Uncertainty in forecasts, Exploring

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1 Uncertainty in valuations - explorations

No matter what type of valuation one is doing, have to deal with the fact that we are forecasting *uncertain* future cash flows.

Valuation: Forecast *expected* future cash flows.

NPV of those a *point estimate* of the value.

Because the interest rate that is used in discounting is a risk-adjusted one, this *does* take into account risk.

However, in most settings one want to look closer at the uncertainty involved in the cash flows.

→ It may help in understanding what is going on.

Particularly, something often missed when constructing cash flow expections: Look for interactions.

Summarize this as a sequence of useful questions to ask, and ways to formally proceed.

- How bad can it get?
  - Breakeven analysis
  - Scenario Analysis
- How likely is it?
  - Scenario analysis with probabilities
  - Simulation
- What circumstances should force a rethink?
  - Decision Trees
  - Real option analysis

2 Breakeven analysis

Given a NPV calculation, ask:

How much does each input need to change (fall/increase) before the NPV falls to zero.

3 Scenario analysis

Exercise 1.

The Titmar Motor Company is considering the production of a new personal transportation vehicle (PTV). The PTV would compete directly with the innovative new Segway. The PTV will utilize a three-wheel platform capable of carrying one rider for up to six hours per battery charge, thanks to a new battery system developed by

TitMar. TitMar's PTV will sell for substantially less than the Segway but offer equivalent features. The pro forma financials for the proposed PTV project, including the underlying forecasts and assumptions, are given below.

Assumptions and Predictions	Estimates
Price per unit	$4,895
Market share (%)	15.00%
Market size (Year 1)	$200,000 units
Growth rate in market size beginning in Year 2	5.00%
Unit variable cost	$4,250
Fixed cost	$9,000,000
Tax rate	50.00%
Cost of capital	18.00%
Investment in NWC	5.00% of the predicted change in firm revenues.
Initial investment in PP&E	$7,000,000
Depreciation (5 year life w/no salvage)	$1,400,000

	Year 0	1	2	3	4	5
Investment	$(7,000,000)					
Revenue		146,850,000	154,192,500	161,902,125	169,997,231	178,497,093
Variable Cost		(127,500,000)	(133,875,000)	(140,568,750)	(147,597,188)	(154,977,047)
Fixed cost		(9,000,000)	(9,000,000)	(9,000,000)	(9,000,000)	(9,000,000)
Depreciation		(1,400,000)	(1,400,000)	(1,400,000)	(1,400,000)	(1,400,000)
EBT(Net Operating Income)		$8,950,000	$9,917,500	$10,933,375	$12,000,044	$13,120,046
Tax		(4,475,000)	(4,958,750)	(5,466,688)	(6,000,022)	(6,560,023)
Net Operating Profit after Tax (NOPAT)		$4,475,000	$4,958,750	$5,466,688	$6,000,022	$6,560,023
Plus: Depreciation expense		1,400,000	1,400,000	1,400,000	1,400,000	1,400,000
Less: Capex	(7,000,000)	-	-	-	-	-
Less: Change in NWC	(7,342,500)	(367,125)	(385,481)	(404,755)	(424,993)	8,924,855
Free Cash Flow	$(14,342,500)	$5,507,875	$5,973,269	$6,461,932	$6,975,029	$16,884,878
Net Present Value	$9,526,209					
Internal Rate of Return	39.82%					
Units Sold		30,000	31,500	33,075	34,729	36,465

Note that revenue is calculated as follows: price per unix $\times$ market share $\times$ market size and units sold $=$ revenues/price per unit. The project offers an expected NPV of $9,526,209 and an IRR of 39.82%. Given TitMars stated Hurdle rate of 18%, the project looks like a winner.

Even though the project looks very good based on management's estimates, it is risky and can turn from a positive NPV investment to a negative one with relatively modest changes in key value drivers. Develop a spreadsheet model of the project valuation, and answer the following questions:

1. If the market share turns out to be only 5%, what happens to the project's NPV?
2. If market share remains at 15% and the price of the PTV falls to $4,500, what is the resulting NPV?

4 Monte Carlo Simulation

5 Decision Trees

Old idea in decision analysis: Sequence of contingent decisions.

6 Real Options

In many investment projects, there are "hidden options."
Exercise 2.

Consider the decision problem of *ExOff Oil*, which is deciding the participtiption in a joint venture with a Russian firm, to purchase an oil field in the remoter regions of Siberia.

We are given the following data about ExOff's share:

- Initial purchase payment for a share in the joint venture: \$10,000.
- Drilling costs: \$500,000.
- Number of barrels per year 10,000 (in perpetuity).
- Oil prices (per barrel) \$20.
- Extraction and transportation costs (per barrel) \$16.
- Discount rate $r = 10\%$.

(1) Value the investment using the given information.

This is the traditional NPV analysis of this investment project. But let us assume we have some more information about this particular project.

There is big uncertainty about the oil price next year. You have heard ominous rumours from your industrial spies in Utah, that the "cold fusion" crazies actually have found a way of running a car using this source of energy.

If this happen to be true, it will immediately reduce the demand for oil by 80%, thus reducing the price of oil to (your guesstimate) \$5 a barrel.

However, if they are not successful, you believe that OPEC will get together, and the oil price will rise, to about \$35 a barrel.

(2) Does this information change your analysis?

7 Readings

(Titman and Martin, 2016, Ch 3)

References

Sheridan Titman and John D Martin. *Valuation. The art and science of corporate investment decisions*. Pearson, third edition, 2016.