



TESLA BOT: INVESTMENT ANALYSIS

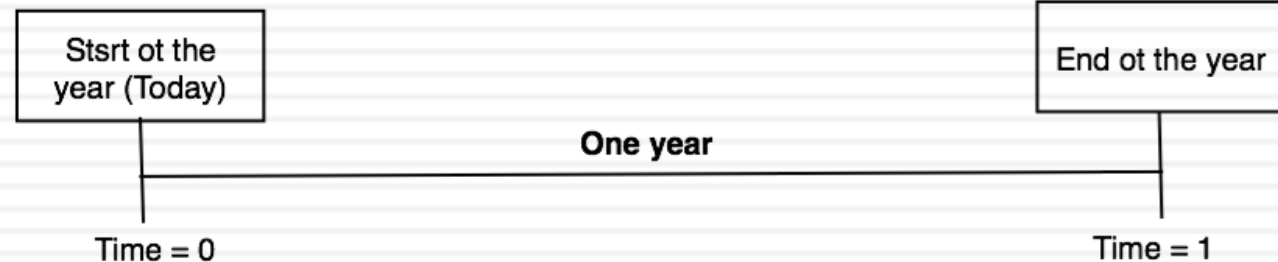
An "Elon-gated" Discussion!

Discrete and Continuous Time

The Real World

Most of your cash flows occur over the entire year. Revenues and operating expenses are spread over the year, though there may be "seasonal" factors

Some of your cash flows (tax payments, debt payments) occur at discrete intervals (every quarter or month)



The PV World

The Discrete Time World: Cash flows are assumed to occur at a point in time.

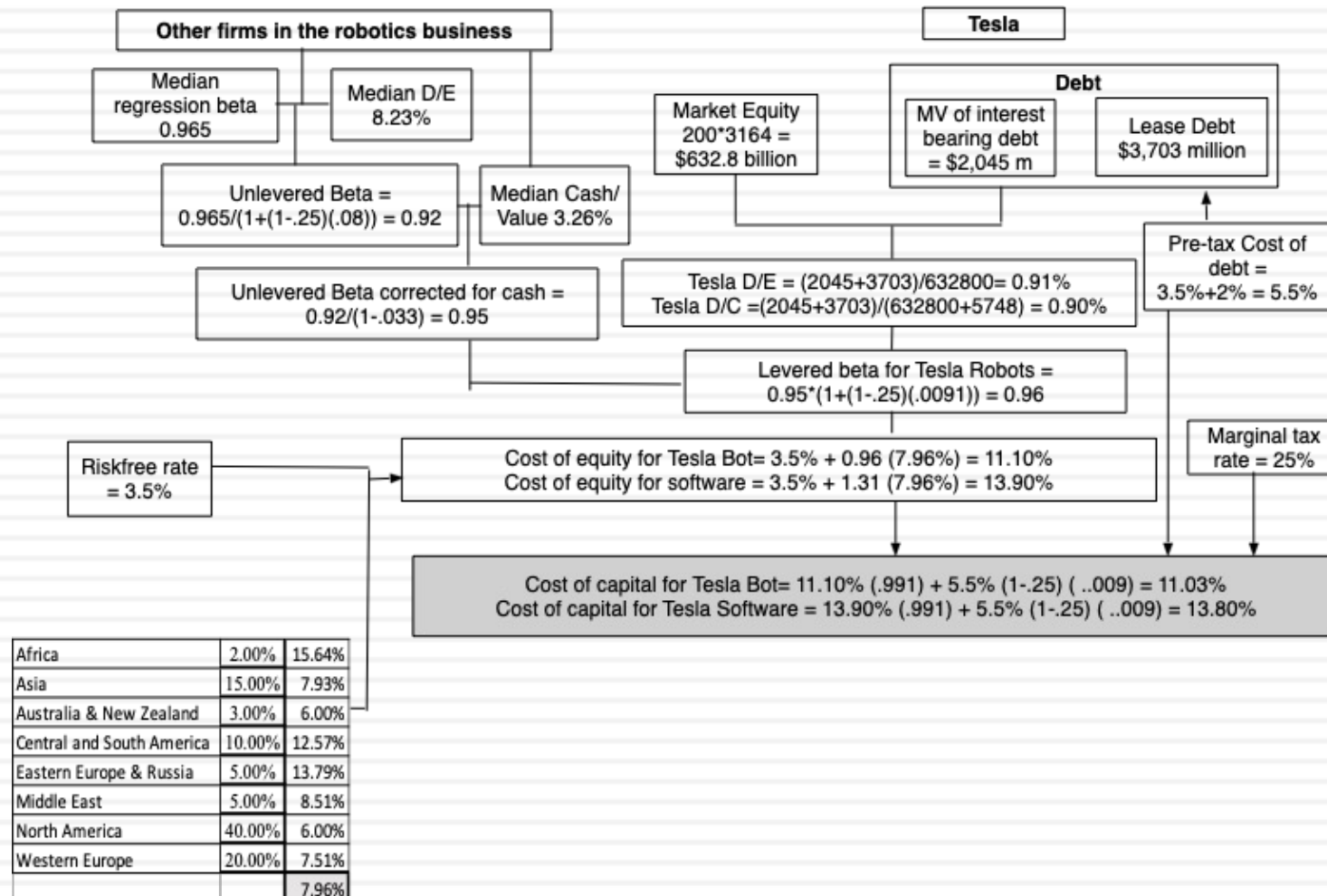
The Accounting World

The Accounting World: Revenues, earnings and expenses occur in fiscal years

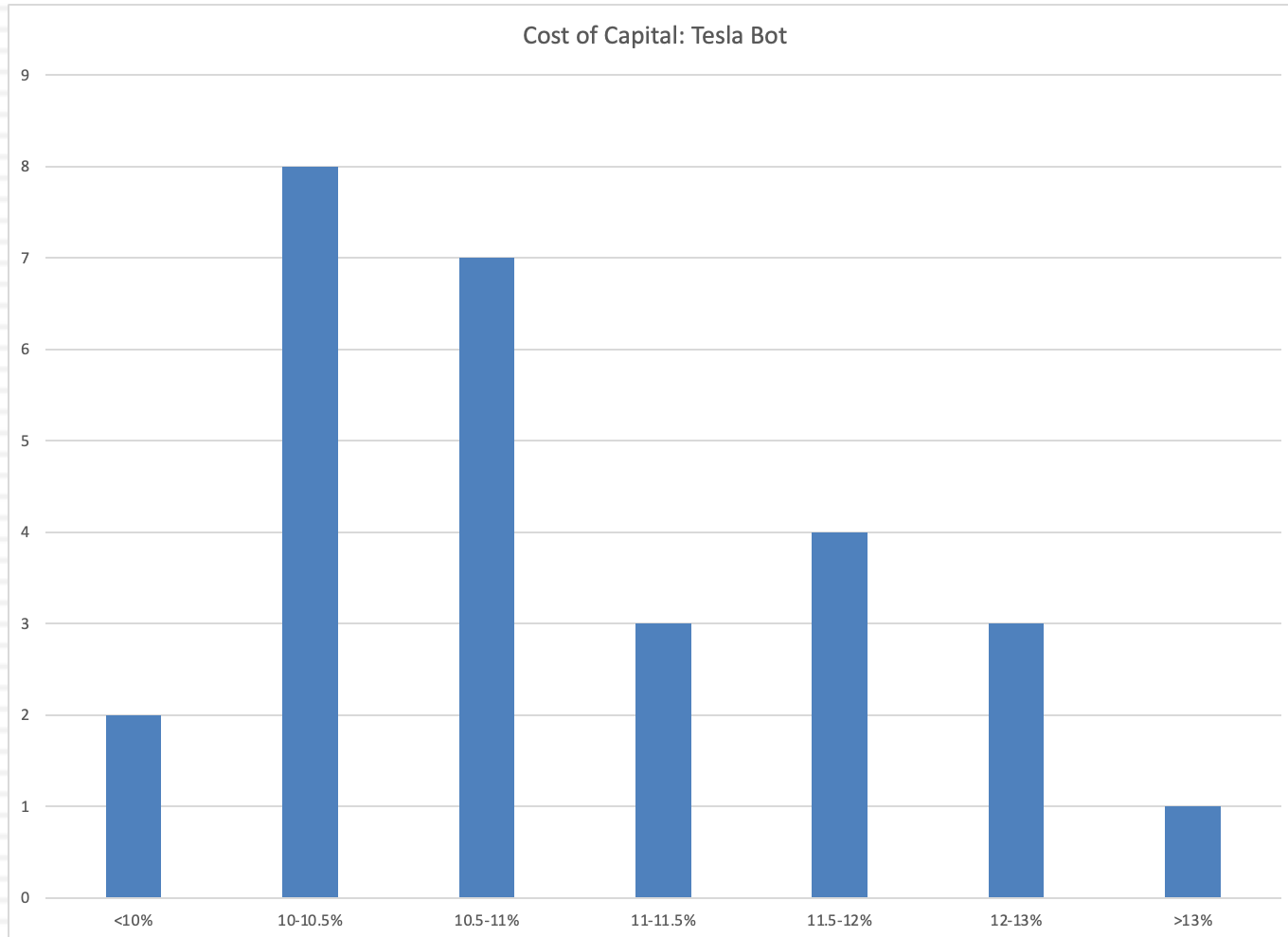
Summary of Conclusions

- Based upon the riskiness of this project and Tesla's debt to equity ratio of 0.91%, the beta for this project, when fully operational, is 0.96, the cost of equity is 11.10% and the cost of capital is 11.03%.
- From an accounting return standpoint, the return on capital computed using the average operating income and capital invested over the period is about 19-24%, depending on what you include in book value, and whether you include or exclude the synergy benefits, but that includes negative returns on capital for the first 3 years.
- The net present value of just the cash flows on the project, discounted at 11.03% (for most of the years..)
 - *is -\$6.00 billion, for a finite life of 10 years and without counting side effects (lost sales at stores and synergy) & -3.70 billion, with synergies considered.*
 - *is -\$3.66 billion, under the assumption of an infinite life, with higher capital expenditures during the project life, without counting the side effects (lost sales at stores and synergies)*
- There are synergies to the software business, and they add \$2.3 billion in value, when you discount the additional cash flows generated for the software business, discounted back at a software cost of capital. In the finite life case, and \$3.5 billion in the longer life analysis.
- **I would recommend rejecting the investment, notwithstanding the allure of the big market for robots. The low margins and substantial reinvestment needed will result in value destruction.**

Cost of Capital Calculations



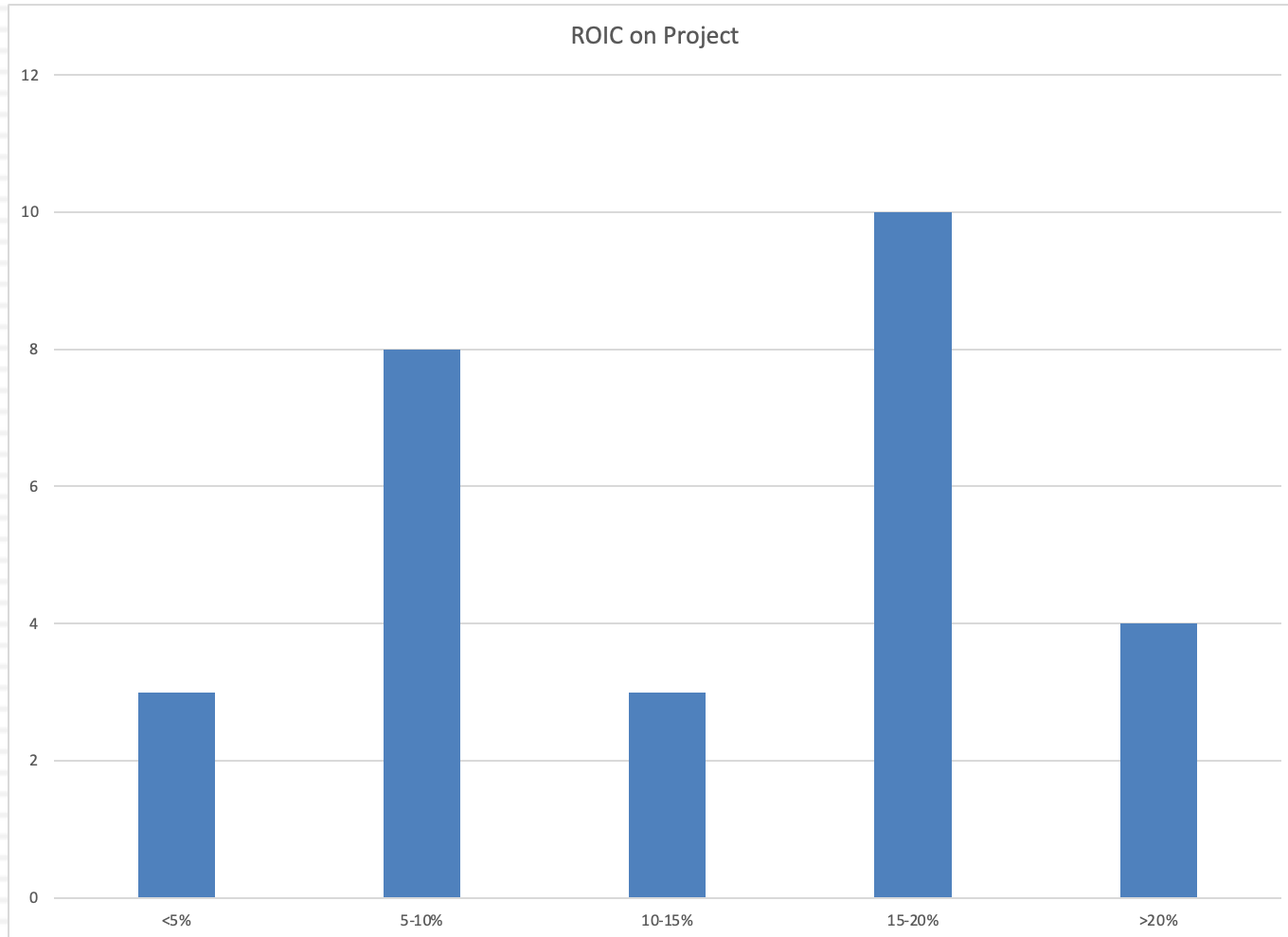
Cost of Capital: Your numbers



Return on Capital Computation

<i>Year</i>	<i>Tbot</i>	<i>Software</i>	<i>Total</i>	<i>Average BV: Investment</i>	<i>Average BV: WC</i>	<i>Average BV</i>	<i>ROC</i>
1	-\$1,648	\$400	-\$1,248	\$19,100	\$176	\$19,276	-6.48%
2	-\$1,161	\$410	-\$751	\$17,300	\$333	\$17,633	-4.26%
3	-\$526	\$420	-\$105	\$15,500	\$535	\$16,035	-0.66%
4	\$212	\$431	\$643	\$13,700	\$1,198	\$14,898	4.32%
5	\$1,254	\$442	\$1,695	\$11,900	\$1,388	\$13,288	12.76%
6	\$1,700	\$453	\$2,152	\$10,100	\$1,516	\$11,616	18.53%
7	\$2,214	\$464	\$2,678	\$8,300	\$1,667	\$9,967	26.87%
8	\$2,809	\$475	\$3,284	\$6,500	\$1,844	\$8,344	39.36%
9	\$3,588	\$487	\$4,076	\$4,700	\$2,076	\$6,776	60.15%
10	\$4,379	\$500	\$4,879	\$2,900	\$936	\$3,836	127.20%
Average=							27.78%
Aggregate =	\$12,821	\$4,481	\$17,303			\$121,667	14.22%

Your findings: Return on Capital



Finite Life case assumptions

□ Incremental Effects

- The \$2 billion in money spent on R&D already is ignored for purposes of cash flow computation, since it is non-incremental.
- When analyzing the cost of the distribution system, we consider the cost of the system in year 3 (\$ 2,154 million) but we show the savings in year 8 (\$2,498 million). Similarly, for depreciation, we show the depreciation on the existing system of \$107 million from years 4-8, but show the differential depreciation between the two systems (-\$17 million) in years 9 & 10.
- **Since we are planning on wrapping up the business in 10 years, there is no need for significant capital maintenance expenditures.**
- Both working capital investments and store investments are assumed to occur at the start of the year and are therefore shown at the end of the previous year.

Expansion now or later?

	Last year	1	2	3	4	5	6	7	8	9	10
Capacity used by Batteries	40.00%	44.80%	50.18%	56.20%	62.94%	70.49%	78.95%	88.43%	99.04%	110.92%	124.23%
Capacity used by Tesla Bot		30.00%	35.00%	40.00%	45.00%	50.00%	55.00%	60.00%	65.00%	70.00%	75.00%
Total capacity used	40.00%	74.80%	85.18%	96.20%	107.94%	120.49%	133.95%	148.43%	164.04%	180.92%	199.23%
Expansion Investment				-\$2,154					\$2,497.73		
Depreciation on Expansion (STL: 20 year life; Salvage=0)					\$107.69	\$107.69	\$107.69	\$107.69	\$107.69	-\$17.20	-\$17.20

What will happen if I take the investment?

- Run out of capacity earlier (in year 4)
- Spend \$2,154 million on new capacity in year 3
- Depreciate this straight line over 20 years

What will happen if I take the investment?

- Run out of capacity later in year 9
- Spend \$2,498 million on new capacity in year 8
- Depreciate this straight line over 20 years

What is the effect on present value?

- PV of spending earlier rather than later = $2154/1.112^3 - 2498/1.112^8$
- Depreciate the earlier investment starting in year 4 versus year 9

Incremental Cash Flows - Finite Life

Year	0	1	2	3	4	5	6	7	8	9	10
Total Market	\$25,000	\$28,750	\$33,063	\$38,022	\$43,725	\$50,284	\$57,827	\$66,500	\$76,476	\$87,947	\$101,139
Market Share	0.00%	5.00%	10.00%	15.00%	20.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Variable cost as % of revenues		60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%
Marketing cost		\$500.00	\$575.00	\$661.25	\$760.44	\$874.50	\$1,005.68	\$1,156.53	\$1,330.01	\$1,529.51	\$1,758.94
Revenues		\$ 1,438	\$ 3,306	\$ 5,703	\$8,745	\$12,571	\$ 14,457	\$ 16,625	\$ 19,119	\$ 21,987	\$ 25,285
- Production Costs		\$ 863	\$ 1,984	\$ 3,422	\$5,247	\$ 7,543	\$ 8,674	\$ 9,975	\$ 11,471	\$ 13,192	\$ 15,171
- Marketing Costs		\$ 500	\$ 575	\$ 661	\$ 760	\$ 875	\$ 1,006	\$ 1,157	\$ 1,330	\$ 1,530	\$ 1,759
- Deprec'n (including capacity)		\$ 1,800	\$ 1,800	\$ 1,800	\$1,908	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,783	\$ 1,783
- Allocated G&A		\$ 158	\$ 165	\$ 174	\$ 182	\$ 191	\$ 201	\$ 211	\$ 222	\$ 233	\$ 244
- Advertising Exp.		\$ 315	\$ 331	\$ 347	\$ 365	\$ 383	\$ 402	\$ 422	\$ 443	\$ 465	\$ 489
Operating Profit		\$(2,198)	\$(1,549)	\$(701)	\$ 283	\$ 1,672	\$ 2,266	\$ 2,953	\$ 3,745	\$ 4,784	\$ 5,839
Taxes		\$ (549)	\$ (387)	\$ (175)	\$ 71	\$ 418	\$ 567	\$ 738	\$ 936	\$ 1,196	\$ 1,460
EBIT(1-t)		\$(1,648)	\$(1,161)	\$(526)	\$ 212	\$ 1,254	\$ 1,700	\$ 2,214	\$ 2,809	\$ 3,588	\$ 4,379
+ Deprec'n		\$ 1,800	\$ 1,800	\$ 1,800	\$1,908	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,783	\$ 1,783
+ Fixed Allocated Exp (1-t)		\$ (32)	\$ (48)	\$ (68)	\$ (91)	\$ (119)	\$ (151)	\$ (189)	\$ (233)	\$ (284)	\$ (344)
- Cap Ex	\$ 20,000		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
- Opp. Cost of Capacity				\$ 2,154		\$ -	\$ -		\$ (2,498)	\$ -	\$ -
- Chg in WC	\$ 106	\$ 138	\$ 177	\$ 225	\$ 283	\$ 140	\$ 160	\$ 185	\$ 212	\$ 244	\$ (1,871)
+ Salvage Value											\$ 2,000
After-tax Cashflow	\$(20,106)	\$ (18)	\$ 413	\$(1,173)	\$1,745	\$ 2,903	\$ 3,296	\$ 3,749	\$ 6,769	\$ 4,843	\$ 9,689

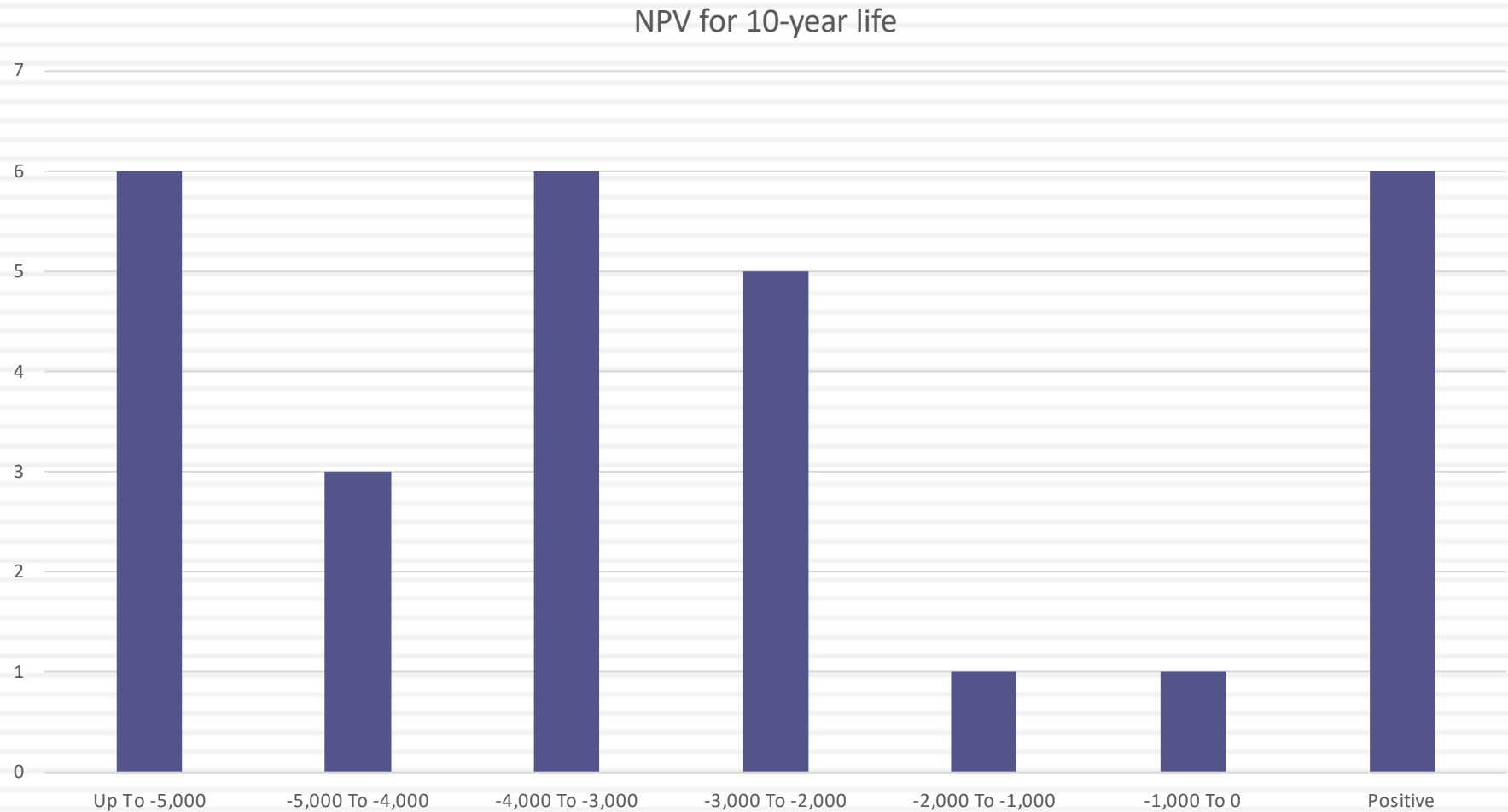
Incremental Cash Flows – Finite Life (A More Direct Approach)

Year	0	1	2	3	4	5	6	7	8	9	10
Total Market	\$25,000.0	\$28,750.0	\$33,062.5	\$38,021.9	\$43,725.2	\$50,283.9	\$57,826.5	\$66,500.5	\$76,475.6	\$87,946.9	\$101,138.9
Market Share	0.00%	5.00%	10.00%	15.00%	20.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Variable cost as % of revenues		60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%
Marketing cost		\$500.00	\$575.00	\$661.25	\$760.44	\$874.50	\$1,005.68	\$1,156.53	\$1,330.01	\$1,529.51	\$1,758.94
Revenues		\$ 1,438	\$ 3,306	\$ 5,703	\$ 8,745	\$ 12,571	\$ 14,457	\$ 16,625	\$ 19,119	\$ 21,987	\$ 25,285
- Production Costs		\$ 863	\$ 1,984	\$ 3,422	\$ 5,247	\$ 7,543	\$ 8,674	\$ 9,975	\$ 11,471	\$ 13,192	\$ 15,171
- Marketing Costs		\$ 500	\$ 575	\$ 661	\$ 760	\$ 875	\$ 1,006	\$ 1,157	\$ 1,330	\$ 1,530	\$ 1,759
- Deprec'n (including capacity)		\$ 1,800	\$ 1,800	\$ 1,800	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,783	\$ 1,783
- Incremental G&A		\$ 200	\$ 230	\$ 265	\$ 304	\$ 350	\$ 402	\$ 463	\$ 532	\$ 612	\$ 704
- Advertising Exp.		\$ 315	\$ 331	\$ 347	\$ 365	\$ 383	\$ 402	\$ 422	\$ 443	\$ 465	\$ 489
Operating Profit		\$ (2,240)	\$ (1,613)	\$ (792)	\$ 161	\$ 1,514	\$ 2,065	\$ 2,701	\$ 3,435	\$ 4,405	\$ 5,380
Taxes		\$ (560)	\$ (403)	\$ (198)	\$ 40	\$ 378	\$ 516	\$ 675	\$ 859	\$ 1,101	\$ 1,345
EBIT(1-t)		\$ (1,680)	\$ (1,210)	\$ (594)	\$ 121	\$ 1,135	\$ 1,549	\$ 2,026	\$ 2,576	\$ 3,304	\$ 4,035
+ Deprec'n		\$ 1,800	\$ 1,800	\$ 1,800	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,908	\$ 1,783	\$ 1,783
- Cap Ex	\$ 20,000		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
- Opp. Cost of Capacity				\$ 2,154		\$ -	\$ -		\$ (2,498)	\$ -	\$ -
- Chg in WC	\$ 106	\$ 138	\$ 177	\$ 225	\$ 283	\$ 140	\$ 160	\$ 185	\$ 212	\$ 244	\$ (1,871)
+ Salvage Value											\$ 2,000
After-tax Cashflow	\$ (20,106)	\$ (18)	\$ 413	\$ (1,173)	\$ 1,745	\$ 2,903	\$ 3,296	\$ 3,749	\$ 6,769	\$ 4,843	\$ 9,689

The Value Effect: NPV

Year	0	1	2	3	4	5	6	7	8	9	10
Cash Flow from TBot	\$ (20,106)	\$ (18)	\$ 413	\$ (1,173)	\$ 1,745	\$ 2,903	\$ 3,296	\$ 3,749	\$ 6,769	\$ 4,843	\$ 9,689
PV of Cash Flows (@11.03%)	\$ (20,106)	\$ (16)	\$ 335	\$ (857)	\$ 1,148	\$ 1,720	\$ 1,759	\$ 1,802	\$ 2,930	\$ 1,888	\$ 3,402
Net Present Value of TBot	\$ (5,996)										
Incremental Revenues		\$1,000	\$1,025	\$1,051	\$1,077	\$1,104	\$1,131	\$1,160	\$1,189	\$1,218	\$1,249
After-tax operating income (CF)		\$400	\$410	\$420	\$431	\$442	\$453	\$464	\$475	\$487	\$500
PV of cash flows (@ 13.80%)		\$351	\$317	\$285	\$257	\$231	\$208	\$188	\$169	\$152	\$137
PV of softwaresynergy =	\$2,295										
Cumulative NPV	\$ (3,700)										

Your findings... Finite Life NPV



Explanations for Infinite Life Case

- When extending the project life to infinity, I did make some changes to the assumptions about capital maintenance.
 - ▣ Starting in year 1, I start with capital maintenance, setting it at 80% of depreciation, growing to 85% in year 2, to 90% in year 3, 95% in year 4 and 100% in year 5. I also adjust this capital maintenance for inflation, allowing capital maintenance to inflate at 2.5% a year over time. By year 10, my capital maintenance expenditure is 128.01% of depreciation in that year.
 - ▣ Advertising expenses continue beyond year 15.
 - ▣ Working capital will continue to grow to keep up with revenues
- The synergy benefits now continue in perpetuity as well.

Incremental Cash Flows- Infinite Life

Year	0	1	2	3	4	5	6	7	8	9	10	Term Year
Total Market	\$25,000	\$28,750	\$33,063	\$38,022	\$43,725	\$50,284	\$57,827	\$66,501	\$76,476	\$87,947	\$101,139	\$103,667
Market Share	0.00%	5.00%	10.00%	15.00%	20.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Variable cost as % of revenues		60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%
Marketing cost		\$500.00	\$575.00	\$661.25	\$760.44	\$874.50	\$1,005.68	\$1,156.53	\$1,330.01	\$1,529.51	\$1,758.94	\$1,802.91
Revenues		\$1,438.00	\$3,306.00	\$5,703.00	\$8,745.00	\$12,571.00	\$14,457.00	\$16,625.00	\$19,119.00	\$21,987.00	\$25,285.00	\$25,917.00
- Production Costs		\$863.00	\$1,984.00	\$3,422.00	\$5,247.00	\$7,543.00	\$8,674.00	\$9,975.00	\$11,471.00	\$13,192.00	\$15,171.00	\$15,550.00
- Marketing Costs		\$500.00	\$575.00	\$661.00	\$760.00	\$875.00	\$1,006.00	\$1,157.00	\$1,330.00	\$1,530.00	\$1,759.00	\$1,803.00
- Deprec'n (including capacity)		\$1,800.00	\$1,768.00	\$1,768.00	\$1,875.00	\$1,875.00	\$1,875.00	\$1,875.00	\$1,875.00	\$1,750.00	\$1,750.00	\$1,794.00
- Allocated G&A		\$158.00	\$165.00	\$174.00	\$182.00	\$191.00	\$201.00	\$211.00	\$222.00	\$233.00	\$244.00	\$250.00
- Advertising Exp.		\$315.00	\$331.00	\$347.00	\$365.00	\$383.00	\$402.00	\$422.00	\$443.00	\$465.00	\$489.00	\$501.00
Operating Profit		-\$2,198.00	-\$1,516.00	-\$668.00	\$315.00	\$1,704.00	\$2,299.00	\$2,985.00	\$3,777.00	\$4,817.00	\$5,872.00	\$6,018.00
Taxes		-\$549.00	-\$379.00	-\$167.00	\$79.00	\$426.00	\$575.00	\$746.00	\$944.00	\$1,204.00	\$1,468.00	\$1,505.00
EBIT(1-t)		-\$1,648.00	-\$1,137.00	-\$501.00	\$236.00	\$1,278.00	\$1,724.00	\$2,239.00	\$2,833.00	\$3,613.00	\$4,404.00	\$4,514.00
+ Deprec'n		\$1,800.00	\$1,768.00	\$1,768.00	\$1,875.00	\$1,875.00	\$1,875.00	\$1,875.00	\$1,875.00	\$1,750.00	\$1,750.00	\$1,794.00
+ Fixed Allocated Exp (1-t)		-\$32.00	-\$48.00	-\$68.00	-\$91.00	-\$119.00	-\$151.00	-\$189.00	-\$233.00	-\$284.00	-\$344.00	-\$353.00
- Cap Ex	\$20,000.00	\$1,476.00	\$1,579.00	\$1,713.00	\$1,854.00	\$2,000.00	\$2,050.00	\$2,101.00	\$2,154.00	\$2,207.00	\$2,263.00	\$2,319.00
- Opp. Cost of Capacity				\$2,154.00	\$	\$	-	-	\$-2,498.00	\$	\$	\$
- Chg in WC	\$106.00	\$138.00	\$177.00	\$225.00	\$283.00	\$140.00	\$160.00	\$185.00	\$212.00	\$244.00	\$47.00	\$48.00
+ Salvage Value											\$41,088.00	
After-tax Cashflow	-\$20,106.00	-\$1,494.00	-\$1,174.00	-\$2,894.00	-\$116.00	\$895.00	\$1,238.00	\$1,640.00	\$4,607.00	\$2,627.00	\$44,588.00	\$3,588.00

The terminal value calculation

- I assumed a perpetual life.
 - Did I have to?
 - What are the alternatives?
- Cash flow to the firm in year 11
 - = EBIT (1-t) + Depreciation – Cap Ex – Change in WC
 - = \$ 4,514 + \$ 1,794 – \$ 2,319 - \$ 47 = \$3,589 million
- Terminal Value in year 10
 - = CF in year 11/ (Cost of capital –g)
 - = 3,588/ (.1103-.025) = \$ 42,078 million

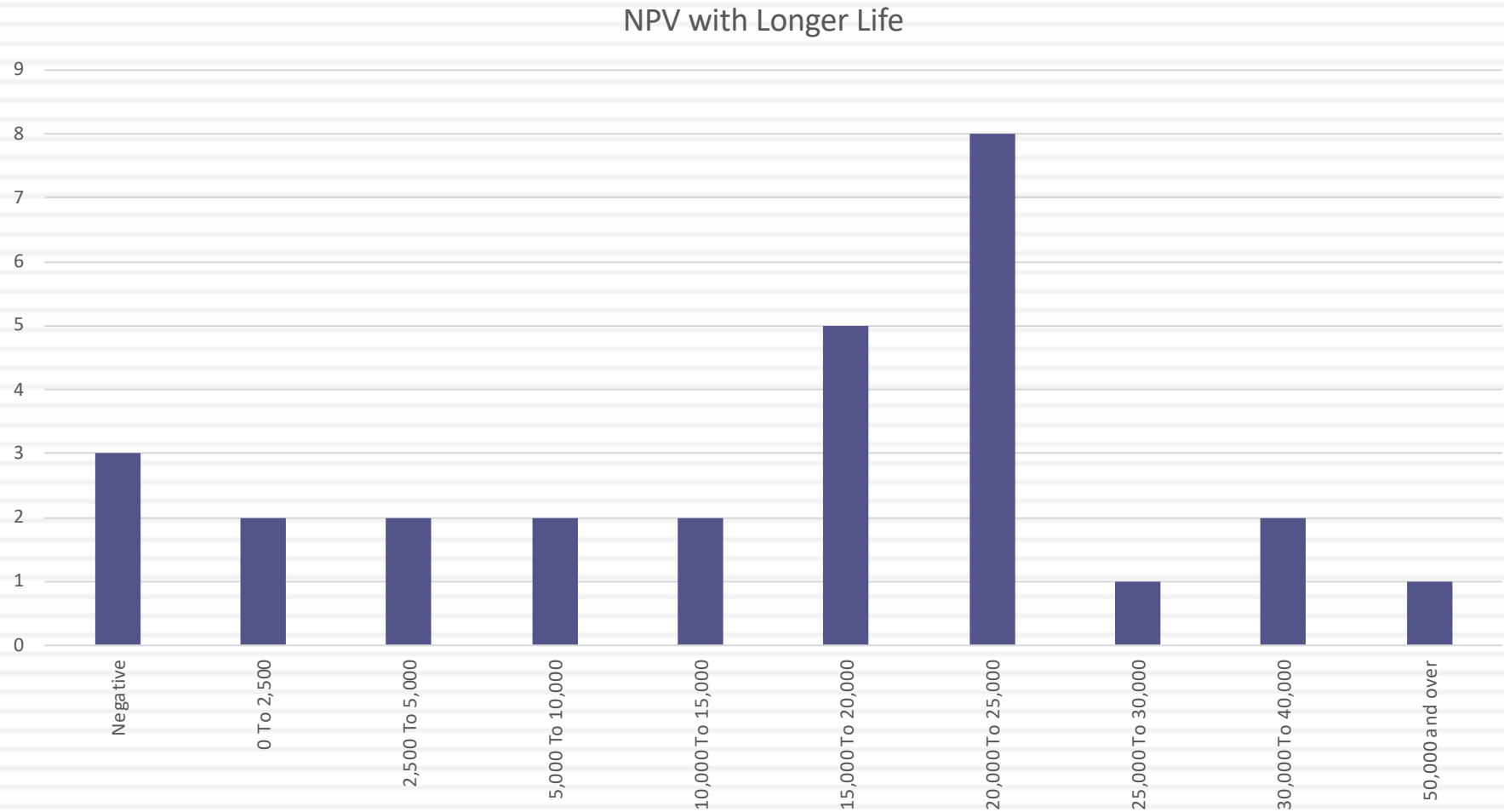
Finite versus Infinite: The Cash Flow Trade off

<i>Year</i>	<i>Finite</i>	<i>Longer Life</i>	<i>Incremental Effect</i>
0	-\$20,106	-\$20,106	\$0
1	-\$18	-\$1,494	-\$1,476
2	\$413	-\$1,174	-\$1,587
3	-\$1,173	-\$2,894	-\$1,721
4	\$1,745	-\$116	-\$1,861
5	\$2,903	\$895	-\$2,008
6	\$3,296	\$1,238	-\$2,058
7	\$3,749	\$1,640	-\$2,109
8	\$6,769	\$4,607	-\$2,162
9	\$4,843	\$2,627	-\$2,216
10	\$9,689	\$44,588	\$34,899

Value Added: NPV of Infinite Life Case

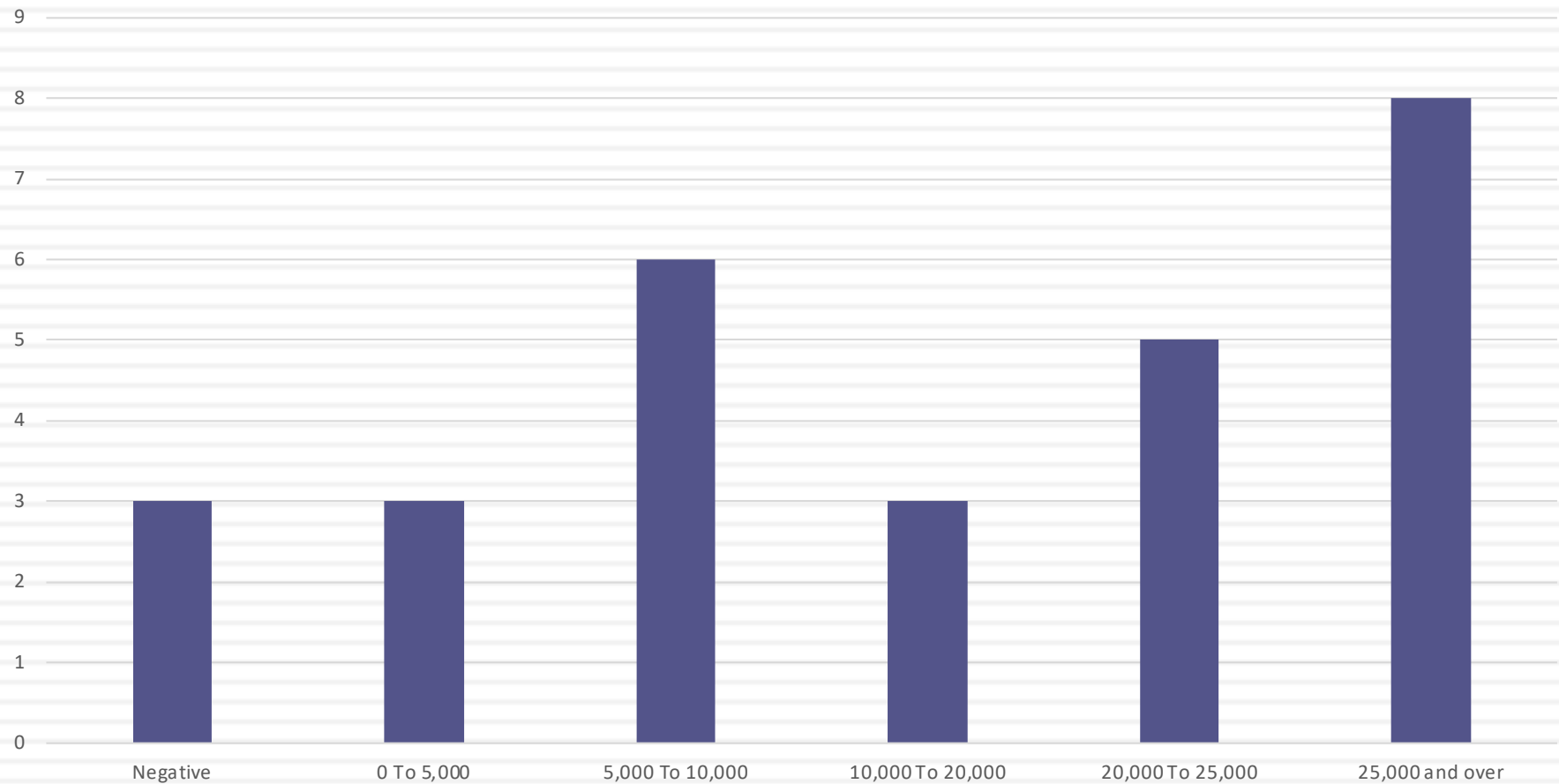
Year	0	1	2	3	4	5	6	7	8	9	10
Cash Flow from TBot	\$(20,106)	\$(1,494)	\$(1,174)	\$(2,894)	\$(116)	\$ 895	\$1,238	\$1,640	\$4,607	\$2,627	\$44,588
PV of Cash Flows @ 11.24%	\$(20,106)	\$(1,346)	\$ (952)	\$(2,114)	\$ (77)	\$ 531	\$ 661	\$ 788	\$1,995	\$1,025	\$15,941
Net Present Value of TBot	\$ (3,655)										
Incremental Revenues		\$1,000	\$1,025	\$1,051	\$1,077	\$1,104	\$1,131	\$1,160	\$1,189	\$1,218	\$1,249
After-tax operating income (CF)		\$400	\$410	\$420	\$431	\$442	\$453	\$464	\$475	\$487	\$500
PV of cash flows @ 14.08%											\$4,421
Terminal Value		\$351	\$317	\$285	\$257	\$231	\$208	\$188	\$169	\$152	\$1,351
NPV software	\$3,510										
Cumulative NPV	\$ (146)										

Your findings: Infinite Life



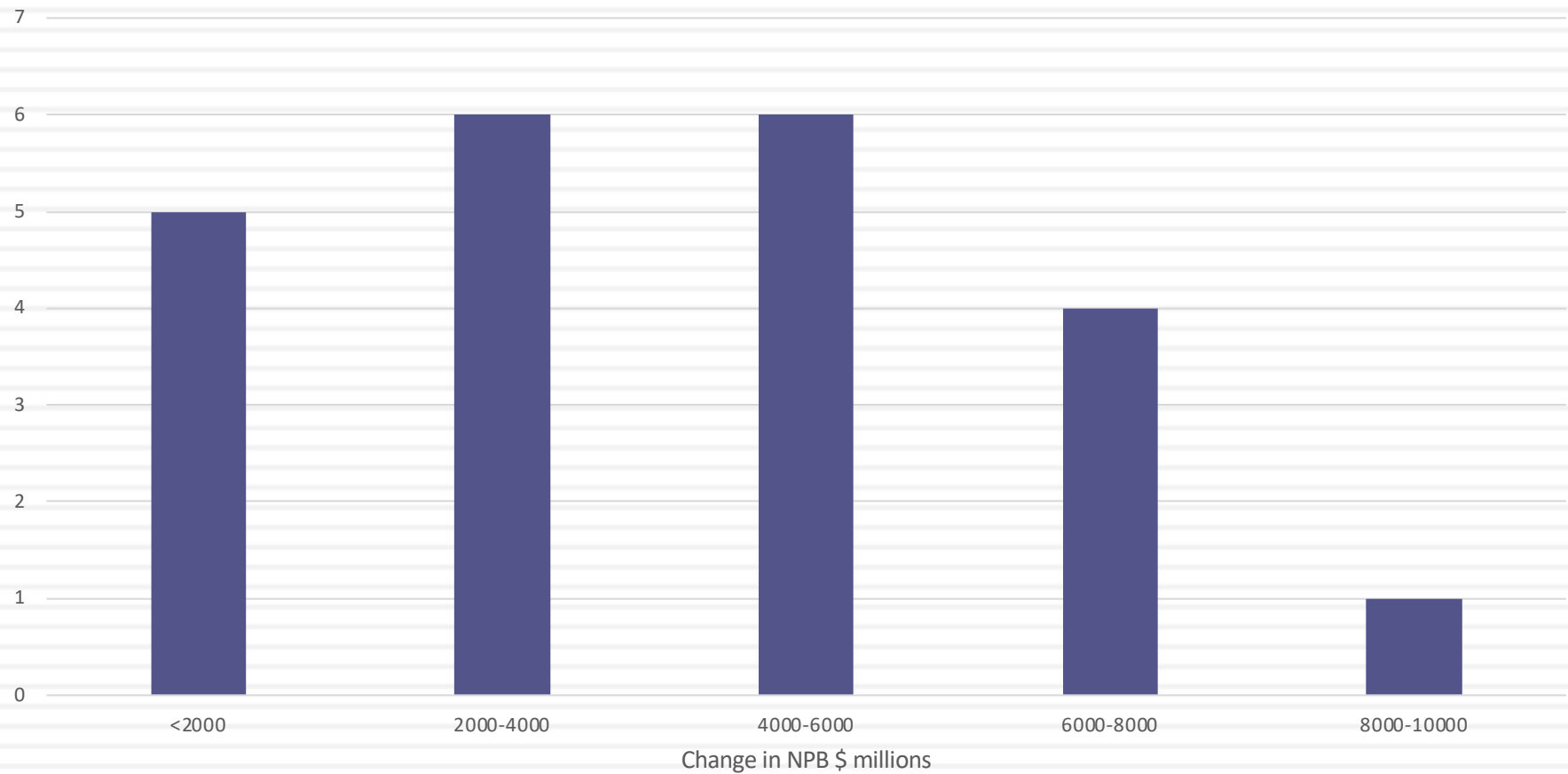
Effect of Lengthening Project Life

NPV Effect of Lengthening Life



Change in NPV

Change in NPV - Longer vs Finite



Investment consistency in growth and project life assumptions

After year 12

Capital Expenditure Assumption

Project ends

No (or very low) capital maintenance

Let assets run down towards end of life

Infinite life; $g=0\%$

Capital maintenance = Depreciation

Maintain invested capital at base level

Infinite life; $g = \text{inflation}$

Capital maintenance $>$ Depreciation

Capital invested has to grow at inflation rate

Infinite life; $g > \text{inflation}$

Capital investment to increase capacity

Capital maintenance $>$ Depreciation

Capital invested has to grow to reflect real growth

Final Conclusions

- Of the 28 groups that turned in numbers, 17 groups chose to invest, and 11 groups suggested rejection.
- There were at least five groups that had conditional decisions, i.e., reject with a 10-year life and accept with a longer life. Unfortunately, this is not a choice, since the life of the project is not probabilistic, but deterministic.
- If you believe in crowd wisdom, here was the crowd judgment on the key variables:

	<i>Cost of Capital</i>	<i>Return on Capital</i>	<i>NPV - 10 year</i>	<i>NPV - Longer Life</i>
Average	10.87%	13.98%	\$133	\$21,362
Median	10.89%	14.82%	-\$3,408	\$16,886
High	15.52%	38.60%	\$62,018	\$196,643
Low	6.53%	3.04%	-\$8,826	-\$5,029

- ▣ If you accepted the project, what is your biggest concern going forward?
- ▣ If you rejected the project, what is most likely to cause you to regret that decision?