CORPORATE FINANCE: THEORY AND PRACTICE

Net Present Value

- What real assets, tangible and intangible, should the firm purchase (investment decision) to produce goods and services to generate future cash returns?
  - Identify a project
  - Evaluate whether the project is worth more than the capital required to undertake it (capital budgeting or capital expenditure CAPEX decision)
  - If the project has a positive net present value (**NPV)**, then considers funding
- E.g. Consider an investment that requires $1000 of initial outlay and provides a single cash inflow of $1210 after one year. The required rate of return is 10%
  - NPV = -1000 + (1210/1.1) = $100, +NPV, we should undertake the investment, It will make us $100 richer (wealth creation)
- NPV depends on future cash flows
  - The difference between cash received and cash paid out
  - Different to accounting profits which include income and expenses not yet received or paid as well as depreciation charges which are not cash flows at all
- The value of a project depends on all the incremental (additional) cash flows after-tax that follow from project acceptance
- Important to include all incidental effects on the remainder of the firm's business such as existing products sales

Financing Decision

- Sells claims on real assets (financial assets or securities) and on the cash flow those assets will generate
  - Involve money or cash
  - Cash flows may have a time dimension
  - Involve an element of risk or uncertainty
- The evaluation of risky cash flows over time
- Future cash flows need to be discounted to their present values for proper comparison
- A dollar today is worth more than a dollar tomorrow

- **Portfolio theory**: suggests that investors should diversify their portfolio investments to reduce risk
- Risk in investment is measured by standard deviation (for single assets) or beta (for portfolios)

- **Capital Asset Pricing Model or Security Market Line**: a simple linear relationship between expected return and beta

- **Efficient market theory**: competition in capital markets is very tough and security prices reflect intrinsic value of assets

Corporations

- Legally distinct from their owners
- Pay their own taxes
- Provide limited liability (shareholders cannot be held personally responsible for the firm's debts)
- Owners not usually the managers
- Shareholders vote to elect a board of directors (executive and non-executive) that appoints top management
- The board is supposed to ensure that managers act in the shareholders' best interest

Separation of Ownership and Control

- Advantages:
  - Allows share ownership to change without interfering with the business operation
  - Allows the firm to hire and fire professional managers
- Problems:
  - Managers' and shareholders' objectives may differ
  - Managers may have their own nests to feather, such as seeking a luxurious working lifestyle or building an empire to satisfy their own ego
  - This potential conflict of interest is termed a principal-agent problem

- **Agency Costs**: Any loss of firm value that results from conflict of interest, incurred when:
    - Managers do not attempt to maximize firm value and
    - Shareholders incur costs to monitor the managers, constrain their actions and align their interest with shareholders'
- **Agency Theory:** The possible conflicts of interest, and how the company attempts to overcome them, between managers, shareholders, employees, debt holders, government and other constituencies "stakeholders"

Corporate Governance

- Agency problems are mitigated by good systems of corporate governance
    - Legal and regulatory requirements (eg. financial statements)
    - Compensation plans for managers (eg. stock options)
    - Board of directors (holding managers to task)
    - Monitoring (by security analysts and banks)
    - Takeovers (a market mechanism of control)
    - Shareholder pressure (eg. becoming directors or selling out)

Capital Structure Theory

- Two types of financing decisions to raise capital:
    - The issue of debt and equity capital
    - The retention of profits vs. dividend decision
- Modigliani and Miller's **capital structure theory** provides a starting point for analyzing the impact of financing decisions on firm value

Information Asymmetry

- Managers, shareholders and lenders may all have different information about the value of a real or financial asset
- Managers typically have more information about the true prospects of the firm
- Financial managers need to recognize these information asymmetries and finds ways to reassure investors that there are no nasty surprises on the way

Signalling Theory

- **Signaling theory**: Managers may use capital structure and dividend decisions to signal their view of the firm's prospects
    - E.g. an increase in the dividend could signal an expectation of improved earnings, and hence increased capacity to pay higher dividends
- It becomes more difficult to resolve conflicts and agency problems when managers have more information than shareholders/debtholders

Option Theory

- Firms regularly use derivative securities such as options and futures to reduce risk
- Many capital investments include an embedded option to expand or to bail out in the future; these are called real options in capital budgeting decisions
- Binomial tree model or Black-Scholes-Merton formula can be used to value these financial derivatives and real options

Working Capital Requirements

- Firms generally use sales and COGS to estimate cash flow:
    - Cash inflow = Sales – Increase in accounts receivable AR
    - Cash outflow = COGS + Increase in inventory INV - Increase in accounts payable AP
    - Net cash flow = cash inflow – cash outflow = [Sales – COGS] **–** [AR + INV – AP]
- [AR + INV – AP] = working capital
    - Working capital is likely to increase in the early and middle years of a project
    - When the project comes to an end, all the investments in working capital over the life are recovered and treated as a cash inflow
- Include the opportunity cost of a resource used in a project even when no cash changes hands
    - E.g. a new operation will use an already acquired land that could otherwise be sold. The opportunity cost of a resource is the cash it could generate for the company if the project were rejected and the resource were sold or put to some other productive use
- Ignore past and irreversible sunk costs

- Ignore the accountant's allocation of existing overheads and include only the extra overhead expenses generated by a project
- Remember salvage value (net of any taxes) when the project comes to an end
- Treat inflation consistently by discounting nominal cash flows at a nominal rate of return and real cash flows at a real rate

Separate Investment and Financing Decisions

- Analyse the project as if it were all equity-financed, treating all cash flows as coming from and going to shareholders
- If a project is partly financed by debt, we will neither subtract the debt proceeds from the required investment nor recognise interest and principal payments on the debt as cash outflows
- Financing costs are recognised in the discount rate instead

Depreciation

- Is allowable deduction against profit
- It provides an annual tax shield:
  Tax shield = (depreciation * tax rate)
- The tax shield is implicitly shown in the reduced amount of tax on operations recorded in the income statement
- As depreciation is a noncash expense, it has to be added back to profit after-tax to arrive at the net cash flow
- Straight-line depreciation is used in CFTP
- E.g. a replacement decision
  - Capital cost of a new 4-year machine = $25,000
    Salvage value of new machine in year 4 = $1,000
    Current salvage of old machine = $2,000
    Current book value of old machine = $5,000
    Extra initial inventory = $1,500
    Increase in working capital in year 1 to 3 are $500, $700 and $300 respectively
    Existing warehouse space to install the new machine can be sold today for $10,000 after-tax and has no value in year 4
    Increase in before-tax revenue = $8,500 p.a.
    Increase in before-tax operating costs = $2,500 p.a.
    Allocated overhead costs = $1,300 p.a.
    Annual depreciation of old machine = $1,250
    Annual depreciation rate of new machine on straight-line prime cost basis = 25%

    $25,000 * 0.25 = $6,250
    Tax rate = 30%
    Required rate of return = 10%

  - Tax effect on sale of old machine today
    = tax rate * (book value – sale price)
    = 0.3 * (5,000 – 2,000) = 900
  - Tax effect on sale of new machine in year 4
    = tax rate * (book value – sale price)
    = 0.3 * (0 – 1,000) = -300
  - Increased depreciation = new dep. – old dep.
    = 6,250 – 1,250 = 5,000
  - Recovery of working capital in year 4
    = 1,500 + 500 + 700 + 300 = +3,000

		Year 0	Year 1	Year 2	Year 3	Year 4
1	New machine	-25000				1000
2	Old machine	2000				
3	Tax effect on sale	900				-300
4	Working capital	-1500	-500	-700	-300	3000
5	Opportunity cost warehouse	-10000				
6	**Capital cash flow**	-33600	-500	-700	-300	3700
7	Increased revenue		8500	8500	8500	8500
8	Increased costs		-2500	-2500	-2500	-2500
9	Increased depreciation		-5000	-5000	-5000	-5000
10	Profit before tax		1000	1000	1000	1000
11	Tax at 30%		300	300	300	300
12	Profit after tax		700	700	700	700
13	Increased depreciation		5000	5000	5000	5000
14	**Operating cash flow (12+13)**		5700	5700	5700	5700
15	**Total cash flow (6+14)**	-33600	5200	5000	5400	9400
16	Present value @10%	-33600	4727	4132	4057	6420
17	NPV =	-14263				

Problem 1: Investment Timing Decision

- Sometimes you have the ability to defer an investment and select a start date that is more ideal to make the investment decision
- A project might become more valuable if undertaken in the future:

Start date, year	0	1	2	3	4	5
Net future value at start date *t*	50	64.4	77.5	89.4	100	109.4
Change in value from previous year (%)		28.8	20.3	15.4	**11.9**	9.4
NPV @ 10%	50	58.5	64.0	67.2	**68.3**	67.9

- The optimal timing to invest is year 4 in order to maximise NPV
- Before year 4 the net future value increases by more than 10% a year, greater than the cost of capital in the project
- You maximise the NPV of your investment if you commence the project as soon as the rate of increase in value drops below the cost of capital

Problem 2: The Choice Between Long and Short Lived Equipment

- Suppose a firm is forced to choose between two machines A and B, which do exactly the same job and have the following lives and costs:

Machine	C_o	C_1	C_2	C_3	PV at 6%
A	-15	-5	-5	-5	-28.37
B	-10	-6	-6	-	-21.00

- Machine B has a lower present value of costs but needs to be **replaced** a year earlier than A
- The rule is to compare the assets on their equivalent annual cash flow (EAC), i.e. the total cash *per year* from buying and operating the asset
  $EAC_A = PV_A$ / 3-year annuity factor
  $= -28.37 / [(1 - 1.06^{-3})/0.06] = -10.61$ (annual rental cost)
  $EAC_B = PV_B$ / 2-year annuity factor
  $= -21.00 / [(1 - 1.06^{-2})/0.06] = -11.45$ (annual rental cost)
- The series of annuity payments (EAC) starts in year 1, not year 0
- Machine A is better as its equivalent annual cost is less
- What will be the PV and EAC if the cost of capital is zero?
  $PV_A = (-15 - 5 - 5 - 5) = -30$ $EAC_A = -30 / 3 = -10$
  $PV_B = (-10 - 6 - 6) = -22$ $EAC_B = -22 / 2 = -11$
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EAC and Inflation/Technological Change

- When we calculated the EAC of machines A and B, we assumed a 6% real discount rate and no inflation
- With a 5% inflation rate
  - Year 1 nominal cash flow = $10.61(1.05)=11.14$,
  - Year 2 = $10.61(1.05)^2=11.70$
  - Year 3 = $10.61(1.05)^3=12.28$
- When comparing the EAC of two machines, it is recommended to do the calculations in real terms
- Suppose that, thanks to technological improvements, new machines cost 20% less each year in real terms to buy and operate
- Owners of the old machines are forced to match this reduction and will charge anyone for use of the machines a real rent for year 2 which is 80% of the rent for year 1
- How much will the owner need to charge the user of each machine in year 1 to recover the PV of the costs? (i.e. how much will it cost to rent each machine?)

PV of renting machine A
$= rent_1/1.06 + 0.8(rent_1)/1.06^2 + 0.8*0.8(rent_1)/1.063 = 28.37$

$rent_1 = 12.94$

PV of renting machine B $= rent_1/1.06 + 0.8(rent_1)/1.06^2 = 21.00$

$rent_1 = 12.69$

The merits of the two machines are now reversed

It pays to buy the shorter-lived machine B rather than become locked into an aging technology with machine A in year 3

Problem 3: When to replace an old machine

- An elderly machine can produce a cash *inflow* of $4,000 a year for 2 more years and then it will give up the ghost
- The current salvage value is $8,000 and next year's salvage value is $7,000
- A new machine costs $15,000 but will provide a cash inflow of $8,000 a year for three years
- When should you replace the machine? Now, in 1 year's time or in 2 years' time?
- We first calculate the EAC of the new machine:

	C_o	C_1	C_2	C_3	NPV at 6% ($000)
New machine	-15	+8	+8	+8	6.384
EAC		2.388	2.388	2.388	6.384

EAC_{new} = 6,384 / [(1 – 1.06^{-3})/0.06] = 2,388 per year
If replace today, the annuity series of $2,388 starts in year 1
If replace in 1 year's time, the annuity series starts in year 2
If replace in 2 years' time, the annuity series starts in year 3

- The optimal timing of replacement can be decided by comparing the NPVs achieved over an infinite period of replacement with new machines:

$$NPV_{now} = 8000 + \frac{2388}{0.06} = 47800$$

$$NPV_{1\ year} = \frac{4000}{1.06} + \frac{7000}{1.06} + \left\{\left(\frac{2388}{0.06}\right)(1.06)^{-1}\right\} = 47925$$

$$NPV_{2\ year} = \frac{4000}{1.06} + \frac{4000}{1.06^2} + \left\{\left(\frac{2388}{0.06}\right)(1.06)^{-2}\right\} = 42755$$

Problem 4: Cost of excess capacity

- Suppose a new investment project requires heavy use of an existing information system and will bring the purchase date of a new replacement system forward from year 4 to year 3.
- The new system has a life of five years, and at a discount rate of 6% the present value of the cost of buying and operating it is $500,000.
- When the new system in turn wears out, we will replace it with another.
- First convert the $500,000 present value to an EAC of $118,700 (=500,000/[(1–$1.06^{-5}$)/0.06])
- As the new system will be continuously replaced with another, we will have to pay $118,700 a year indefinitely
- If we undertake the new project and buy the replacement system in year 3, the perpetual series of $118,700 begins in year 4; if we do not undertake the new investment, the series begins in year 5
- The additional cost of $118,700 in year 4 has a present value of 118700/$(1.06)^4$ =$94,020
- This amount of $94,020 must be charged against the new project for the use of spare capacity

Sensitivity Analysis

- E.g. a Japanese firm is evaluating the introduction of an electrically powered motor scooter, the revenue is estimated as unit sales * unit price
  (market share * market size) * unit price
  (.1 * 1 million) * ¥375,000
  = ¥37.5 billion

Preliminary cash flow forecasts for the project (¥ billions)			
		Year 0	Years 1-10
1	Investment	-15	
2	Revenue		37.5
3	Variable cost		30.0
4	Fixed cost		3.0
5	Depreciation (straight-line)		1.5
6	Pretax profit (2-3-4-5)		3.0
7	Tax @50%		1.5
8	Net profit after tax		1.5
9	Operating cash flow (5+8)		3.0
10	Net cash flow	-15	3.0
11	NPV = -15 + (3)[(1 - 1.1^{-10})/0.1] = +3.43		

- The project *appears* to be worth going ahead with a positive NPV, need to conduct a sensitivity analysis
- The projects NPV is recalculated as each underlying variable is set one at a time at its optimistic or pessimistic value and all other variables are as expected

		Range	
Variable	**Pessimistic**	**Expected**	**Optimistic**
Market size, million	0.9	1	1.1
Market share	0.04	0.1	0.16
Unit price, yen	350,000	375,000	380,000
Unit variable cost, yen	**360,000**	300,000	275,000
Fixed cost, ¥ billions	4	3	2

		NPV, ¥ billions	
Variable	**Pessimistic**	**Expected**	**Optimistic**
Market size	1.1	3.4	5.7
Market share	-10.4	3.4	17.3
Unit price	-4.2	3.4	5.0
Unit variable cost	**-15.0**	3.4	11.1
Fixed cost	0.4	3.4	6.5

Recalculate the NPV for Pessimistic unit variable cost value

		Year 0	Years 1-10
1	Investment	-15	
2	Revenue		37.5
3	**Variable cost**		**36.0**
4	Fixed cost		3.0
5	Depreciation (straight-line)		1.5
6	Pretax profit (2-3-4-5)		-3.0
7	Tax @50%		-1.5
8	Net profit after tax		-1.5
9	Operating cash flow (5+8)		0.0
10	Net cash flow	-15	0.0
11	NPV = -15 + (0)[(1 - 1.1^{-10})/0.1] = -15		

- Suppose that the pessimistic value for unit variable cost partly reflects the production department's worry that a particular machine will not work as designed and that the operation will have to be performed at an extra cost of ¥20,000 per unit
- If it does occur, the after-tax cash flow will be reduced by ¥1 billion a year and the NPV reduced by (1)[(1 - 1.1^{-10})/0.1] =¥6.14 billion
- The chance for the problem to occur is 10%
- Suppose further that a ¥10 million pretest of the machine will reveal whether it will work and allow you to clear up the problem
- The value of additional information about unit variable cost from the pretest is therefore:
  –¥10M + (.10 x ¥6,140M) = +¥604 million
- Should invest in the pretest
- Limits to sensitivity analysis
  - Sensitivity analysis forces the manager to identify the underlying variables and calculate the consequences of misestimating the variables
  - It indicates where additional information would be most useful, and helps to expose inappropriate forecasts
  - One drawback is what exactly optimistic or pessimistic means
  - Another problem is that the underlying variables are likely to be interrelated, not independent

<u>Scenario Analysis</u>

- If the variables are interrelated, we may use scenario analysis to look at different but consistent combinations of variables
- Example. A scenario of higher oil prices and a world recession would result in the following:
  market size = 0.8 million
  market share =0.13
  unit price = ¥431,300
  unit variable cost = ¥345,000
  fixed cost = ¥3.5 billion

		Year 0	Years 1-10
1	Investment	-15	
2	Revenue		44.9
3	Variable cost		35.9
4	Fixed cost		3.5
5	Depreciation		1.5
6	Pretax profit (2-3-4-5)		4.0
7	Tax @50%		2.0
8	Net profit after tax		2.0
9	Operating cash flow (5+8)		3.5
10	Net cash flow	-15	3.5
11	NPV = -15 + (3.5)[(1 - 1.1^{-10})/0.1] = +6.43		

Break-Even Analysis

- Analysis of the level of sales, Q,:
  NPV = {[Revenue – Variable cost – Fixed cost – Depn] x(1-tax rate) + Depn} x [annuity factor] – Investment
  NPV = {[(Q(375,000) – Q(300,000) – ¥3B – ¥1.5B] x(1–.5) + ¥1.5B} x [(1 – 1.1^{-10})/.1] – ¥15B = 0
  Q = 85,098 units
- A lower break-even unit sales will be derived based on accounting profits:
  Profit before-tax = [Revenue – Variable cost – Fixed cost – Depn]
  Profit before-tax = [(Q(375,000) – Q(300,000) – ¥3B – ¥1.5B] = 0
  Q = 60,000 units
- A business with high fixed costs is said to have high operating leverage and high business risk, and will have a high break-even sales
- Operating leverage is usually defined in terms of accounting profits rather than cash flows
- Degree of Operating Leverage (DOL):

$$\text{DOL} = \frac{\text{percentage change in profits}}{\text{percentage change in sales}}$$

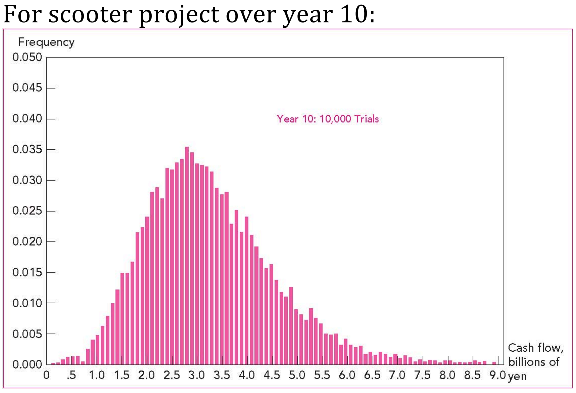
or

$$\text{DOL} = 1 + \frac{\text{fixed costs including depreciation}}{\text{pretax profits}}$$

- For the scooter project: DOL = 1 + (3 + 1.5)/3 = 2.5
- i.e. a 1% shortfall in the project's revenue would result in a 2.5% shortfall in profits

Monte-Carlo Simulation

- Simulation is a tool for considering all possible combinations of variables and showing the entire distribution of project outcomes
- *Step 1*: Modeling the project by giving the computer a set of equations to specify the interdependence between different variables and between different periods
- *Step 2*: Specifying the probabilities of possible forecast errors for each of the variables that determine cash flow
- *Step 3*: Select at random a value from the distribution of each variable and calculate the net cash flow for each period, repeat the process thousand times to get probability distributions of the project cash flows in each period (which reflect project risk)
- *Step 4:* Calculate the expected cash flows from the distributions of project cash flows to find their present values
- For scooter project over year 10:

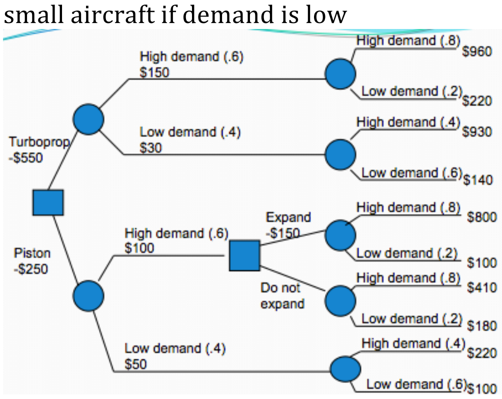


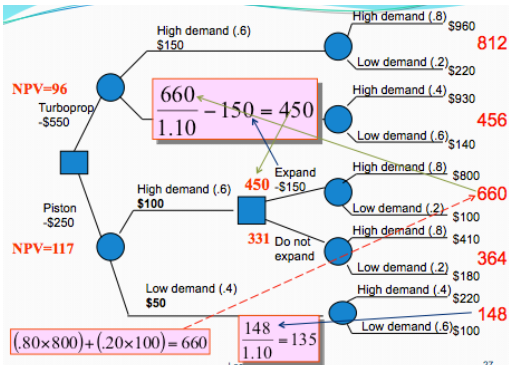
Flexibility and Real Options

- Options to modify projects are known as real options
- Decision trees help companies determine their options by showing the timing of sequential decisions and possible cash flow outcomes
    - Option to expand
    - Option to abandon (to cut losses)
    - Timing options (to postpone investments)
    - Production options (to provide flexibility in production)
- Such options do not show up in the assets in the accounting balance sheet but are reflected in the market value of shares

Magna Carter example

- Magna Charter is a new company to provide an executive flying service
- There is a 40% chance that demand for the service in the first year will be low; if it is low, there is a 60% chance that it will remain low in subsequent years
- On the other hand, if the initial demand is high, there is an 80% chance that it will stay high
- The immediate decision is whether to buy a turboprop plane for \$550,000 or to buy a smaller capacity piston-engine plane for \$250,000
- At the end of the first year, the company has a second decision to make if it has a piston aircraft: it can expand by buying a secondhand piston aircraft for \$150,000 if demand is high, or sit tight with one small aircraft if demand is low





- First consider whether to expand Piston next year:

  Expected payoff from expansion as of year 2 → (.8 x 800) + (.2 x 100) = \$660

  If the discount rate is 10%, the NPV of expanding computed as of year 1 is →

  $NPV_{t=1}$ = -150 + (660/1.10) = \$450

  If no expansion, the expected payoff as of year 2 → (.8 x 410) + (.2 x 180) = \$364

  The NPV of not expanding → $NPV_{t=1}$ = 0 + (364/1.10) = \$331 (less than expansion)

  Should purchase the second piston plane to expand if market demand is high in year 1

- Now work back from the future to the present:
- If demand is high→ receive in year 1 \$100,000 cash flow + \$450,000 net present value
- If demand is low → receive \$50,000 cash flow+ net present value of [(.4x220)+(.6x100)]/1.1=\$135,000
- Investment in the Piston:

$$NPV_{t=0} = -250 + \frac{.6(100+450)+.4(50+135)}{1.10} = 117$$

- Investment in the Turpoprop:

$$NPV_{t=0} = -550 + \frac{.6(150)+.4(30)}{1.10} + \frac{.6[.8(960)+.2(220)]+.4[.4(930)+.6(140)]}{(1.10)^2} = 96$$

- The company should buy a piston plane now and expand to buy a second piston if demand turns out to be high in year 1

- If there were no option to expand piston:

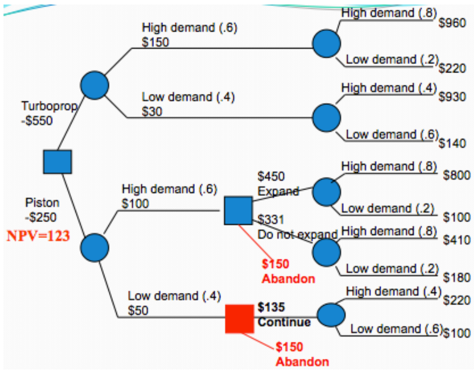
$$NPV_{t=0} = -250 + \frac{.6(100)+.4(50)}{1.10} + \frac{.6[.8(410)+.2(180)]+.4[.4(220)+.6(100)]}{(1.10)^2} = 52$$

- The value of the option to expand is, therefore, (117 – 52 = 65) or \$65,000
- As expansion cash flows are likely to be of lower risk, a lower discount rate should be applied to them

- If only the piston plane can be abandoned in year 1 for \$150,000, but not the turboprop, the NPV for the Piston will become:

$$NPV_{t=0} = -250 + \frac{.6(100+450)+.4(50+\mathbf{150})}{1.10} = 123$$

- The value of the option to abandon Piston
  = $NPV_{\text{with option}} - NPV_{\text{without option}}$
  = 123 – 117
  = 6 or \$6,000



<u>Look First to Market Values</u>

- Suppose a car dealer offers you a brand new car and a meeting with your favorite movie star for \$60,400, how much are you paying for the encounter?
  - If you estimate the car's value from its parts to be 61,000, this suggests the dealer is paying you \$600 to meet with the movie star
  - However you might note that the market price of the car is \$60,000, so that you are really paying \$400 to have your dream come true
- When you have the market price for an asset,
  - Use this price (public information) or at least as a starting point for your analysis
  - Then, ask yourself whether the asset is worth more to you than to others based on your private information
- Suppose that a new department store costs \$100 million and will generate \$8 million cash flow a year for 10 years
  - Real estate prices and rents are estimated to grow by 3% a year so the expected value of the real estate in year 10 = 100 x 1.03^{10} = \$134 million

    $$NPV = -100 + \frac{8}{1.10} + \frac{8}{1.10^2} + \cdots + \frac{8+134}{1.10^{10}}$$
    $$= \$1 \text{ million}$$
  - It is helpful to consider this decision by dividing the business into a real estate subsidiary that buys the building for \$100 million and a retailing subsidiary that rents and operates it to earn \$8 million a year
  - Then figure out
    - how much rent the real estate subsidiary would have to charge to get a fair return, and
    - whether the retailing subsidiary could afford to pay the rent, *and for how long*, to make a positive NPV
  - If the market rental income is \$7 million in year 1 and rents are expected to increase by 3% per year, then: $PV = \frac{7}{r-g} = \frac{7}{.10-.03} = \$100 \text{ million}$
  - When the market price of the property is equal to the PV of the growing stream of rents, the real estate subsidiary would earn a fair return of 10% through a 7% rental income (dividend) and 3% capital gain
  - Retail business could afford the rents in the first five years if rents are expected to increase by 3% per year
    - Year 1: \$7m
    - Year 2: 7(1.03) = \$7.21m
    - Year 3: $7(1.03)^2$ = \$7.43m
    - Year 4: $7(1.03)^3$ = \$7.65m
    - Year 5: $7(1.03)^4$ = \$7.88m
    - Year 6: $7(1.03)^5$ = \$8.11m (rent is greater than store's income)
  - Retail business has only a five-year economic life:
    expected value of real estate in year 5 = 100 x 1.03^5 =\$116

    $$NPV = -100 + \frac{8}{1.10} + \frac{8}{1.10^2} + \cdots + \frac{8+116}{1.10^{5}} = \$2 \text{ million}$$

<u>Kingsley Solomon's gold mine</u>

- Investment = \$500 million
  Life = 10 years
  Production = 0.1 million ounces a year

Production cost = $1,150 per ounce fixed
Current gold price = $1,500 per ounce
Discount rate = 10%

- If gold price is forecasted to rise by 5% per year:
$$NPV = -500 + \frac{.1(1575-1150)}{1.10} + \frac{.1(1654-1150)}{1.10^2} + \cdots + \frac{.1(2443-1150)}{1.10^{10}}$$
- $= -\$35$ million
- This traditional DCF analysis is wrong!
- There is no need to forecast future gold prices when there is an active market for gold
- Market price is the PV of all future cash flows:
$$P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \cdots + \frac{D_t + P_t}{(1+r)^t}$$
- For an asset such as gold which does not produce any income, D_1=D_2=D_t=0
  $P_0 = P_t/(1+r)^t$
  i.e. today's price is already equal to the present value of the future price, no need to forecast P_t
- NPV = –initial investment + PV revenues – PV costs
  PV revenues = .1 million ounces x 10 years x $1,500
  = $1,500 million
  PV costs = (.1 million x $1,150) x [(1 – 1.10^{-10})/0.10]
  = $707 million
  NPV = –500 + 1,500 – 707 = $293 million

Economic Rents and Competitive Advantage

- Profits that more than cover the cost of capital are known as economic rents
- In the long run competition eliminates economic rents
- The ability of a firm to earn a return no less than the cost of capital leads to its financial sustainability
- Michael Porter (1980) identifies five aspects of industry structure (or "five forces") that determine which industries are able to provide sustained economic rents:
  - Rivalry among existing competitors
  - Likelihood of new competition
  - Threat of substitutes
  - Bargaining power of suppliers
  - Bargaining power of customers
- A firm also can secure a competitive advantage within its industry by focusing on:
  - better products (e.g. iPhone)
  - lower costs (IKEA)
  - particular market niche (Rolex)
- Don't assume other firms will watch passively
- Ask –
  - How long a lead do I have over my rivals?
  - What will happen to prices when that lead disappears?
  - In the meantime how will rivals react to my move?
  - Will they cut prices or imitate my product?
- The key to investing is determining the competitive advantage of any given company and, above all, *the durability of that advantage*
- Read "Marketing Lessons: Whatever Happened to Starbucks?" at *http://knowledge.asb.unsw.edu.au/article.cfm?articleid=1192* **(examinable material)**
- A case of a US firm for which an analysis of its competitive position helped ferret out a negative-NPV project that was mistakenly estimated to be positive
  - A proposal to produce a chemical "polyzone"
  - Raw materials were imported from Europe
  - Finished product was exported back to Europe
  - US firm had no long-run technological edge over European competitors but only a head start
  - No competition from European firms: