

# Teach Yourself: Economic Evaluation:

## 1 q: Common Methodology Across Companies:

Including Incremental Value, Optimised Without  
Case, Expected Value

# The purpose of this module is to ...

Level 3: Decision making

Level 2:

Be aware of valuation methods that are commonly used across the industry

Level 1: Hands-on economic modelling

## Contents:

The following concepts seem to be common across the industry: –

- ▶ Incremental value
- ▶ Optimised without case
- ▶ Expected Value
- ▶ Key Drivers & Range Analysis Workshop
- ▶ Forecasts of Commodity Price and Exchange Rate
- ▶ Forecasts of other economic parameters
- ▶ Discount Rate and Country Risk
- ▶ Price forecasts for key consumables
- ▶ Base Date
- ▶ Currencies

# Incremental Value

When valuing a project or change in direction inside a company you should compare the value of doing the project/change with not doing it.

You should value the company “with” the project/change and value the company “without” the project/change. The difference is the “incremental value”

$$[\text{value of 'with' case}] - [\text{value of 'without' case}] = [\text{incremental value}]$$



# optimised without case

The “**without case**” is not the ‘do nothing case’ nor is it the ‘status quo case’. If the project/change does not proceed then management is likely to take other steps to improve and optimise the business as best it can without the investment/change.

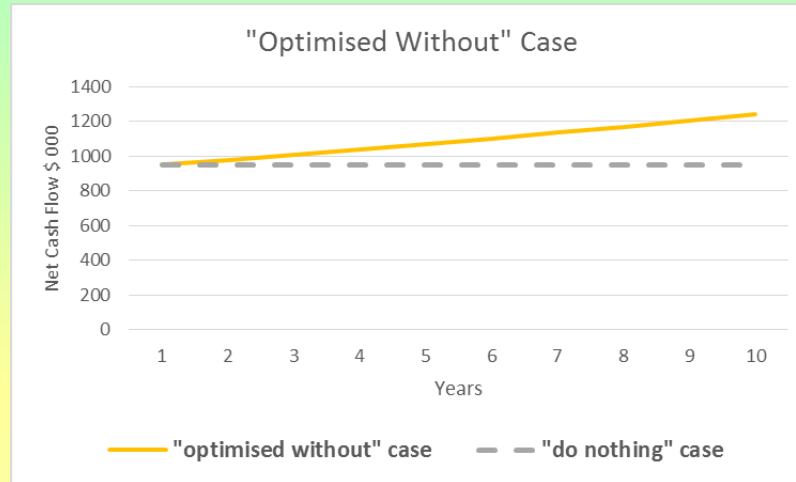
For example it might:

- make minor improvements to squeeze out more production and sales,
- change product quality or customers
- press down production costs
- change selling channels

The business would be optimised without the investment/change and its value is called the “**optimised without case**”. (so its value should be greater than the ‘do nothing case’ or ‘status quo’ case. This means that the ‘incremental value’ would be lesser.)

# optimised without case

Pictorially this concept is ...



“With” Case  
\$10.3M

“optimised  
without”  
Case  
\$7.8M

“do  
nothing”  
Case  
\$6.9 M

Incremental

# Expected Value

As discussed in the modules on NPV there are several ways of presenting your NPV results. Three common methods are: –

1. **Single Case NPV:** One case is presented that represents the ‘mid case’ or best opinion.  
 $NPV = US\$32M$

2. **Expected Value:** Typically, a range of cases are given probabilities so that a weighted NPV is presented. As an illustration: –

Case	NPV	Probability	Weighted
Unfavourable	-20	35%	-7
Mid	+32	50%	+16
Favourable	+55	15%	+8
<b>Expected NPV</b>			<b>17</b>

So here the expected value of US\$17M is a lot less than the single case of \$32M.

3. **Probabilistic NPV:** A Monte Carlo is run that gives a distribution of hundreds or thousands of possible NPVs. From this can be read the mean NPV, median NPV, most likely NPV, likelihood of being greater than zero NPV, etc, etc.

# Expected Value

**Expected Value:** Of the these three methods, I prefer the expected value method – but only if the matrix of the three cases is shown. It gives an indication of things going bad and of things going well. In this illustration the matrix suggests there is more downside than upside.

When useful the ‘maximum’ and the ‘minimum’ cases can be added to show a wider range. Most importantly this ‘expected value’ matrix is valid only if each of the three (or five) cases is internally consistent. Each must have a mine schedule, production plan and sales plan that matches the price forecast, market, capex and opex of that case. It is unsatisfactory to change price and sales without reconfiguring a matching mine schedule and production plan.

**Monte Carlo /Probabilistic:** Like many other practitioners I have big reservations about this method in mining. I can see how it can work in the oil industry, mineral processing, chemicals but have never seen an economic model capable of reconfiguring the mine schedule plus processing plant recoveries every time the price forecast and sales plan changes. This happens hundreds or thousands of times at random between minimum and maximum. I have seen experts in the software claim the algorithms cover all these sorts of relationships but when probed find it is totally inadequate. I will never forget the major project disaster that was 98% certain to produce positive NPV during its Monte Carlo. Still senior managers love seeing the distributions, the mathematical outputs, the confidence boundaries – even if, garbage in = garbage out



# Expected Value

Remember to always take a helicopter view of the business. As is discussed in other modules: –

- ▶ NPV is nothing more than the mathematical treatment of a collection of expert opinions.
  - Some people get side tracked into comparing the mathematical outputs of each method, such as mean versus median. They get lost in statistics and how clever they have been rather than seeing results as helpful blocks of data to give a feel for the business/project.
- ▶ Decision making is a lot, lot more than focussing on the highest NPV.
- ▶ NPV is just one of a basket of metrics by which you can assess your business/project.

# Key Drivers & Range Analysis Workshop

These will be covered in a separate module

**Key Drivers:** It is common for companies to use the economic model early in a study phase, or in preparation for the next study phase, to analyse the business/project for its key drivers of value.

**Range Analysis:** In parallel it would conduct a workshop to identify the likely range of values for each of these key drivers – typically minimum, low, mid, high, maximum.

Putting these together will give focus to the following people: –

- ▶ **Decision makers**
- ▶ **Senior management**
- ▶ **Project leaders**
- ▶ **Team members**
- ▶ **Market specialists**

How often do these people put lots of effort into refining capital estimates and chasing up operating costs when the most important drivers are in sales and revenue. Typically these are prices & exchange rates, production & sales volumes, head grades & processing recoveries. How often do people get bogged down in advanced technical discussions that are intellectually stimulating – such as contingency in capex or production contractor margins – but probably are only second or third order in importance? The driver that is commonly grossly underestimated is closure cost.

# Key Parameters

## 1. Forecasts of Commodity Price and Exchange Rate

- ▶ These two forecasts probably will be the most important of all parameters.
- ▶ They must be forecasts in couplets – price and forex may be inversely related in many mining countries so you will need a pair for the mid case, a pair for the unfavourable case, a pair for the favourable case, etc. If inversely related they will partly counteract each other.
- ▶ Both of these must be formally forecast by your company and endorsed by the most senior management and/or Board.
- ▶ Most companies forecast just the mid-case and do not appreciate the relationship between price forecasts and forex for high and low cases. They leave it up to the project team.
- ▶ The estimates of capital costs and operating costs by internal specialists and external consultants must use these forecasts of forex. Too many external estimates of capex and opex costs use whatever the consultants decide and so inherently are inconsistent and incorrect.

## 2. Forecasts of other economic parameters

Your company should forecast, or agree with you: –

- ▶ Inflation rates – for all countries involved. (Tax deductions for past capex usually should be calculated in nominal terms then deflated to real terms to capture the erosive effect of inflation.)

# Key Parameters

## 3. Discount Rate and Country Risk

Your company must define: –

- ▶ its discount rate on an after-tax basis; in real or nominal terms
  - Is there just one discount rate for final net cashflow, or four separate ones for the four cashstreams and perhaps a fifth for closure costs?
- ▶ whether it is a general base discount rate for all investments or specific to the home country only.
- ▶ how to incorporate country risk
- ▶ if there is a hurdle rate for investment

See the website module on discount rate & country risk

## 4. Price forecasts for key consumables

Your company may forecast, or agree with your estimates for the prices of key inputs, such as: –

- ▶ Energy prices – diesel, electricity, gas
- ▶ Labour – if it is expected to increase or decrease in real terms over the years
- ▶ Consumables – several external supplies may be key.

Internal specialists and external consultants must use these forecasts, plus the company's forecasts of exchange rates, when compiling operating costs.

# Base Date

Common practice is to select a base date for the valuation that is convenient and close to when the next decision will be made. 1<sup>st</sup> January or 1<sup>st</sup> July are typical.

Technically all the forecasts of price, exchange rate and key consumables should be recalculated to match this base date. You will need to use judgement and discuss within your company if this is warranted. As always take a helicopter view of its significance.

# Currencies

It is common for mining projects to have prices in one currency (such as US\$), capex sourced from several countries, operating costs sourced in local and foreign currencies and taxes paid in local currency.

1. Your company must define the currency in which the NPV is to be expressed. Its discount rate needs to be based in that same currency. As an illustration let's select US\$ on 1<sup>st</sup> July 20XX.
2. Let's say products are sold in US\$ but incur transportation costs to market in local currency and another currency. Each of these transport costs will be inputted in local currencies and their annual totals converted to US\$ inside the economic model.
3. Let's say capital equipment is sourced from Chile, Korea, India, Germany then assembled locally. The big purchases need to be inputted in their own currency, the construction costs in local currency and each converted to US\$ on a year-by-year basis.
4. Operating costs should be treated similarly.
5. Tax needs to be computed in local currency and converted to US\$ on an annual basis.
6. The bottom line of each of the four cashstreams therefore will be in US\$'s and can be summed for an annual net cashflow and discounted in real US\$ terms

END