.
- How does competition in the product market affect firms' debt/equity decisions?
- Limited liability models: Debt softens competition: higher comp => higher debt.
- Predation models: higher competition leads to lower debt. (Why?)

Game Theoretic Approach to Capital Structure.

- Moral Hazard Model.
- Asymmetric Information Model.
- See BCF section 8 for incorporation of managerial overconfidence.

Cash-flow Rights and Control Rights

- Debt-holders: first fixed claim on cash-flows (cash-flow rights); liquidation rights in bad times (control rights)- hard investors.
- Equity-holders: residual claimants on cash-flows (cash-flow rights): voting rights in good times (control rights) – soft investors.
- => minority shareholder rights versus blockholders.

Equity-holders' control rights

- Voting rights.
- Soft: free-rider problems.
- Minority holders versus block-holders.
- Minority –holders versus insiders.
- Separation of ownership and control.
- Corporate Charter.
- Dual class of shares.
- Pyramids/tunelling etc.

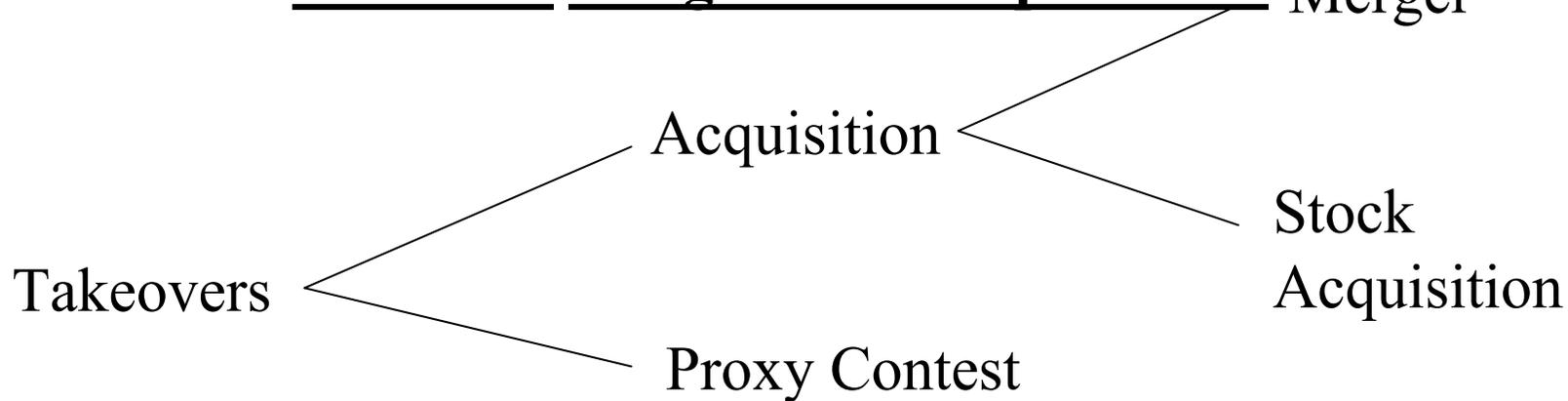
Capital/corporate structure in emerging economies.

- Separation of ownership and control.
- Corporate Charter.
- Dual class of shares.
- Pyramids/tunelling etc.
- Weak Legal Systems.
- Cultural differences.

Game-theoretic approaches.

- JFE special issue 1988 (Grossman and Hart, Stultz, Harris and Raviv).
- Bebchuk (lecture slides to follow).
- Garro Paulin and Fairchild (2006) Lecture slides to follow.

Section 5: Mergers and Acquisitions. Merger



1. Merger- must be approved by stockholders' votes.

2. Stock acquisition- No shareholder meeting, no vote required.

-bidder can deal directly with target's shareholders- bypassing target's management.

- often **hostile** => **target's defensive mechanisms.**

-shareholders may holdout- **freerider problems.**

3. Proxy Contests- group of shareholders try to vote in new directors to the board.

Synergy Value of a Merger

$$V_{AB} - (V_A + V_B).$$

Synergy comes from increases in cashflow from the merger:

$$\Delta CF_t = \Delta REV_t - \Delta Costs_t$$

Example: Market Value after Merger.

- Firm A (bidder): cashflows = £10m, $r = 20\%$.
 $V = £50m$.
- Firm B (target): cashflows = £6m, $r = 15\%$. =
£40m.
- If A acquires B: Combined Cashflows are expected to increase to £25m P.A. New Discount rate 25%.
- Synergy cashflows = £9m.
- Total value = £100m.
- Synergy Value = £10m.

Who gets the gains from mergers?

- Depends on what the bidder has to pay! (bid premium)

$$NPV_{Bidder} = V_{AB} - V_A - I$$

$$NPV_{target} = I - V_B$$

If $I = V_B$, Bidder gets all of the positive NPV.

If $I = V_{AB} - V_A$, Target gets all of the positive NPV.

Why a Bid premium?

- Hostile Bid: defensive (anti-takeover) mechanisms (leverage increases, poison pills, etc):
- Bidding wars.
- Market expectations.

Effects of takeovers on stock prices of bidder and target.

Successful Bids

Takeover Technique	Target	Bidders
Tender Offer	30%	4%
Merger	20%	0
Proxy Contest	8%	n.a

Unsuccessful Bids

Takeover Technique	Target	Bidders
Tender Offer	-3%	-1%
Merger	-3%	-5%
Proxy Contest	8%	n.a

Jensen and Ruback JFE 1983

Game Theoretic Approach to M and A.

- Grossman and Hart (Special Issue on Corporate Control 1982).
- Harris and Raviv (Special Issue on Corporate Control 1982).
- Bebchuk (Special Issue on Corporate Control 1982)..
- Burkart (JOF 1995).
- Garvey and Hanka.
- Krause.

Garvey and Hanka paper

- Lecture slides to follow.

Grossman and Hart free-rider paper

- Lecture slides to follow.

Section 6: Convertible Debt.

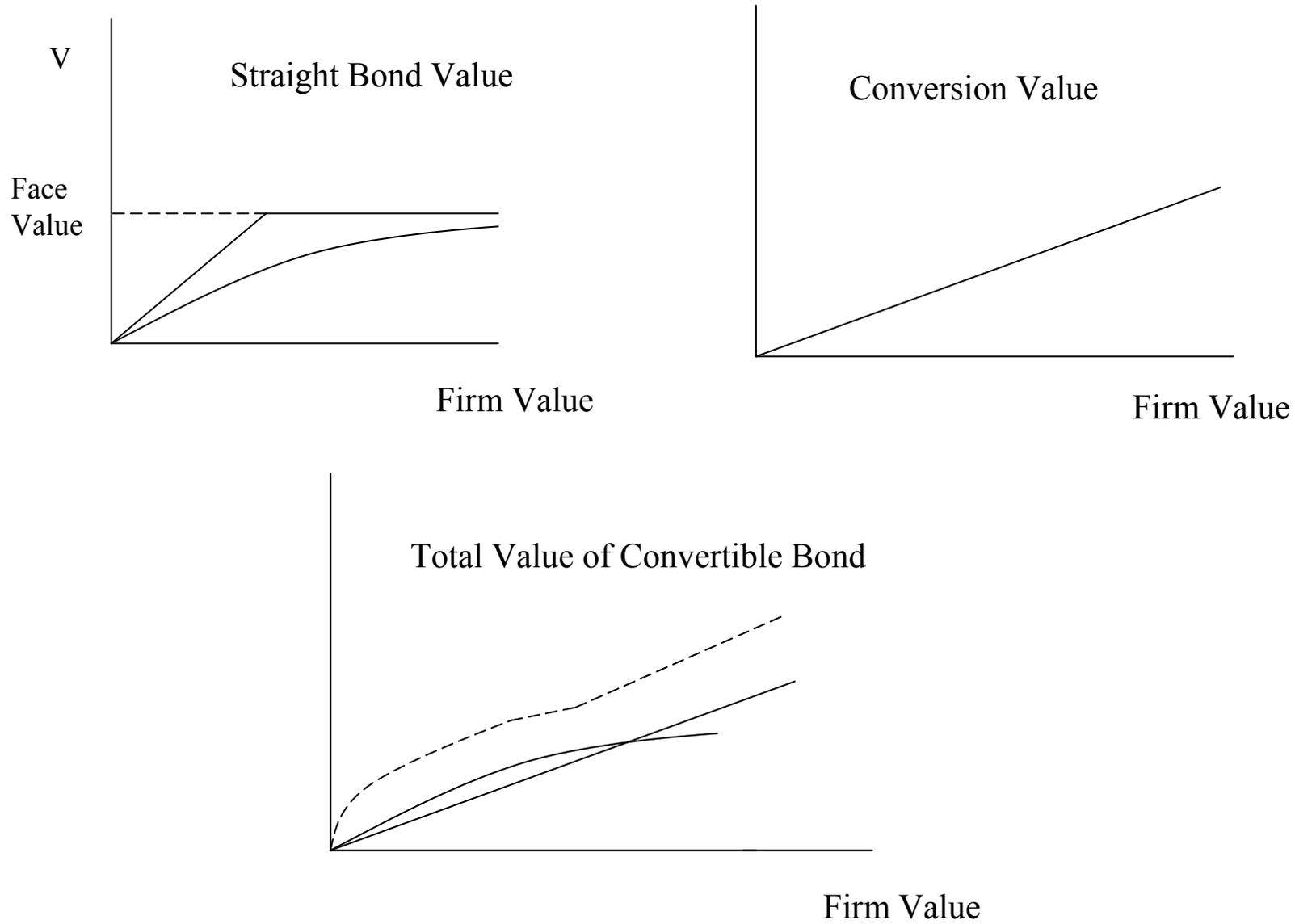
- Valuation of Convertibles.
- Impact on Firm Value.
- Why firms issue convertibles.
- When are they converted (call policy)?

Convertible bond -holder has the right to exchange the bond for common stock (equivalent to a call option).

Conversion Ratio = number of shares received for each bond.

Value of Convertible Bond = $\text{Max} \{ \text{Straight bond value, Conversion Value} \} + \text{option value.}$

Value of Convertible Bond. (Occidental Electric Case Study)



Conflict between Convertible Bond holders and managers.

Convertible Bond = straight debt + call option.

Value of a call option increases with:

Time.

Risk of firm's cashflows.

Implications: Holders of convertible debt maximise value by not converting until forced to do so => Managers will want to force conversion as soon as possible.

Incentive for holders to choose risky projects => managers want to choose safe projects.

Reasons for Issuing Convertible Debt.

Much real world confusion.

Convertible debt - lower interest rates than straight debt.

=> cheap form of financing?

No! Holders are prepared to accept a lower interest rate because of their conversion privilege.

$$CD = \sum_{t=1}^N \frac{I_C}{(1 + K_C)^t} + \frac{PR}{(1 + K_C)^N}.$$

$$D = \sum_{t=1}^N \frac{I_D}{(1 + K_D)^t} + \frac{M}{(1 + K_D)^N}.$$

$$I_D > I_C, PR > M, K_D > K_C \Rightarrow CD > D.$$

Example of Valuation of Convertible Bond.

October 1996: Company X issued Convertible Bonds at October 1996: Coupon Rate 3.25%, Each bond had face Value £1000.

Bonds to mature October 2001.

Convertible into 21.70 Shares per per bond until October 2001.

Company rated A-. Straight bonds would yield 5.80%.

Now October 1998:

Face Value £1.1 billion.

Convertible Bonds trading at £1255 per bond.

The value of the convertible has two components; The straight bond value + Value of Option.

Valuation of Convertible Bond- Continued.

If the bonds had been straight bonds: Straight bond value =

$$\text{PV of bond} = \sum_{t=0.5}^{t=3} \frac{16.25}{(1.058)^t} + \frac{1000}{(1.058)^3} = 932.83$$

Price of convertible = 1255.

Conversion Option = 1255 – 933 = 322.

Oct 1998 Value of Convertible = 933 + 322 = 1255.
= Straight Bond Value + Conversion Option.

Alternative Analysis of Irrelevance of Convertible Debt.

	Firm Does Badly.	Firm Does Well.
Convertible Debt	No Conversion.	Conversion.
Compared with: Straight Bonds.	CD cheaper financing, lower coupon rate.	CD expensive, Bonds are converted, Existing Equity Dilution.
Equity.	CD expensive.	CDs cheaper.

Firm Indifferent between issuing CD, debt or equity.

-MM.

Why do firms issue convertible debt?

If convertible debt is not a cheap form of financing, why is it issued?

A. Equity through the Back Door (Stein, Mayers).

-solves asymmetric information problems (see Myers-Majluf).

-solves free cashflow problems.

B. Convertible debt can solve risk-shifting problems.

- If firm issues straight debt and equity, equity holders have an incentive to go for risky (value reducing) NPV projects.

Since CD contains an option feature, CD value increases with risk.

-prevents equity holders' risk shifting.

Convertible Debt and Call Policy.

Callable Convertible debt => firms can force conversion.

When the bond is called, the holder has 30 days to either:

- a) Convert the bond into common stock at the conversion ratio, or
- b) Surrender the bond for the call price.

When should the bond be called?

Option Theory: Shareholder wealth is maximised/ CD holders wealth is minimised if

Firm calls the bond as soon as value = call price.

Call Puzzle.

Manager should call the bond as soon as he can force conversion.

Ingersoll (1977) examined the call policies of 124 firms 1968-1975.

- He found that companies delayed calling far too long.
- median company waited until conversion value was 44% above call price - suboptimal.

Call Puzzle addressed by Harris and Raviv.

- signalling reasons for delaying calling.
- early calling might signal bad news to the market.