

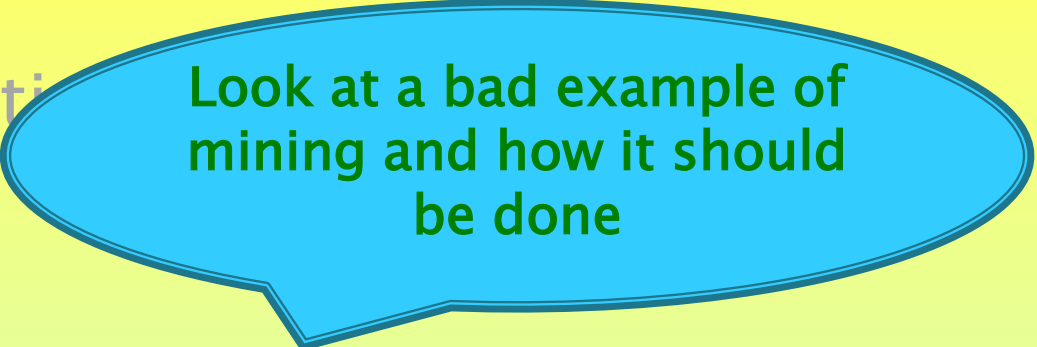
Teach Yourself: Economic Evaluation:

1 t: A Dreadful Model – Mining

The purpose of this module is to ...

Level 3: Decision making

Level 2: Evaluation



Look at a bad example of mining and how it should be done

Level 1: Hands-on economic modelling

A dreadful model →

Recently I had to use an evaluation model that was the embodiment of everything **not** to do in the mining section.

- ▶ This person was in another country and we never met, but I suspect was of an accounting/commercial background. (let's assume it was a 'he')
- ▶ He looked to have tried to quickly learn about mining and do his best.
- ▶ But its layout was naïve which led to lots of mathematic errors and some mining concepts were badly understood.
- ▶ He received the mine schedule from the mining engineer that was for 15 years – the first four years in months and eleven years in quarters. So naively he created a worksheet with 48 columns of months and 44 columns of years. → 92 columns not just 15 years.

Error 1: **Naivety** – Using months and quarters was unwarranted as it brought no increase in accuracy of his valuation. He blindly followed the schedule: he should have used years. His model was not to be used by the mining engineers to run the mine. It was not fit-for-purpose.

Error 2: **Unwarranted detail**: The 92 columns caused him to make lots of mathematical errors across rows, such as not changing algorithms when months changed to quarters.

A dreadful model →

Error 3: **Very, very bad:** He did not sum the quantities across each row so he could check his quantities of each type of ore and waste mined over the 15 years. He did not compute his average head grade for each ore type for the 15 years so as to check against the input data from the mining engineer. To me this is negligent!

Error 4: **Unneeded complexity:** Instead he started the top of his mining section with the mineable ore and each month/quarter he calculated how it would decrease and the quantity remaining. Of course he could not keep track of head grades because they varied.

This looks really smart, is frequently done by less experienced people, but is nearly useless – It is far better to calculate your own row total tonnes and your average head grades across the 15 years and then check carefully against the source data. Then check your year by year amounts/head grades against the mine schedule.

Error 5: **Upside-down logic:** He got hold of a waste to ore ratio from somewhere and used this to compute the tonnes of waste mined each month/quarter. Instead he should have inputted the waste quantities from the mining engineers mine schedule, and used this to compute the waste-to-ore ratio.

Error 6: **Double dilution:** Someone must have explained to him about dilution of the in-situ ore when it is mined. He did not ask if this is already in the mine schedule but proceeded to dilute the run of mine ore by a further 7%. His head grades therefore were double diluted (but he did not increase the tonnes).

A dreadful model →

Error 7: **Working Stocks:** This was a final feasibility study but there were no weeks of production allowed for working stocks from run of mine ore in front of the processing plant right through to product trucked to the customers point of purchase. These would have tallied many weeks and significantly reduced the sales revenue in the first year.

Error 8: **Magical Feed Grades:** When the ore was fed to the processing plant it was higher in grade than the ore in the mine schedule and therefore higher than the ore with double dilution. This is plain shoddy workmanship. He should have recognised the stupidity and been working closely with the mining engineers and metallurgists.

Error 9: **All in black and white:** He crafted his model entirely in black and white with no colour coding for fresh data inputs or for data referenced from other worksheets. I had to work laboriously through cell by cell searching for the fresh data inputs and for computations. To speed up my understanding I coloured coded key parts of his model – with lots of cells changed to pink font that showed me his errors.

Error 10: **Lots of convoluted computations:** This led me to discover that instead of all the mining and processing intuitively flowing down one worksheet he managed to weave it through multiple worksheets. Computations and logic jumped from one worksheet to another. Why? Why make it unnecessarily convoluted when a simple flow down one worksheet would be most effective? I see this too often in poorly structured models.

What to do →

Do not try to calculate the mine schedule from bottom-up in your model. This is not your skill, you do not have the mine planning software, and you are liable to make gross errors. Do not try to give the impression that are doing that at high level in your model. You will demonstrate naivety.

Instead you should be using the final production schedules presented by the mining engineers and by the processing metallurgists. Check the row totals in your own work against their life of mine totals. Then have those specialists check your model. Co-operate!

1. Keep the flow of computations intuitive for others.
2. Colour code the rows as inputs, references and computations.
3. Tally every row of inputs and outputs and check it against external information.

Keep track of contained metals ...

When working down the mining, processing and sales I compute the tonnes of metal (or ounces of gold), and sometimes its notional value, contained in the:

1. Run of mine ore
2. Ore fed to the processing plant
3. Concentrates produced from the feed
4. Products sold

Firstly it is a most important check of my own work.

Secondly it tells everyone how much money is involved and lost at each stage of the business

END