



Case study

Turin 9 September 2015

Sarah Shababi

Please do not distribute by electronic or other means or cite without permission



Outline



- ▶ Examine investment appraisal and the related techniques;
- ▶ Discuss the practical application of investment appraisal techniques to the public sector;
- ▶ Run through the spreadsheet you will need to use in your working groups next week.



3. Run through the spreadsheet you will need to use in your working groups next week.



Working groups case study

Details of investment

- ▶ Cost of investment: to be determined
- ▶ Useful life: 20 years
- ▶ Expected cubic metres water/tons of waste per year: to be determined
- ▶ Cost of capital: to be calculated based on K_d (cost of debt) and K_e (cost of equity)
- ▶ Equity/debt % of company: to be established

Excel spreadsheet – investment data and instructions

The image shows an Excel spreadsheet with the following data:

	A	B	C	D	G	H	I
1							
2	Cost of investment						
3	Useful life	20 years					
4	Operating start date	01/01/2016					
5	Expected cubic metres/year						
6	Capital structure:	100 %					
7	Equity	%					
8	Debt	100 %					
9	Tax rate	0					
10							
11							
12							
13							
14							
15							
16							

Callout boxes and their questions:

- Box 1: "What is the cost of my investment?" (points to cell B2)
- Box 2: "How many cubic metres do we expect from investment?" (points to cell B5)
- Box 3: "What is the capital structure of my company?" (points to cell B7)

Instructions at the bottom:

- Row 13: "= cells to be completed"
- Row 15: "= variable to be completed only once all the other information has been included"

Excel spreadsheet – profit and loss account/ income statement

	A	B	C	D	E	F	G	H	I	
1	Years	2015	2016	2017	2018	2019	2020	2021	2022	
2	Revenue from water tariffs	0	0	0	0	0	0	0	0	
3	Operating costs:	0	0	0	0	0				
4	Power and other direct costs									
5	Labour costs									
6	Direct overheads									
7	Depreciation and Amortization	0	0	0	0	0				
8	Other operating expenses									
9	Administrative expenses									
10	Operating income/loss	0	0	0	0	0				
11	Interest expense	0	0	0	0	0				
12	Income (loss) before tax	0	0	0	0	0				
13	Tax provision	0	0	0	0	0	0	0	0	
14	Result for the period	0	0	0	0	0				
15										
16	Unit price per cubic metre of water									
17										
18	If budget available insert data for years 2016 onwards, if budget unavailable insert 0									
19										
20	Percentage annual increase in revenues									
21	Percentage annual increase in operating costs									
22	Tax rate									
23										

Key variable of entire spreadsheet is the unit price per cubic metre of water

Expected percentage increases in revenue and costs

What is the tax rate in the country where investing?

Excel spreadsheet – cost of capital calculation

	A	B	C	D	E	F	G
1	Calculation of cost of capital						
2							
3	WACC	0%					
4	Debt	100%					
5	Equity	0%					
6	Kd						
7	Ke						
8	tax rate	0%					
9							
10							
11							

What is the cost of debt of the company?

What is the cost of equity of the company?

Excel spreadsheet – cost of capital calculation completed

	A	B	C	D	E	F	G	H
1	Calculation of cost of capital							
2								
3	WACC	6,40%						
4	Debt	50%						
5	Equity	50%						
6	Kd	6%						
7	Ke	8%						
8	tax rate	20%						
9								
10								
11								

Excel spreadsheet – loan amortisation plan

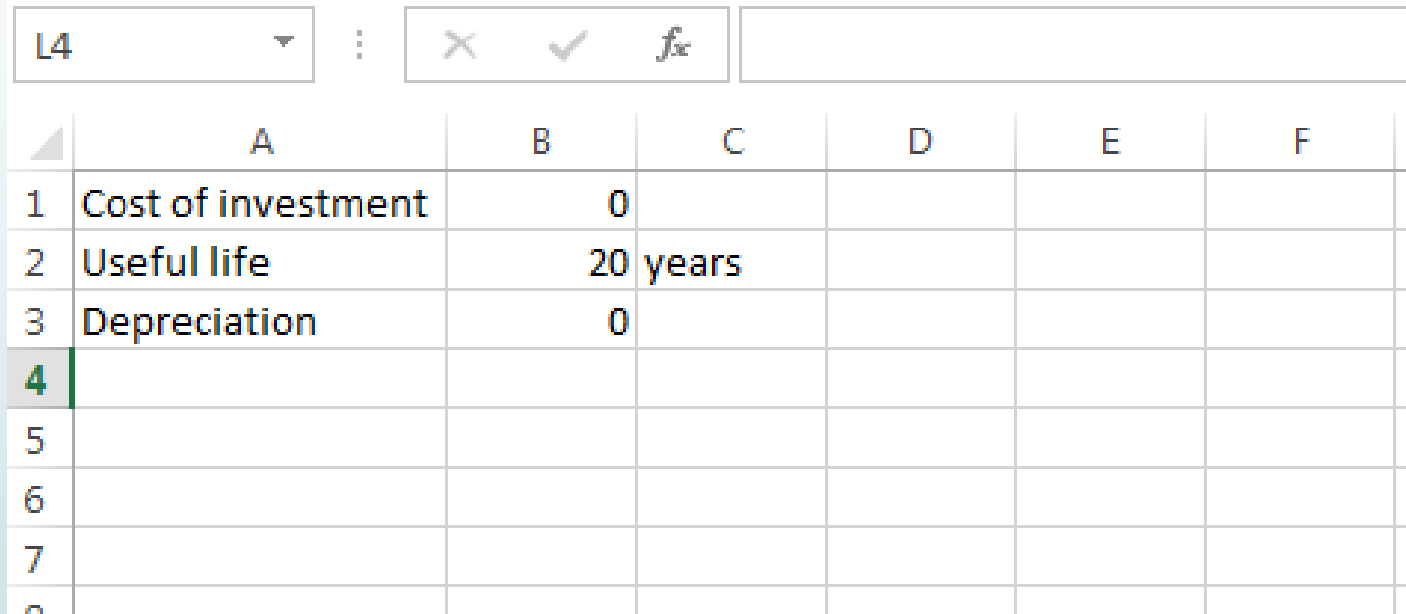
	A	B	C	D	E	F	G	H
1							Principal	
2	Years	Date	Scheduled Payment	Principal	Kd (interest rate)	Interest pmt	Balance Beginning	Ending Balance
3	1	31/12/2015	0	0	0,00%	0		0
4	2	31/12/2016	0	0	0,00%	0	0	0
5	3	31/12/2017	0	0	0,00%	0	0	0
6	4	31/12/2018	0	0	0,00%	0	0	0
7	5	31/12/2019	0	0	0,00%	0	0	0
8	6	31/12/2020	0	0	0,00%	0	0	0
9	7	31/12/2021	0	0	0,00%	0	0	0
10	8	31/12/2022	0	0	0,00%	0	0	0
11	9	31/12/2023	0	0	0,00%	0	0	0
12	10	31/12/2024	0	0	0,00%	0	0	0
13	11	31/12/2025	0	0	0,00%	0	0	0
14	12	31/12/2026	0	0	0,00%	0	0	0
15	13	31/12/2027	0	0	0,00%	0	0	0
16	14	31/12/2028	0	0	0,00%	0	0	0
17	15	31/12/2029	0	0	0,00%	0	0	0
18	16	31/12/2030	0	0	0,00%	0	0	0
19	17	31/12/2031	0	0	0,00%	0	0	0
20	18	31/12/2032	0	0	0,00%	0	0	0
21	19	31/12/2033	0	0	0,00%	0	0	0
22	20	31/12/2034	0	0	0,00%	0	0	0

What is the amount of the loan? i.e. how much has the company borrowed to finance this investment?

Excel spreadsheet loan amortisation plan - completed

	A	B	C	D	E	F	G	H
1							Principal	
2	Years	Date	Scheduled Payment	Principal	Kd (interest rate)	Interest pmt	Balance Beginning	Ending Balance
3	1	31/12/2015	87.185	27.185	6,00%	60.000	1.000.000	972.815
4	2	31/12/2016	87.185	28.816	6,00%	58.369	972.815	944.000
5	3	31/12/2017	87.185	30.545	6,00%	56.640	944.000	913.455
6	4	31/12/2018	87.185	32.377	6,00%	54.807	913.455	881.078
7	5	31/12/2019	87.185	34.320	6,00%	52.865	881.078	846.758
8	6	31/12/2020	87.185	36.379	6,00%	50.805	846.758	810.379
9	7	31/12/2021	87.185	38.562	6,00%	48.623	810.379	771.817
10	8	31/12/2022	87.185	40.876	6,00%	46.309	771.817	730.942
11	9	31/12/2023	87.185	43.328	6,00%	43.857	730.942	687.614
12	10	31/12/2024	87.185	45.928	6,00%	41.257	687.614	641.686
13	11	31/12/2025	87.185	48.683	6,00%	38.501	641.686	593.003
14	12	31/12/2026	87.185	51.604	6,00%	35.580	593.003	541.398
15	13	31/12/2027	87.185	54.701	6,00%	32.484	541.398	486.697
16	14	31/12/2028	87.185	57.983	6,00%	29.202	486.697	428.715
17	15	31/12/2029	87.185	61.462	6,00%	25.723	428.715	367.253
18	16	31/12/2030	87.185	65.149	6,00%	22.035	367.253	302.104
19	17	31/12/2031	87.185	69.058	6,00%	18.126	302.104	233.045
20	18	31/12/2032	87.185	73.202	6,00%	13.983	233.045	159.844
21	19	31/12/2033	87.185	77.594	6,00%	9.591	159.844	82.250
22	20	31/12/2034	87.185	82.250	6,00%	4.935	82.250	0

Excel spreadsheet – depreciation of investment



	A	B	C	D	E	F
1	Cost of investment	0				
2	Useful life	20 years				
3	Depreciation	0				
4						
5						
6						
7						
8						

Excel spreadsheet – cash flow calculation

	A	B	C	D	E	F	G	H	I	J	K
1		0	1	2	3	4	5	6	7	8	9
2	Years	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
3	Result for the period	0	0	0	0	0	0	0	0	0	0
4											
5	Add back										
6	Depreciation	0	0	0	0	0				0	0
7	Interest	0	0	0	0	0				0	0
8	Working capital recovered (last year only)										
9											
10	Deduct										
11	Working capital	0	0	0	0	0				0	0
12	Cost of investment	0									
13											
14	Cash flows	0	0	0	0	0				0	0
15											
16	Discounted cash flows	0	0	0	0	0				0	0
17											
18	NPV	0									
19											
20	Working capital % of revenue										

Working capital measures operating liquidity, so we are looking for an approximate % of sales to estimate our working capital.



TRM SpA – source



Incinerator – modelled on TRM

- ▶ Cost of investment in 2015: € 300 million, of which 20% financed by equity and 80% financed by debt.
- ▶ Allowed waste per annum: 421,000 tons.
- ▶ Operating costs 2015:
 - Energy and disposal costs: € 11 million
 - Personnel costs: € 3.5 million
 - Insurance costs: € 2.3 million
 - Raw materials: € 3.8 million
 - Maintenance: € 7.5 million
 - Other operating costs: € 5.7 million

NPV – Present value table

n/i	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%	5.5%	6.0%	7.0%	8.0%	9.0%	10.0%	11.0%	12.0%	20.0%
1	0.99010	0.98522	0.98039	0.97561	0.97087	0.96618	0.96154	0.95694	0.95238	0.94787	0.94340	0.93458	0.92593	0.91743	0.90909	0.90090	0.89286	0.83333
2	0.98030	0.97066	0.96117	0.95181	0.94260	0.93351	0.92456	0.91573	0.90703	0.89845	0.89000	0.87344	0.85734	0.84168	0.82645	0.81162	0.79719	0.69444
3	0.97059	0.95632	0.94232	0.92860	0.91514	0.90194	0.88900	0.87630	0.86384	0.85161	0.83962	0.81630	0.79383	0.77218	0.75131	0.73119	0.71178	0.57870
4	0.96098	0.94218	0.92385	0.90595	0.88849	0.87144	0.85480	0.83856	0.82270	0.80722	0.79209	0.76290	0.73503	0.70843	0.68301	0.65873	0.63552	0.48225
5	0.95147	0.92826	0.90573	0.88385	0.86261	0.84197	0.82193	0.80245	0.78353	0.76513	0.74726	0.71299	0.68058	0.64993	0.62092	0.59345	0.56743	0.40188
6	0.94205	0.91454	0.88797	0.86230	0.83748	0.81350	0.79031	0.76790	0.74622	0.72525	0.70496	0.66634	0.63017	0.59627	0.56447	0.53464	0.50663	0.33490
7	0.93272	0.90103	0.87056	0.84127	0.81309	0.78599	0.75992	0.73483	0.71068	0.68744	0.66506	0.62275	0.58349	0.54703	0.51316	0.48166	0.45235	0.27908
8	0.92348	0.88771	0.85349	0.82075	0.78941	0.75941	0.73069	0.70319	0.67684	0.65160	0.62741	0.58201	0.54027	0.50187	0.46651	0.43393	0.40388	0.23257
9	0.91434	0.87459	0.83676	0.80073	0.76642	0.73373	0.70259	0.67290	0.64461	0.61763	0.59190	0.54393	0.50025	0.46043	0.42410	0.39092	0.36061	0.19381
10	0.90529	0.86167	0.82035	0.78120	0.74409	0.70892	0.67556	0.64393	0.61391	0.58543	0.55839	0.50835	0.46319	0.42241	0.38554	0.35218	0.32197	0.16151
11	0.89632	0.84893	0.80426	0.76214	0.72242	0.68495	0.64958	0.61620	0.58468	0.55491	0.52679	0.47509	0.42888	0.38753	0.35049	0.31728	0.28748	0.13459
12	0.88745	0.83639	0.78849	0.74356	0.70138	0.66178	0.62460	0.58966	0.55684	0.52598	0.49697	0.44401	0.39711	0.35553	0.31863	0.28584	0.25668	0.11216
13	0.87866	0.82403	0.77303	0.72542	0.68095	0.63940	0.60057	0.56427	0.53032	0.49856	0.46884	0.41496	0.36770	0.32618	0.28966	0.25751	0.22917	0.09346
14	0.86996	0.81185	0.75788	0.70773	0.66112	0.61778	0.57748	0.53997	0.50507	0.47257	0.44230	0.38782	0.34046	0.29925	0.26333	0.23199	0.20462	0.07789
15	0.86135	0.79985	0.74301	0.69047	0.64186	0.59689	0.55526	0.51672	0.48102	0.44793	0.41727	0.36245	0.31524	0.27454	0.23939	0.20900	0.18270	0.06491
16	0.85282	0.78803	0.72845	0.67362	0.62317	0.57671	0.53391	0.49447	0.45811	0.42458	0.39365	0.33873	0.29189	0.25187	0.21763	0.18829	0.16312	0.05409
17	0.84438	0.77639	0.71416	0.65720	0.60502	0.55720	0.51337	0.47318	0.43630	0.40245	0.37136	0.31657	0.27027	0.23107	0.19784	0.16963	0.14564	0.04507
18	0.83602	0.76491	0.70016	0.64117	0.58739	0.53836	0.49363	0.45280	0.41552	0.38147	0.35034	0.29586	0.25025	0.21199	0.17986	0.15282	0.13004	0.03756
19	0.82774	0.75361	0.68643	0.62553	0.57029	0.52016	0.47464	0.43330	0.39573	0.36158	0.33051	0.27651	0.23171	0.19449	0.16351	0.13768	0.11611	0.03130
20	0.81954	0.74247	0.67297	0.61027	0.55368	0.50257	0.45639	0.41464	0.37689	0.34273	0.31180	0.25842	0.21455	0.17843	0.14864	0.12403	0.10367	0.02608
21	0.81143	0.73150	0.65978	0.59539	0.53755	0.48557	0.43883	0.39679	0.35894	0.32486	0.29416	0.24151	0.19866	0.16370	0.13513	0.11174	0.09256	0.02174
24	0.78757	0.69954	0.62172	0.55288	0.49193	0.43796	0.39012	0.34770	0.31007	0.27666	0.24698	0.19715	0.15770	0.12640	0.10153	0.08170	0.06588	0.01258
25	0.77977	0.68921	0.60953	0.53939	0.47761	0.42315	0.37512	0.33273	0.29530	0.26223	0.23300	0.18425	0.14602	0.11597	0.09230	0.07361	0.05882	0.01048
28	0.75684	0.65910	0.57437	0.50088	0.43708	0.38165	0.33348	0.29157	0.25509	0.22332	0.19563	0.15040	0.11591	0.08955	0.06934	0.05382	0.04187	0.00607
29	0.74934	0.64936	0.56311	0.48866	0.42435	0.36875	0.32065	0.27902	0.24295	0.21168	0.18456	0.14056	0.10733	0.08215	0.06304	0.04849	0.03738	0.00506
30	0.74192	0.63976	0.55207	0.47674	0.41199	0.35628	0.30832	0.26700	0.23138	0.20064	0.17411	0.13137	0.09938	0.07537	0.05731	0.04368	0.03338	0.00421
31	0.73458	0.63031	0.54125	0.46511	0.39999	0.34423	0.29646	0.25550	0.22036	0.19018	0.16425	0.12277	0.09202	0.06915	0.05210	0.03935	0.02980	0.00351
40	0.67165	0.55126	0.45289	0.37243	0.30656	0.25257	0.20829	0.17193	0.14205	0.11746	0.09722	0.06678	0.04603	0.03184	0.02209	0.01538	0.01075	0.00068