

## Commercial Skills for Chemists: Finance

### Student Pack

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This resource was produced as part of the National HE STEM Programme



# Student Pack

## Finance

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### Finance

- Overview
- Task Briefing
- Lecture Resources
- Other Materials

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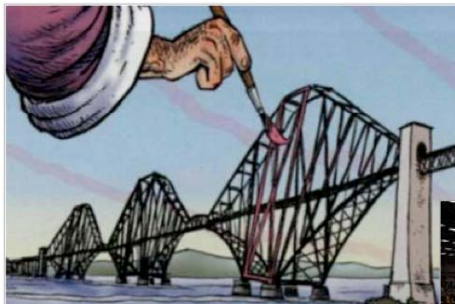
## Finance – Task Briefing

- You are a group of technologists working for *Mega Chemicals plc*. Your work is to evaluate new technologies and recommend which ones *MegaChem* might wish to take to market
- 5 new projects that *MegaChem* are interested in can be found on the following slides
- Your task, as a team, task will be to produce financial budgets for two projects, clearly separating capital costs and revenue and quantifying potential income streams. If appropriate you should use discounted cash flow (DCF) methods to value future income streams
- You should learn and retain the distinction between *income* and *expenditure* and between *revenue* and *capital* budgets
- To help with your decision making you will have access to lecture material, text books, a workshop session, and an Excel template for preparing the budgets

## *The New Projects...*

*Here are the 5 projects MegaChem are interested in.....*

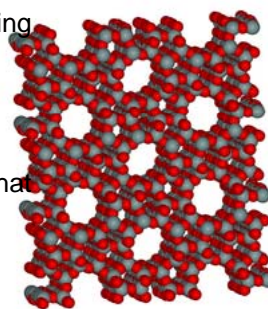
## Project 1 Anti-corrosive pigment



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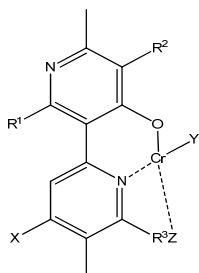
## Project 1 – Anti-Corrosion Pigment

- We have discovered a better anti-corrosion pigment using zeolite to encage zinc chromate
- Corrosion costs \$1trn in US alone!
- Zinc chromate is a well known effective anti-corrosive that is restricted in use because  $\text{Cr}^{\text{VI}}$  is toxic in the environment
- Because our pigment encages chromate anions, it provides the anti-corrosive benefits without the toxicity issues
- We recommend reviewing the opportunities for developing and commercialising this pigment

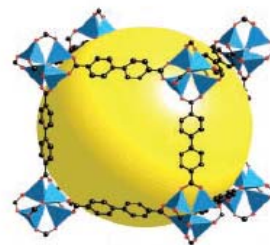


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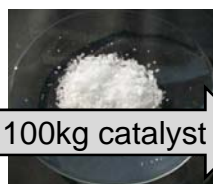
## Project 2 Methane Oxidation Catalyst



Catalyst Facts:  
 Turn over Number:  
 15 Million  
 Turn over Frequency:  
 1.5 kat  
 Synthetic Cost: 18000\$/kg



$8.8 \times 10^7 \text{ m}^3$  methane



100kg catalyst

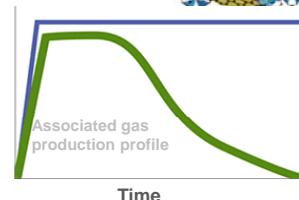
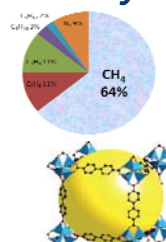


$1.2 \times 10^5 \text{ T}$  methanol

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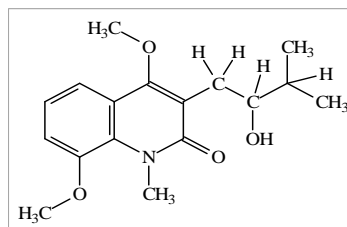
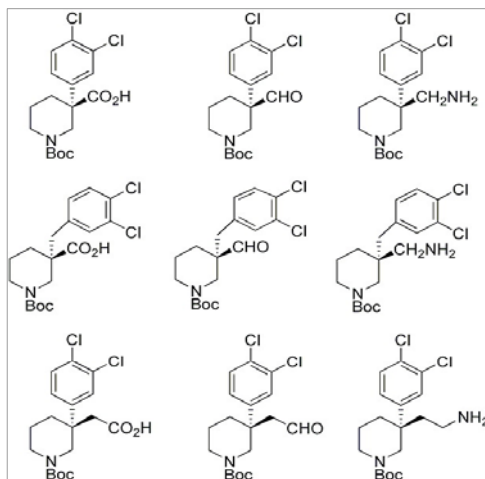
## Project 2 – Methane Oxidation Catalyst

- We have a chromium catalyst that can convert methane to methanol at mild conditions
- Methane (natural gas) is difficult and expensive to transport over long distances, while methanol liquid is much cheaper and easier to move
- Commercial Opportunities could include
  - Major methane gas fields around the world
  - Potential to reduce flaring of associated gas
  - Exploit methane hydrates in arctic waters
- We need to assess and prioritise these opportunities



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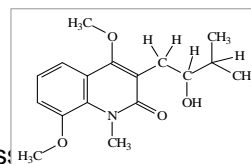
## Project 3 New antibacterial synthesis



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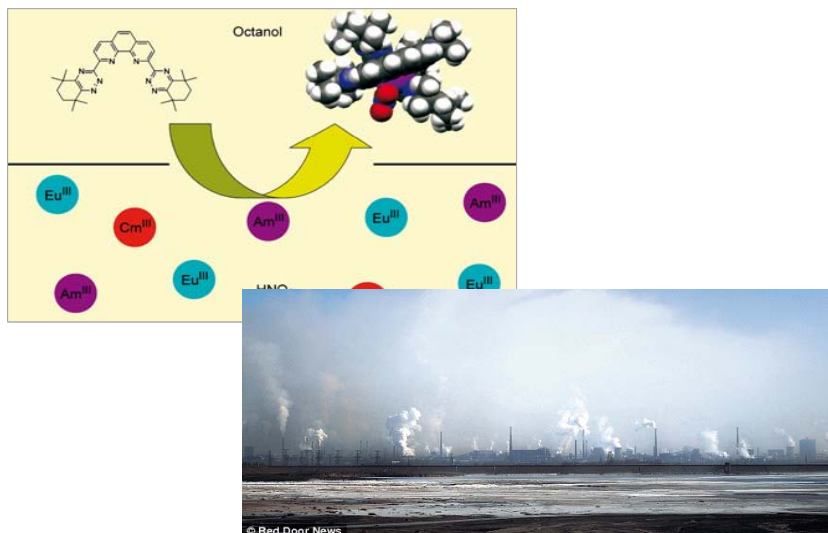
## Project 3 New antibacterial synthesis

- We have a new route to synthesizing specific enantiomers of intermediates and drug candidate molecules
- Using specific enantiomers avoids some major potential side effects caused in drug trials by the presence of the opposite enantiomer
  - See 'thalidomide'
- In particular, we have a route to an enantiomer of lunacridine, which has potential anti-bacterial activity
  - Lunacridine could be the precursor of a whole new family of antibiotics, the first major discovery since 2000 (which was the first since 1962)
  - Constant demand for new antibiotics
  - World market around \$15bn pa
- We would like to determine the value of the process for a new antibiotic candidate



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## Project 4 New Separation Technique



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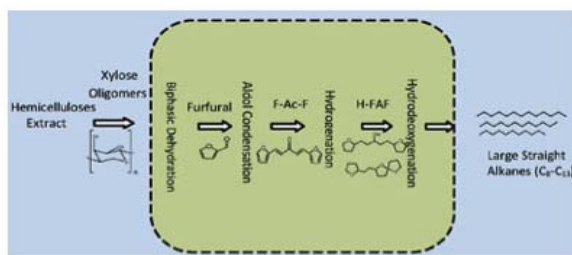
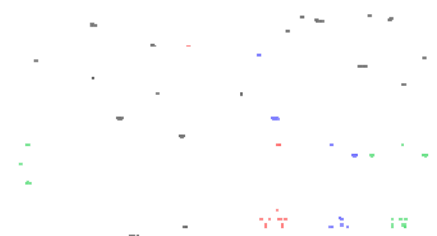
## Project 4 New Separation Technique

- Lanthanides ('rare earths') and actinides are chemically similar and hard to separate
  - Lanthanide fission products are a problem in nuclear waste
  - Thorium is a contaminant in lanthanide mining
  - Lanthanides have interesting magnetic properties and important industrial uses
- We have discovered a new phenanthroline-derived ligand that can separate actinides (Th, Am, etc) from chemically similar lanthanides
- We plan to explore opportunities in both nuclear waste decontamination and clean-up of rare earth mines



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## Project 5 Bio-diesel from Lignin



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## Project 5 Bio-diesel from Lignin

- There are few current processes for making Jet Fuel from Biomass sources
  - Demand for Jet fuel around 5million barrels/day
- We have a multiple step process that converts lignin hemicellulose to C<sub>8</sub>-C<sub>12</sub> paraffins suitable for Jet Fuel
  - Lignins are major constituents in certain tropical and temperate plants
  - Other biomass process tend to make lighter paraffins not C<sub>8</sub>-C<sub>12</sub>
- We recommend further study of the economics and logistics of this process



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## Understanding Finance – Lecture Resources

- The following slides are from an approximately 1 day workshop on finance given to students at a UK University in 2012
- Part of this lecture is available on video at <http://www.youtube.com/watch?v=0daRMiFvcEI&feature=youtu.be>
- You may read or use as much of this material as you like, working through the exercises if need be, to help you produce your assignments
- There will be workshop sessions where we will work through the 'SmithChem', 'MiniGas' and 'A.CID Chemicals' Case Studies

## Understanding Budgets



*For chemists (and other scientists)*

## *What businesses want?*

- Cash (especially for SMEs)
- Profit (for larger companies)
- ROI (for companies with external shareholders - esp PLCs)
- Growth
- Long term sustainability

## *Important Financial Data*

- Profit (what we made last year/quarter)
- Balance sheet (where we are now)
- Budget forecast (where we'll be if all goes according to plan)
- Investment appraisal (can we afford to change our future?)

## What is Profit? (and Loss)

- The difference between all the Income/sales and costs/expenditure
- Calculated at point of invoice not payment
- Income and costs should be compared over matching period
- The cost of large items is spread over their lifetime
- You pay tax on your profit
  - terminology - 'profit before tax' or 'profit after tax'

## SmithChem Ltd

SmithChem Ltd is a small chemical consultancy founded by Jo Smith – advising customers on safe materials handling, and the disposal of chemicals

### INCOME

In January, SmithChem does one project for MegaChem PLC and has received payment of £2000 for this work. It has done some work for Midshire University and has invoiced them £1500. This missed the end of January payment run but the money is expected in mid February. They have also received an order to do work for LittleChem Ltd estimated at £2500, but this is expected to take place later in February and paid early in March.

### EXPENSES

In January, Jo visited MegaChem, spending £40 on travel, Midshire spending £50, and LittleChem spending £60.

SmithChem has one part-time employee whose salary costs are £6000 per year.

SmithChem received a telephone bill of £300 in early February relating to the three months ending on 31<sup>st</sup> January.

SmithChem carries various insurances totaling £600 per year, paid on a monthly direct debit.

SmithChem operates from a small office (costing £600 rent per quarter), and has £5000 of office equipment, furniture and PC's which will fully depreciate over 5 years

Jo would like to go on a ski-ing holiday in February and asked SmithChem's accountant how much profit the Company had made in January.

Calculate the profit SmithChem made in January. Can Jo spend this money on a holiday?

## SmithChem Profit

▪ Sales in January	£3500
▪ Costs	
▪ Travel	(£150)
▪ Rent	(£200)
▪ Wages	(£500)
▪ 1 month telephone	(£100)
▪ Insurance	(£50)
▪ 1 month depreciation	(£83.33)
▪ Profit in January is	£2416.67

## SmithChem Profit

▪ Sales in January	£3500	Because we count invoiced sales not just paid sales
▪ Costs		
▪ Travel	(£150)	
▪ Rent	(£200)	Because we are calculating 1 month's profit not 3
▪ Wages	(£500)	
▪ 1 month telephone	(£100)	
▪ Insurance	(£50)	
▪ 1 month depreciation	(£83.33)	Depreciation of £5000 over 5 years/60 months is £83.33 per month
▪ Profit in January is	£2416.67	

## SmithChem Cash Flow

<b>Cash from Sales</b>	<b>£2000</b>	
<b>Cash spent in January</b>		
▪ Travel	(£150)	
▪ Rent	(£200)	
▪ Insurance	(£50)	
▪ Wages	(£500)	
<b>Cash to be spent February</b>		
▪ 3 months phone bill	(£300)	
▪ Rent	(£200)	
▪ Insurance	(£50)	
▪ Wages	(£500)	
<b>'Holiday money'</b>		<b>£50</b>
<b>And what about tax?</b>		

## SmithChem Cash Flow

<b>Cash from Sales</b>	<b>£2000</b>	
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▪ Travel	(£150)	
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<b>Cash to be spent February</b>		
▪ 3 months phone bill	(£300)	
▪ Rent	(£200)	
▪ Insurance	(£50)	
▪ Wages	(£500)	
<b>'Holiday money'</b>		<b>£50</b>
<b>And what about tax?</b>		

Mid-shire Uni won't pay us until the end of the month

The whole bill has to be paid in February

## *Cash is not the same as profit*

- Profit is taken when invoice is sent to customer
  - Cash arrives when they pay

*also*

- Depreciation of assets comes off profit
  - No cash paid out
- Paying dividend costs cash
  - but paid after profits
- Buying fixed assets costs cash,
  - but does not reduce profit

## *Profit & Loss Account*

Sales		95,000
Direct wages	22,800	
Materials	<u>18,550</u>	
Gross Profit		53,650
<b>Administrative salaries</b>		10,200
Light, heat & power	2,955	
Insurance	1,000	
Transport costs	3,900	
Promotional expenditure		2,300
Bank charges	250	
Accounting charges	500	
Printing & postage	3,600	
Telephone	1,700	
Research & development		2,000
Rent & rates		6,500
Miscellaneous expenses		1,200
Depreciation		3,675
Total Overheads		39,780
Net Profit (before interest & tax)		13,870
Bank interest payable		2,120
Net Profit (before tax)		£11,750

## Profit and Loss - Usual Format

- Sales
- - Cost of Goods Sold
- Gross Profit

COGS includes all your costs of raw materials, product packaging, and direct labour

- - Admin costs
  - Office costs
  - Prof fees
  - R&D
- Net Profit before Interest and Tax
- - Interest
- Profit before tax
- - Tax
- Profit after tax

Admin costs are all the things which don't go into making the product – sometimes called 'overheads'

## SmithChem Customers

- |                   |                   |                   |
|-------------------|-------------------|-------------------|
| • Profit on Job 1 | • Profit on Job 2 | • Profit on Job 3 |
| £2000- £40        | £1500 - £50       | £0 - £60          |
| = £1960           | = £1450           | = -£60            |

- Overhead Costs in January
  - £200 rent, £100 phone, £50 insurance, £500 wages
  - £83.33 depreciation
- How do we share these?
  - By number of jobs?
  - Time spent on each job? (could we allocate wages?)
  - Storage space taken for each job ?

## *Costs may be:*

- Variable
  - Change according to output or revenue
- Fixed
  - Do not change with output
- Direct
  - Can be directly linked to specific activity
- Indirect, 'Overheads'
  - Cannot be linked to specific activity
- NB: Variable costs are often direct, fixed costs are often indirect - but not always!

## *Costs may be:*

- The cost of the Coke, the bottle and the production line workers are direct and variable costs
- The rent, lighting, equipment depreciation in the factory are indirect and fixed costs





# Capital and Revenue Items

- Capital
  - Last more than one year
  - Are used not sold
  - Are more expensive
  - Not generally tax deductible but are depreciated
- Revenue
  - Consumed quickly
  - May be traded
  - Normally cheaper
  - Costs normally reduce tax



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# Cash flows and budgets

Outline Budget Plan for IT Project													
	Y1 1Q	Y1 2Q	Y1 3Q	Y1 4Q	Y2 1Q	Y2 2Q	Y2 3Q	Y2 4Q	Y3 1Q	Y3 2Q	Y3 3Q	Y3 4Q	
<b>Income</b>													
6 Grants	0												
7 Sales													
<b>Subtotal</b>	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Capital Expenditure</b>													
12 Buildings													
13 Equipment	5,000				50,000	50,000							
14 IT													
15 Transport													
16 Other	5,000	0	0	0	50,000	50,000	0	0	0	0	0	0	0
<b>Subtotal</b>	5,000	0	0	0	50,000	50,000	0	0	0	0	0	0	0
<b>Revenue Expenditure</b>													
20 Variable													
21 Project Manager	12,500	12,500	12,500	12,500	13,500	13,500	13,500	13,500	14,500	14,500	14,500	14,500	
22 Development Materials	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	
24 Sub-contractor	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	
25 HSE advice		2,000				2,000			2,000		2,000		
26 Implementation trials				10,000				20,000					
27 Legal fees	2,000				2,000				5,000	5,000	5,000	5,000	
28 PM car hire	600	600	600	600	600	600	600	600	600	600	600	600	
29 IT networking	500		2,000		2,000			2,000	10,000				
<b>Subtotal</b>	23,100	22,600	22,600	32,600	25,600	23,600	41,600	25,600	37,600	29,600	29,600	31,600	
<b>Revenue Expenditure Fixed</b>													
37 Staff type 1													
38 Cleaning	600	600	600	600	600	600	600	600	600	600	600	600	
39 Staff travel	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	2,000	2,000	2,000	2,000	
40 Heating/Gas etc	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	
41 Lab rents	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	
42 Rates													
43 Electricity	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
44 Telephones													
45 Van Leasing	600	600	600	600	600	600	600	600	600	600	600	600	
46 IT Leasing													
47 Insurance	160	160	160	160	160	160	160	160	160	160	160	160	
48 Accountant Input	500	500	500	500	500	500	500	500	500	500	500	500	
<b>Subtotal</b>	8,260	8,260	8,260	8,260	8,260	8,260	8,260	8,260	9,260	9,260	9,260	9,260	
<b>Period cash movement</b>	-36,360	-30,860	-30,860	-40,860	-83,860	-81,860	-49,860	-33,860	-46,860	-38,860	-38,860	-40,860	
<b>Cash balance at end</b>	-36,360	-67,220	-98,080	-138,940	-222,800	-304,660	-354,520	-388,380	-435,240	-474,100	-512,960	-553,820	

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## *Operating Budgets*

- Cash (usually) Budgets that record parameters important to the business
- No statutory format
- Plan vs actual - 'variance'
- Selective format (eg red for negative numbers)
- Link project budgets together to get divisional or corporate budgets

## *Good practice in budgeting*

- Separate capital from revenue items
- Separate activities by manager or section
- Separate Income and Expenditure
- Separate Variable from Fixed Costs
- Control by running actuals alongside plan
- Plan, actuals and best estimate of year end

# Good Practice in Spreadsheets

**BASE ASSUMPTIONS FOR MODELS**

Cost of current OGC VAX system	
Hardware maintenance	7783
Software maintenance	6850
Operating Costs	10000
Security Personnel	2000
Internet Vax support	18000
Mailroom software contract	32400
Current Interest/Discount Rate	10.3%

*link to base assumptions on separate worksheet area*

*Do some 'what ifs'*

Option 1 - Current OGC VAX system	Year 1	Year 2	Year 3	Base Case total	Spillover Case	Overwrite Case
Hardware maintenance	7,750	8,550	9,350	25,650	23,318	28,215
Software maintenance	6,850	6,850	6,850	20,550	18,682	22,606
Operating Costs	10,000	10,000	10,000	30,000	3,000	300,000
Security Personnel	2,000			2,000	1,818	2,200
Internet Vax support	18,000	18,000	18,000	54,000	38,000	81,000
Mailroom software contract	32,400	32,400	32,400	97,200	88,364	106,320
<b>Total</b>	<b>77,000</b>	<b>75,800</b>	<b>76,600</b>	<b>229,400</b>	<b>171,182</b>	<b>540,940</b>

Option 2 - NIT	Year 1	Year 2	Year 3	Base Case total	Spillover Case	Overwrite Case
Project Capital Costs	87,000	25,000	25,000	137,000	117,758	161,900
Project Revenue Budget	43,400	0	0	43,400	30,145	63,100
Operating Revenue Costs	12,500	27,720	27,720	67,940	46,612	99,734
<b>Total</b>	<b>142,900</b>	<b>52,720</b>	<b>52,720</b>	<b>248,340</b>	<b>194,515</b>	<b>324,734</b>

Extra Spend in Year 1 over VAX	65,900					
Revenue saved in years 2-3		23,080	23,880			
Expected payback (years)						3.6
Income Rate of Return (5 years)	-55,960	23,080	23,880	23,880	23,880	19.17%
NPV@10% (Current)						8.36%

# Useful budget template...

Income, that's money from sales, grants etc goes up here

You can change the period to months or years etc to suit the project

Capital expenditure – money spent on big items like chemical plant

Revenue spending related directly to products

Revenue spending on 'overheads'

The template does your arithmetic for you!

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12
Capital Expenditure												
Revenue Expenditure												
Monthly cash movement	45,000	0	0	0	0	0	0	0	0	0	0	0
Cash balance at end	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000

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You could produce something like this

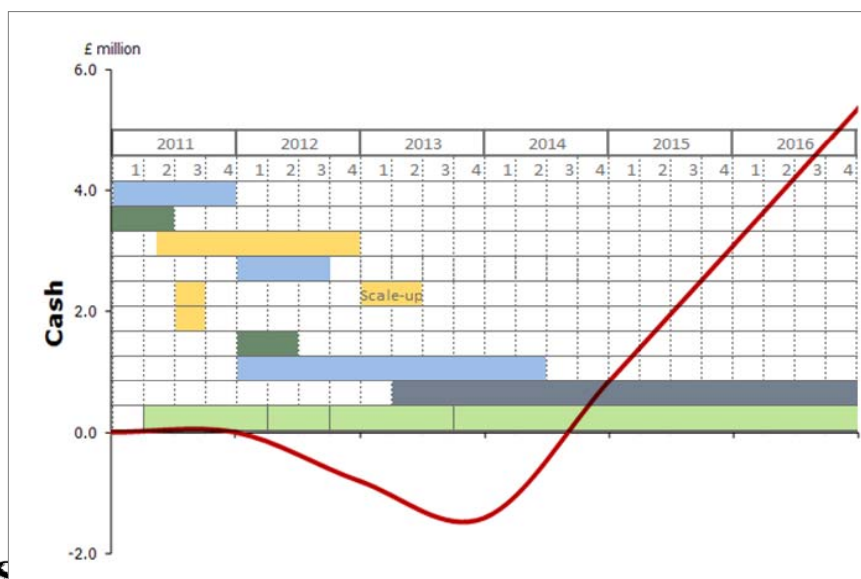
Cash

Outline Budget Plan for IT Project													
Time	Y1 Q1	Y1 Q2	Y1 Q3	Y1 Q4	Y2 Q1	Y2 Q2	Y2 Q3	Y2 Q4	Y3 Q1	Y3 Q2	Y3 Q3	Y3 Q4	
Income													
Grants	0												
Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital Expenditure													
Buildings													
Equipment	5,000				50,000	50,000							
Transport													
Other													
Subtotal	5,000	0	0	0	50,000	50,000	0	0	0	0	0	0	0
Revenue Expenditure													
Project Manager	12,500	12,500	12,500	12,500	13,500	13,500	13,500	13,500	14,500	14,500	14,500	14,500	14,500
Development Materials	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Sub-contractor	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Hardware	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Implementation trials				10,000				20,000	2,000				
Legal Fees	2,000				2,000					3,000	5,000	5,000	5,000
PR & Piv	600	600	600	600	600	600	600	600	600	600	600	600	600
IT networking	500		2,000		2,000				2,000	10,000			
Subtotal	23,100	22,600	22,600	32,600	25,600	23,600	41,600	25,600	37,600	29,600	29,600	29,600	31,600
Cash balance at end	-34,360	-67,220	-98,080	-138,940	-222,800	-304,660	-354,520	-388,380	-431,240	-474,100	-512,960	-553,820	

Time

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...or this



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## *Capital Investment Budgets*

- When the organisation might spend large amounts of money on new projects.
- We do a cash budget and analyse
  - Return on Investment
  - Payback Period
  - Net present value
  - Internal Rate of Return
- *And then decide whether to do the project!*

## *Return on Investment*

- Sometimes called Return on Capital

Average annual profit

Capital investment to earn that profit

- Can be directly compared with the interest we get on putting that money into a bank account

## Payback Period

- - time to break even

n	A	CF	CFac.
Year0	500		
Year1		100	100
Year2		150	250
Year3		250	500
Year4			500
Year5			500

- n: Number of years
- A: Initial investment
- CF: Annual cash flows
- CFac.: Accumulated cash flows

## Project Risk and Discounting

- £1 now is worth more than £1 in the future
  - Not because of inflation - opportunity cost
- Discount future cash flows by a:
  - Discount rate or organisation's cost of capital

## Discounting - Net Present Value

- The calculation for NPV is as follows
- $NPV = [ \text{£}1 / (1+r)^1 ] + [ \text{£}2 / (1+r)^2 ] + \dots + [ \text{£}n / (1+r)^n ]$
- £1: Cash flow in year 1 etc
- n: Number of years (1,2,...,n)
- r: Discount rate
- But you can do it on Excel!

	Discount Rate		30%
Years	Cash	NPV	
1	0		
2	0		
3	0		
4	0		
5	0		
6	0		
7	0		
8	0		
9	0		
10	5		£0.36

## NPV Example

- A profit of £5m in x years, discounted at 10%
  - 1 year                   £4.55m
  - 2 years                   £4.13m
  - 3 years                   £3.76m
  - 4 years                   £3.42m
  - 5 years                   £3.10m                   at 20%, £2.01m                   30%, £1.35m
  - 6 years                   £2.82m
  - 7 years                   £2.57m
  - 8 years                   £2.33m
  - 9 years                   £2.12m
  - 10 years                  £1.93m                   at 20%, £0.81m                   30%, £0.36m

## Internal Rate of Return

- As discount rate increases, the net present value of the project goes down
- There will be a point where NPV declines to zero
- Discount rate at which NPV is zero is called Internal Rate of Return (IRR)
- Measure of return on investment of a project
- Calculate by iteration (or Excel!)

	A	B	C
1	Discount Rate		10%
2			
3	Period	Cash Flow	
4	0	(800)	
5	1	100	
6	2	200	
7	3	300	
8	4	400	
9	5	500	
10			
11	Net Present Value (Method 1)	\$ 265.26	
12	Internal Rate of Return	=IRR(B4:B9)	19.54%
13			

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## Implications of Discounting

- Most companies will discount at cost of capital plus premium
  - Will seek ROI on all projects greater than cost of capital ('hurdle rate')
- Costs in yrs 1-2 not discounted as heavily as revenues in yrs 3+
- Leads to cautious investment decisions
- Sensitive to interest rates & market volatility

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## Some Real Costs

- Large petrochemical plant (e.g.  $\text{NH}_3$ , oil refinery)
  - \$1-3bn
- Pilot plant to prove technology to investors
  - £100k-£2m
- Cost of employing 1 Ph.D researcher in modern laboratory
  - £100k/pa
- Renting modern laboratory space
  - \$20-30 per square foot (US), £20-30 (UK)
- Small Scale reagent and costs
  - [www.smallscalechemistry.colostate.edu](http://www.smallscalechemistry.colostate.edu)



## Some Real Costs

- Cost of clinical trials
  - Phase 1, £1m+, Phase 2, £10m+, Phase 3 £100m?
- Professional fees – lawyers, accountants etc
  - £100-200/hour
- Cost of stand, travel, at Trade Fair or conference
  - £10k
- Cost of marketing campaign aimed at consumers
  - £10-100m+
- Expected rate of return of investors in technology companies
  - 10-15% for multinationals, 30-40% for start-ups



The Budget Template is available online at...

Use it or something very like it!

Click [HERE](#) for the budget template

Click [HERE](#) for a version of the template incorporating NPV and IRR calculations

## Things you should know

- What is the difference between Profit/loss accounts and Cash budgets
  - Profit taken on invoice
  - Capital expenditure and depreciation
- The difference between variable and fixed costs
  - The coke bottle and the air con at the plant
- The difference between capital and revenue
  - The ammonia plant and the natural gas it consumes
- How to prepare a project budget, using DCF methods if appropriate

## Finance – Other Resources

- Example Financial Case Study – oil refinery (see below)
- Excel Template for preparing budgets: Click [HERE](#)
- Example Budget with NPV/IRR calculations in Excel: Click [HERE](#)

	Y1 Q1	Y1 Q2	Y1 Q3	Y1 Q4	Y2 Q1	Y2 Q2	Y2 Q3	Y2 Q4	Y3 Q1	Y3 Q2	Y3 Q3	Y3 Q4
<b>Income</b>												
Revenue	12,000	12,000	12,000	12,000	13,000	13,000	13,000	13,000	14,000	14,000	14,000	14,000
Expenses												
Capital Expenditure					30,000	30,000						
Operating	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Interest	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Depreciation	600	600	600	600	600	600	600	600	600	600	600	600
Taxes	800	800	800	800	800	800	800	800	800	800	800	800
<b>Net Income</b>	5,600	5,600	5,600	5,600	6,600	6,600	6,600	6,600	7,600	7,600	7,600	7,600
<b>Free Cash Flow</b>	5,600	5,600	5,600	5,600	6,600	6,600	6,600	6,600	7,600	7,600	7,600	7,600
<b>NPV</b>												
NPV	38,869	38,869	38,869	38,869	38,869	38,869	38,869	38,869	38,869	38,869	38,869	38,869
<b>IRR</b>												
IRR	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%

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## Finance – Other Resources

- Introductory Book (*not expensive!*):

*How come you don't understand your accountant?*

Robert Cinnamon and Brian Helweg-Larsen  
Published by Kogan Page  
ISBN 07494 37251



- Comprehensive Book (*v. expensive, get from library!*):

Read chapters 5-7 on capital budgets

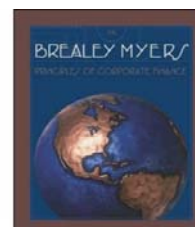
*Principles of Corporate Finance*

R. Brealey and S. Myers

McGraw-Hill

ISBN-10: 0071151451

ISBN-13: 978-0071151450



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## MiniGas Ltd

- MiniGas sells Industrial Heating Oil to small businesses and offices
- The Oil is sold in lots of 1000 litres and MiniGas have the capacity to store and sell 100 lots in a year
- For each lot delivered the oil itself costs £700 and delivery costs £200
- The business has to spend a total of £40000 overhead costs each year to comply with various technical and regulatory issues
- The business calculates the selling price by adding 30% mark-up to its total cost price
- Calculate price per lot
  - If they expect to sell 100 lots
  - If they expect to sell 50 lots
  - What are the range of potential prices chargeable for the 51st lot?

## MiniGas Ltd

Lots Sold 100		Lots Sold 50		Lots Sold 51	
Overheads		Overheads		Overheads	
Oil tank heating	10000	Oil tank heating	10000	Oil tank heating	10000
Business Rates	7000	Business Rates	7000	Business Rates	7000
Maintenance	3000	Maintenance	3000	Maintenance	3000
Insurance	5000	Insurance	5000	Insurance	5000
Security	15000	Security	15000	Security	15000
Sub total	40000	Sub total	40000	Sub total	40000
Overhead cost per 1000l	400	Overhead cost per 1000l	800	Overhead cost per 1000l	784.31
Variable Costs		Variable Costs		Variable Costs	
Delivery	200	Delivery	200	Delivery	200
Oil	700	Oil	700	Oil	700
	900		900		900
Cost 1000l lot	1300	Cost 1000l lot	1700	Cost 1000l lot	1684.31
Add 30% markup	1690	Add 30% markup	2210	Add 30% markup	2189.61
Total Sales	169000	Total Sales	110500	Total Sales	110500
Cost of Sales	90000	Cost of Sales	45000	Cost of Sales	45000
Gross Profit	79000	Gross Profit	65500	Gross Profit	65500
Overheads	40000	Overheads	40000	Overheads	40000
Total Profit	39000	Total Profit	25500	Total Profit	25770

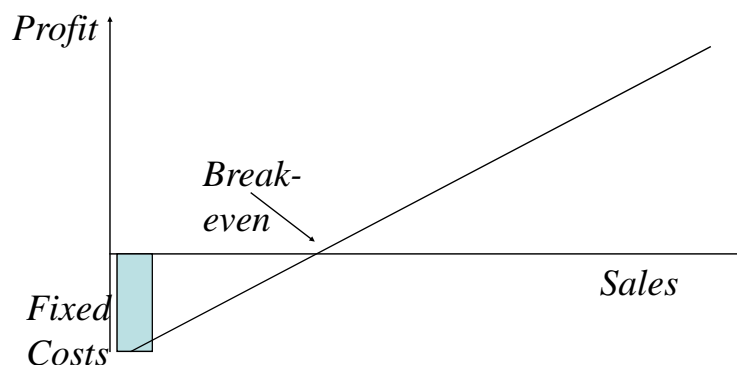
For lot 51 we could charge any sum between £900 and £2189  
 £901 would be pricing on a *marginal* cost basis.  
 £2189 would be pricing on a *full cost* basis

## Full and Marginal Costing

- Full costing covers the marginal (extra) costs of the project plus a portion of the overheads of the enterprise
  - Office rent, rates electricity etc
  - 'full economic cost' in University funding
- Marginal costing only recovers the marginal costs
  - e.g. Easyjet, Ryanair etc

The next slides are not ones that you need to do the task in this module. However they will be very useful some time in a job interview or in your future career when someone asks you something like 'So, can you read a set of accounts?'

## Extra Slides



## *Using the P&L*

- Company is valued at a multiple of accounting profit (or earnings in US) - 'p/e ratio'
- p/e ratios widely used and quoted
  - Stock market, financial pages
- Vary from sector to sector
- Quick and easy to use

## *Problems with P+L*

- Retrospective
- Volatile
- Especially for start-up comp
- Can be manipulated
  - Late or early invoicing
  - Assigning costs to wrong period (e.g. PFI bid expenses)
  - Adjusting depreciation methods
  - Merger and acquisition accounting

## *The Financial Pages*

- **Share Price**
  - Price to buy 1 share in the company yesterday
- **Dividend yield**
  - Last year's dividend per share divided by yesterday's share price
- **Earnings per share (eps)**
  - Last year's net profit of company divided by total number of shares
- **Price/earnings ratio**
  - Yesterday's share price divided by eps
- **Market capitalisation**
  - Total number of shares times yesterday's price
- **Book value**
  - Shareholders interest (capital and reserves) given in balance sheet

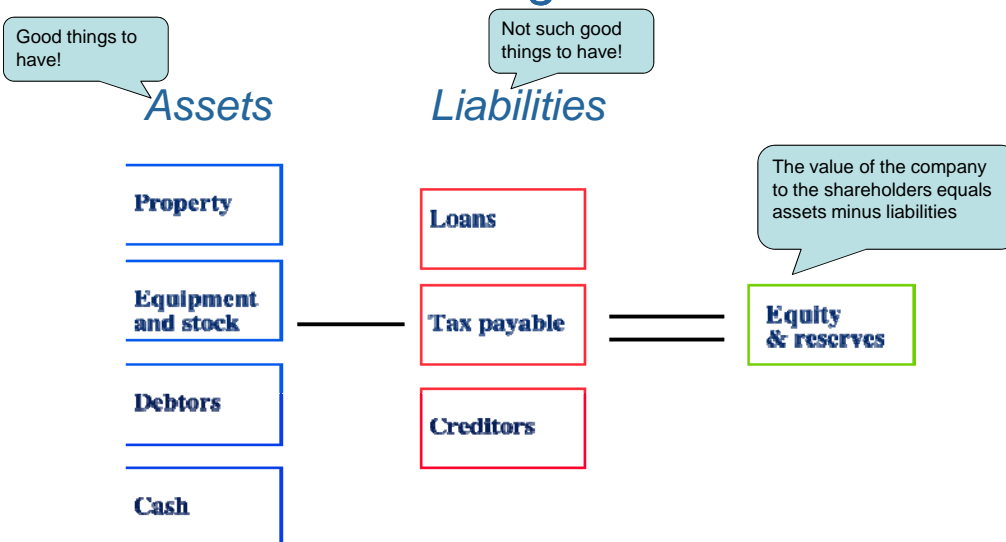
## *Corporation Tax*

- Tax on company profit payable up to 9 months after year end
- Variable rates for different sizes of business (30%, 20% 10%)
- Normal operating expenses (wages, raw materials) can be offset against corp tax
- Capital asset purchase cannot be offset against corp tax unless specific capital allowance in place
- In UK corp tax can be applied to Group, not subsidiary
- Profit one year can be offset against (up to 7) previous years losses

# VAT

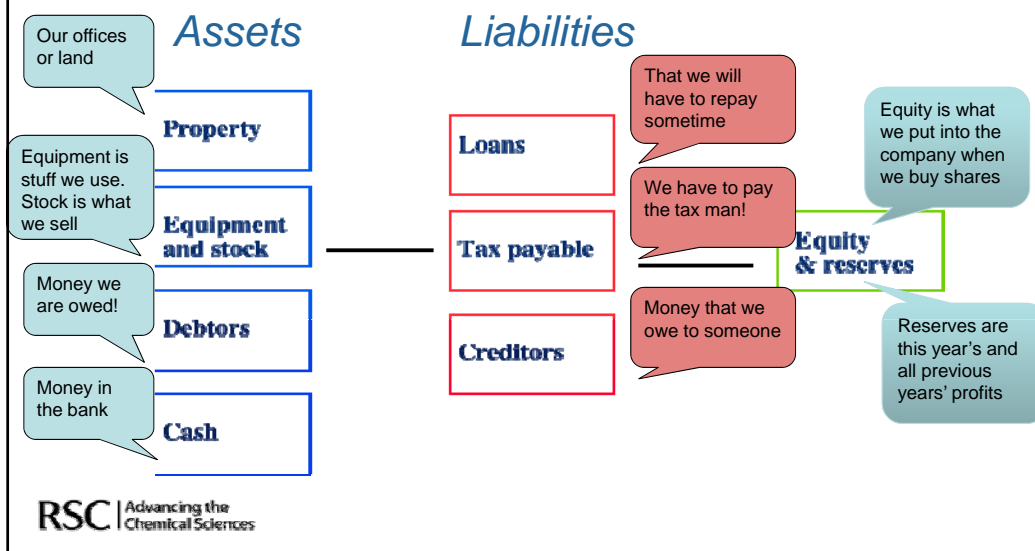
- 'What it says on the tin'
  - tax on added value in commercial activities
- Charge customers VAT and claim back VAT on supplies
- Many Charitable activities are not commercial and are therefore 'outside the scope of VAT'
  - Some charities have trading (VAT registered) subsidiaries
- Net amount payable to or from Customs
- Payable quarterly
- Supplier invoices above £100 must have supplier Vat No
- Certain things are exempt from VAT
  - education and training, health care, charities, leases and lettings
- Certain things are low-rated (5% or zero!)
  - Domestic fuel (5%), children's clothes, food and drink, books etc (0%)

## Understanding the Balance Sheet

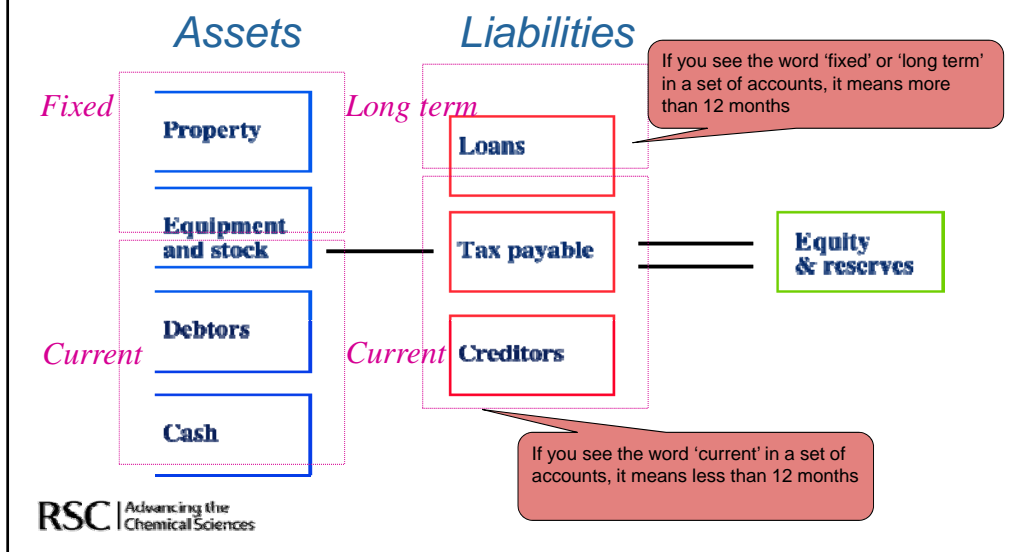


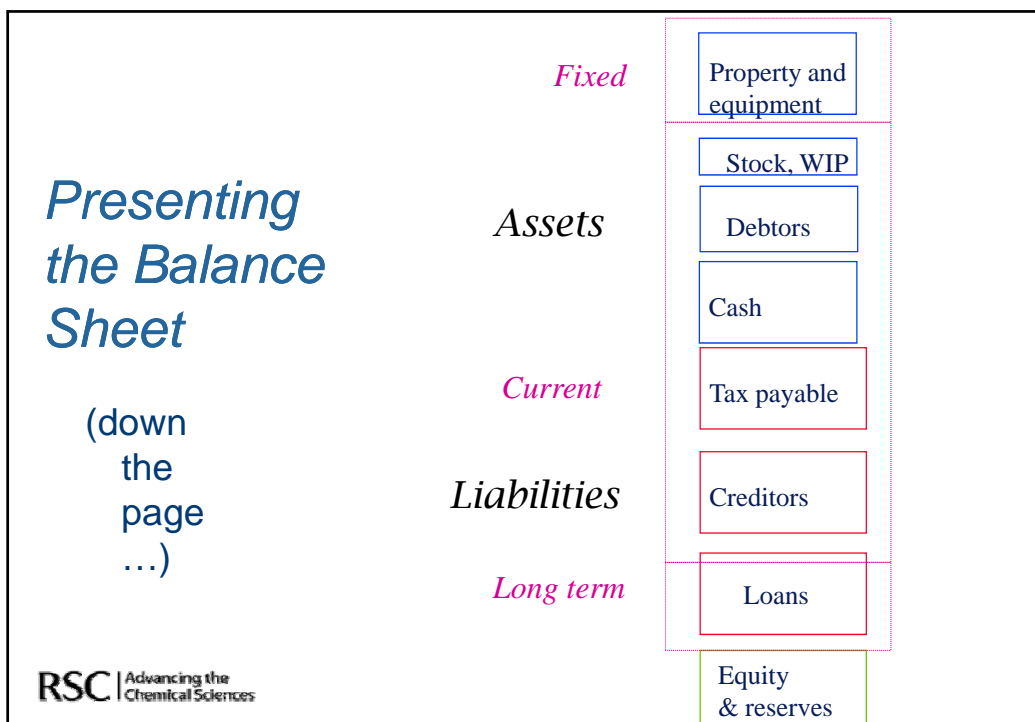


## Understanding the Balance Sheet



## Understanding the Balance Sheet





## Reading the Balance Sheet

	£	£
<b>Fixed Assets</b>		
Land & buildings	88,000	
Fixtures & fittings	14,000	
Plant & machinery	46,000	
Motor vehicles	<u>13,000</u>	
		161,000
<b>Current Assets</b>		
Stock & work-in-progress	58,000	
Debtors	44,000	
Cash in hand	<u>2,000</u>	
	104,000	
<b>Current Liabilities</b>		
Creditors	24,000	
Bank overdraft	<u>18,000</u>	
	42,000	
<b>Net Current Assets</b>		<u>62,000</u>
<b>Total Assets less Current Liabilities</b>		223,000
<b>Long-term Liabilities</b>		
Long term loan from ABC		<u>160,000</u>
<b>Net Assets</b>		<b>£63,000</b>
<b>Capital &amp; Reserves</b>		
Called-up share capital	20,000	
Profit & Loss account	<u>43,000</u>	
<b>Shareholders' Funds</b>		<b>£63,000</b>

Its current assets are more than twice its current liabilities. That's good!

It gets most of its money from a long-term bank loan. I wonder when they have to repay that?

They have quite a lot of stock – I hope they can sell it!

The company is worth £63,000 to its shareholders

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## *Using the Balance Sheet*

- A conservative current 'snapshot' of the company's position
- Shows the assets, the liabilities and the value of the company to its shareholders
- Shows 'money in bank' or on hand
- 'Solvency ratios' - 'current assets to current liabilities'
- Combine with P&L to get interesting information

## *Be sceptical about the Balance Sheet of*

- Advertising agencies, Consultancies, Football Clubs, Start-up companies
- Banks, insurance companies
- Companies with Brands
- Companies with R&D and Patents
- If you see the words 'Leases'!
- Companies with Contingent Liabilities
- If you see the word 'Goodwill'

## *Finding Published Accounts*

- PLCs - 'investor information' on website
- Ltd Co - Companies House, Small Business Gateway, & FAME online
  - Info on profitability, sales, owners, directors, employees
  - Check up on business partners
  - Ratio analysis
- Dun and Bradstreet
  - Credit checking

*It only costs £1-2 to get a set of accounts from Companies House*

## *What accounts can tell you*

- How profitable is the company?
- What is the return on investment?
- Is the company solvent?
- How fast does it collect its debts?
- How quickly does it pay its bills?

## Are accounts useful....

- Which company would you prefer to be?
  - Company A \$1bn sales, \$250m debtors
  - Company B \$800m sales, \$50m debtors
  
- Which company would you prefer to sell to?
  - Company X \$500m purchases, \$125m trade creditors
  - Company Y \$400m purchases \$50m trade creditors

## Are accounts useful....

- Which company would you prefer to be?
  - Company A \$1bn sales, \$250m debtors
  - Company B \$800m sales, \$50m debtors
  
- Which company would you prefer to sell to?
  - Company A \$500m purchases, \$125m trade creditors
  - Company B \$400m purchases \$50m trade creditors

Company A sells more!

But look, it has 25% of its sales still in debtors! On average it's taking 90 days to get paid!

Hmmm, I wonder how fast it pays its creditors?

Some business software and web-sites calculate these *debtor days* and *creditor days* for you 😊

## *Using Published Accounts*

1. read B/Sheet - compare current assets and liabilities
2. Look at P+L (more than 1 year) - are profits increasing?
3. Compare profit with loan and share capital to get return on capital
4. Compare their debtors with their sales, creditors with purchases
5. Look in notes to accounts for anything 'nasty'

## *Two Countries, one language?*

UK	US
Sales/Turnover	Income
Profits	Earnings
Debtors	Accounts receivables
Creditors	Accounts payable
Stock	Inventory
Shares	Stock
Corporation Tax	Income Tax
Income Tax	Individual Federal Tax