1n Hands On Modelling – Cashflow, NPV, IRR



Spend only a few seconds on each page

This website may contain errors so always check your own work and have it audited by a competent person

This website contains personal opinions



The purpose of this module is explore **Cashflow** NPV, IRR, Payback **#1: Revenue** Level 3: Decision making #2 Capex Level 2: Evaluating the business/project Level 1: Hands-on economic modelling #3: Opex #4: Taxes Cashflow (incl NPV, IRR. Payback)





Contents

- 1. Computing Cashflow, NPV & IRR
- 2. Graphing Cashflow & NPV
- 3. IRR Internal Rate of Return
- 4. NPV Net Present Value

1. Computing Cashflow, NPV & IRR

This is simple maths - except internal rate of return ("IRR")

- 1. Reference down the four cashstreams
- Compute net cashflow – sometimes called 'free cash flow' ("FCF")
- 3. Compute IRR using the Excel Function
- 4. Input the discount rate noting its source above
- 5. Compute the discount factor Do this manually! Do not use one of the Excel NPV Functions because other people cannot immediately investigate its maths
- 6. Compute discounted cashflow

sum for NPV compute cumulative NPV

| | Years -> | Units | Total | Yr1 | Yr2 | Yr3 | Yr4 | Yr5 | Yr6 | Yr7 | Yr8 | Yr9 |
|---|---|-------------------|-------|------|------|------|------|------|------|------|------|------|
| | Cashflow and NPV | | | | | | | | | | | |
| | Cashflows | | | | | | | | | | | |
| | Cashstream 1: Revenue | A\$ millions real | 672 | 0 | 0 | 125 | 156 | 156 | 156 | 78 | 0 | 0 |
| | Cashstream 2: Capital Costs | A\$ millions real | 154 | 25 | 98 | 6 | 6 | 6 | 6 | 6 | 0 | 0 |
| | Cashstream 3: Operating Costs | A\$ millions real | 386 | 0 | 11 | 67 | 78 | 74 | 73 | 39 | 45 | 0 |
| | Cashstream 4: Taxes | A\$ millions real | 67 | 0 | -3 | 11 | 21 | 24 | 26 | 1 | -14 | 0 |
| | Net Cashflow | A\$ millions real | 65 | -25 | -105 | 41 | 51 | 51 | 51 | 32 | -32 | 0 |
| • | IRR | Real | 16.8% | | | | | | | | | |
| | Discounting | | | | | | | | | | | |
| 1 | 7Jul20 F Green email: discount rate for investment in gold industry is 8% Real. | | | | | | | | | | | |
| | Discount Rate | % Real | | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| • | Discount Factor | | | 0.96 | 0.89 | 0.82 | 0.76 | 0.71 | 0.65 | 0.61 | 0.56 | 0.52 |
| * | Discounted Cashflow | A\$ millions | 26 | -24 | -94 | 34 | 39 | 36 | 33 | 20 | -18 | 0 |
| | Cumulative NPV | A\$ millions | | -24 | -118 | -84 | -45 | -9 | 24 | 44 | 26 | 26 |
| | NPV | A\$ millions | 26 | | | | | | | | | |
| | | | | | | | | | | | | |

Most important: -

Do not short cut by using an Excel/Google NPV Function because : -

- · Less experience people will not visually discover the simple concept that is NPV
- Hard to find any silly errors
- · Other will take your NPV at face value even though it may be in error
- You will not be able to graph NPV and cumulative NPV year-by-year
- Over the years many people have made mistakes trying to use these functions.
- And You would be 'arrogant'!

It is your duty as a team player to take a few extra minutes of modelling to show NPV step by step and generate the graphs

5

In a long, detailed and complex model, Cashflow, NPV & IRR are likely to have their own worksheet



Computing Cashflow, NPV & IRR

The cashflows can be in Nominal Terms or Real Terms.

- The IRR will follow in the same terms
- Use the discount rate with the same terms where 'discount rate Nominal = rate Real + inflation'
- In the previous example, the NPV is A\$26 million in today's terms (or at the base date)
 - technically is not written as "A\$26 million <u>Real</u>"

Debt

• Because an economic evaluation measures the health of the underlying business/project there will not be any debt or any interest embodied in any cashstream.

5th Cashstream

- Do not allow a fifth cashstream to creep in!
 - > This data must be incorporated in the appropriate Cashstreams #1, #2, #3 and #4.

Accountants

People with an accounting background may derive their cash flow, NPV and IRR via the accounts using EBIT, adding back accounting depreciation, adjusting for ..., etc, etc. This abstract route is entirely valid for accountants

Technical, Operational, Project People

For operational and technical people it is completely inappropriate for them to spend time trying to work back through the accounting route to cashflow and NPV. They should instead be spending their time understanding the project and improving the business. For them the four cashstream sequence and NPV that flows from the 'visual' material and money flows can be made intuitive and visually obvious.



C13th The Holy Virgin of Petrich, The Fortress of Asen, Asenovgrad, Bulgaria

2. Next you should graph the Cashflow & NPV



First read this.

For me, these two graphs are the most valuable part of an entire business model! It is where I look first!

Immediately I can see in this example:

- The free cashflow (green) is thin. The business is vulnerable. The forecasts of price and volumes are super-important. How much confidence in them? If prices drop only a little and/or if costs increase just a little the business will bleed and become cash negative. Equally, if prices a lift a little and/or costs drop a little, NPV will jump: even double.
- The capex (blue) is relatively minor deserves less attention.
- **The opex** consumes most of the revenue. The business needs to focus on how much confidence there is in the estimates of fixed and variable costs. If it is high in fixed costs then the business in dangerous territory. Focus on the likelihood of costs increasing or being improved!
- Tax is a follower so deserves less attention.
- The business bleeds cash in the first two years which require injections of money from the owners (boxes with pink frames). 8

2. Next you should graph the Cashflow & NPV



For me, these two graphs are the most valuable part of an entire business model! It is where I look first!

These two graphs of "NPV & Payback" show that the business: -

- needs four years to payback the upfront cash invested to cover capex and operating losses (discounted basis)
- needs five years before the business starts generating solid contributions to NPV
- reaches full NPV after ten years with the extra cashflow in the final year (run down stocks etc) being substantial. So how much confidence is there that the business will siurvive in its forecast shape over the ten years?

2. Three scenarios for a project ...-

The 'base case' looks robust:

- large upfront investment (blue capex),
- very good margins over five years of operations (green)

US\$M

- Discounted cashflow breaks-even in 6th year
- NPV \$16 million IRR 23%

Base Case - Four Cash Streams **Base Case - NPV** 40 30 20 20 10 Σ Λ \$ 5 -10 2030 2024 2025 2026 2027 2028 2029 2023 2024 2026 2027 2028 2029 2030 202 -20 -20 -40 -30 -40 Cashstream 4: Taxes - Base Case Cashflow if positive Cashstream 3: Operating Costs - Base Case Cashflow Deficit Discounted Cashflow - Base Case Cumulative NPV - Base Case Cashstream 2: Capital Costs - Base Case

The 'low capex case' looks poor: -

- 40% less upfront investment (blue capex)
- Thin margins (green)
- NPV -\$1 million and IRR 7%

The 'high grading case' deserves some consideration: -

- 20% less upfront investment (blue capex)
- Very good margins but a short life
- Discounted cashflow breaks-even after 5 years
- NPV \$3 million IRR 13% ٠

If the business is worried about the industry becoming over-supplied and very competitive, then the next step might be to investigate beginning with the 'high grading case' (some lower risks) and transforming into the longer life, higher NPV 'Base Case' - with more capex investment - when there is more confidence in the market.





10

3. Internal Rate of Return "IRR"

IRR is a great concept that sits alongside NPV and payback.

IRR measures the internal cash generating power of the investment

To my thinking: IRR is like quality - NPV is like quantity – Payback is like risk.

But do not rely on just these three but use a full basket of measures. Level 2 of this website discusses this, including using the profile of the four cashstreams, competitiveness in that industry, business flexibility, technology, adapting to weak and strong markets, prices to avoid negative cashflows, strengths and weaknesses, position on industry cost curve, key risks, options for development, ... etc to make a decision on the business or project!

IRR cannot be computed in visual steps but it requires the Excel IRR Function. Unfortunately people cannot follow the calculation.

IRR needs negative cashflow in the early years and positive in the later years to function. It is used for projects and new businesses, but usually does not apply to existing businesses.

Some people with high mathematical orientation deride IRR because it can have more than one result in special circumstances. If this occurs they should use their practical expertise to briefly explain why one or no result has been selected this time.

Real and Nominal: 'IRR Nominal' is computed from nominal cashflows and 'IRR Real' is computed from real cashflows. The difference is inflation.

A silly and most embarrassing error is when the IRR is not computed from the net cash flow but from the <u>discounted</u> cashflow.

(Avoid this by positioning IRR beneath the row of net cashflow and above the computation of NPV)



4. Net Present Value "NPV"

- 1. The concept is that you should be indifferent about receiving the NPV in cash today or keeping the project/business to the end of its life.
- 2. Any NPV is only as good as the underlying estimates of sales, prices, capital investment, operating costs and the timeline.
- 3. Usually there are a number of possible scenarios, each with its own NPV.
- 4. Far too much importance can be placed on NPV as a measure of a business.
- 5. Too many inexperienced evaluation specialists rush to 'pump out" an NPV with great pride. They do not appreciate that it is the investigations, studies, discussions, doubts, worries, debates, conflict, consensus and computations along the way that are so very important perhaps more important.

Read about NPV in this website's modules for "Level 2: Evaluating the business/project"

Discount Rate

To understand the theory of discounting and NPV you should research the Internet and text books on financial theory.

I understand:

- Discount rate is about the returns that equity investors and lenders expect from investing in your industry (mining, health, transport, food, etc).
 - ✓ with adjustment for your company's debt, etc.
- If a company is in the food industry, I cannot take its discount rate and use it for its investment in mining but need to recalculate its discount rate for the mining industry.
- To discount a set of cashflows precisely, we should discount each of the four cashstreams at its own special discount rate (for its own risk) but generally this is too complex so we use an overall single rate on the net cash flow.
- Companies seem to keep their discount rate highly secret but it seems as if the rate could be computed quite closely by any expert?
- I have yet to have explained why, in an evaluation model, the discount rates does not change over the years to reflect forecast changes in interest rates and in equity markets.
- Discount rate can be real or nominal with the difference being inflation.

IRR is like quality - NPV is like quantity – Payback is like risk.

But an evaluation needs much, much more than these three metrics



13

Bulgaria: deep history; magical sights

www.economicevaluation.com.au