

Teach Yourself Economic Evaluation

1 a. Hands On Modelling 'Introduction & Audit' worksheet

The purpose of this module is to ...

Level 3: Decision making

Level 2: Evaluation of a project



create an
'Intro&Audit'
worksheet

Level 1: Hands-on economic modelling

Spend only a few seconds on most slides.

A big black and white mystery box!

How many models have you opened:

- ▶ where you face vast areas of words and numbers.
- ▶ where the tabs of the worksheets are not labelled so you do not know the overall architecture.
- ▶ where there is no description of what the model is intended to compute, of the person responsible, of the state of audit and of any warnings.
- ▶ where you look for NPV or some other result and try to work back to what is happening
- ▶ where you need to rely on separate emails and documents to understand who is doing what.
- ▶ Where inside the model there is no visible record of the source of every parameter

You probably will say that too many models are like that!

That is why each of your models should begin with a brief 'Introduction & Audit' worksheet.

It will be quick to create and

It will be so helpful for others.

'Intro & Audit' worksheet

It will be the same for all three typical models: –

- i. a simple assessment,
- ii. comparing alternatives, or
- iii. one long, detailed, complex case

It will be the most left-hand worksheet as shown in the examples below: –

i. a worked example of a simple assessment

Worked Example - MetPlant 2011

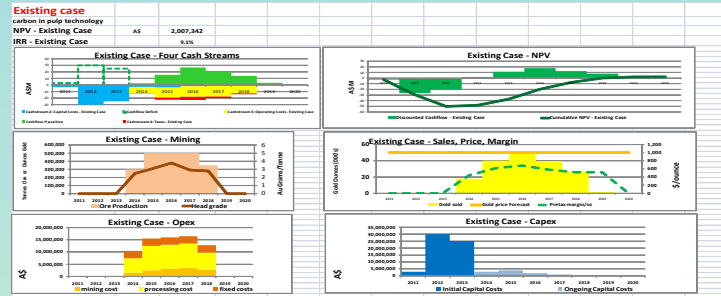
Project Card 04 of 508 324

Context:
This Worked Example illustrates the economic evaluation modelling practices recommended by AusIMM. It compares a gold mine using existing common technology with a new technology - at concept level.

Audits:
This example has not been audited and should not be used without a thorough check.

Summary:
This example has not been audited and should not be used without a thorough check.

Understanding the colour coding:
This example has not been audited and should not be used without a thorough check.



Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cashstream 1: Production and Revenue										
Production	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
Revenue	2,100,000	2,100,000	2,100,000	2,100,000	2,100,000	2,100,000	2,100,000	2,100,000	2,100,000	2,100,000
Operating Costs	1,700,000	1,700,000	1,700,000	1,700,000	1,700,000	1,700,000	1,700,000	1,700,000	1,700,000	1,700,000
Cashstream 2: Capital Costs										
Initial Capital Costs	1,000,000	30,000,000	25,000,000	1,000,000	2,000,000	2,000,000	2,000,000	0	0	0
Ongoing Capital Costs	0	0	0	0	0	0	0	0	0	0
Cashstream 3: Operating Costs										
Operating Costs	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Cashstream 4: Taxes										
Taxes	0	0	0	0	0	0	0	0	0	0
NPV - Existing Case										
NPV	2,007,342	2,007,342	2,007,342	2,007,342	2,007,342	2,007,342	2,007,342	2,007,342	2,007,342	2,007,342

Intro & Audit

Workings in one worksheet

ii. a worked example comparing alternatives ..

Worked Example - For Website

Client: Peter Card 94 97 500 924

Purpose: This Worked Example illustrates the economic evaluation modelling practices recommended by AusIMM. It compares a gold mine using existing common technology with a new technology - at concept level.

Warnings: This example is an illustration. It has not been audited and should be checked before being used.

Audits

Self-audit: For each alternative, check the following:

- NPV: Is the NPV calculated correctly?
- IRR: Is the IRR calculated correctly?
- Payback: Is the payback period calculated correctly?
- Discounting: Is the discounting done correctly?
- Capital Costs: Are the capital costs calculated correctly?
- Operating Costs: Are the operating costs calculated correctly?
- Taxes: Are the taxes calculated correctly?
- Revenue: Is the revenue calculated correctly?
- Production: Is the production calculated correctly?
- Life of Mine: Is the life of mine calculated correctly?
- Inputs: Are the inputs calculated correctly?

Each indicator is highlighted in a specific color. Each indicator is highlighted in a specific color. Each indicator is highlighted in a specific color.

Understanding the colour coding

Green: Positive impact on NPV/IRR. Red: Negative impact on NPV/IRR. Yellow: Neutral impact on NPV/IRR. Blue: Not applicable.

Results Comparison

Existing case: NPV: \$4,365,323, IRR: 28.8%

Alternative A: NPV: \$4,518,833, IRR: 32%

Alternative B: NPV: \$21,417,060, IRR: 20.2%

Inputs - Common

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Production	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Revenue	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Operating Costs	500000	500000	500000	500000	500000	500000	500000	500000	500000	500000
Capital Costs	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Taxes	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000

Existing case

NPV: \$4,365,323, IRR: 28.8%

Cashstream 1: Production and Revenue

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Production	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Revenue	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000

Cashstream 2: Capital Costs

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Capital Costs	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000

Cashstream 3: Operating Costs

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Operating Costs	500000	500000	500000	500000	500000	500000	500000	500000	500000	500000

Cashstream 4: Taxes

Year	2015	2020	2025
Taxes	100000	100000	100000

Cashflow and NPV

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cashflow	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
NPV	4365323									

Alternative A

NPV: \$4,518,833, IRR: 32%

Cashstream 1: Production and Revenue

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Production	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Revenue	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000

Cashstream 2: Capital Costs

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Capital Costs	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000

Cashstream 3: Operating Costs

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Operating Costs	500000	500000	500000	500000	500000	500000	500000	500000	500000	500000

Cashstream 4: Taxes

Year	2015	2020	2025
Taxes	100000	100000	100000

Cashflow and NPV

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cashflow	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
NPV	4518833									

Alternative B

NPV: \$21,417,060, IRR: 20.2%

Cashstream 1: Production and Revenue

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Production	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Revenue	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000

Cashstream 2: Capital Costs

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Capital Costs	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000

Cashstream 3: Operating Costs

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Operating Costs	500000	500000	500000	500000	500000	500000	500000	500000	500000	500000

Cashstream 4: Taxes

Year	2015	2020	2025
Taxes	100000	100000	100000

Cashflow and NPV

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cashflow	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
NPV	21417060									

Results summary & common inputs

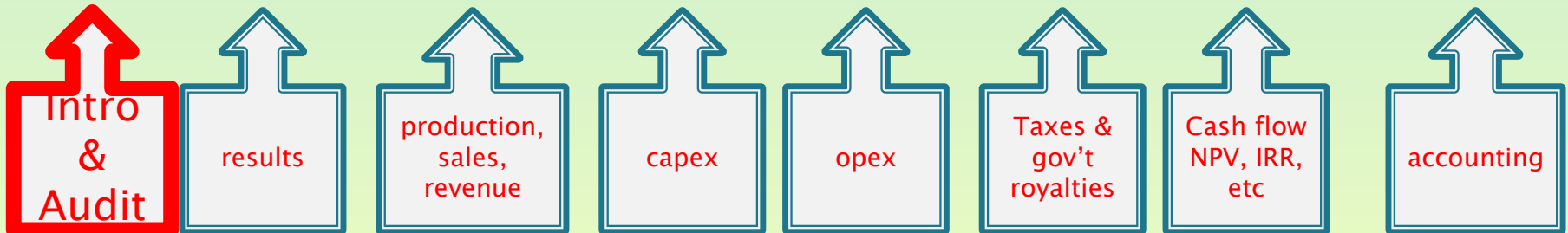
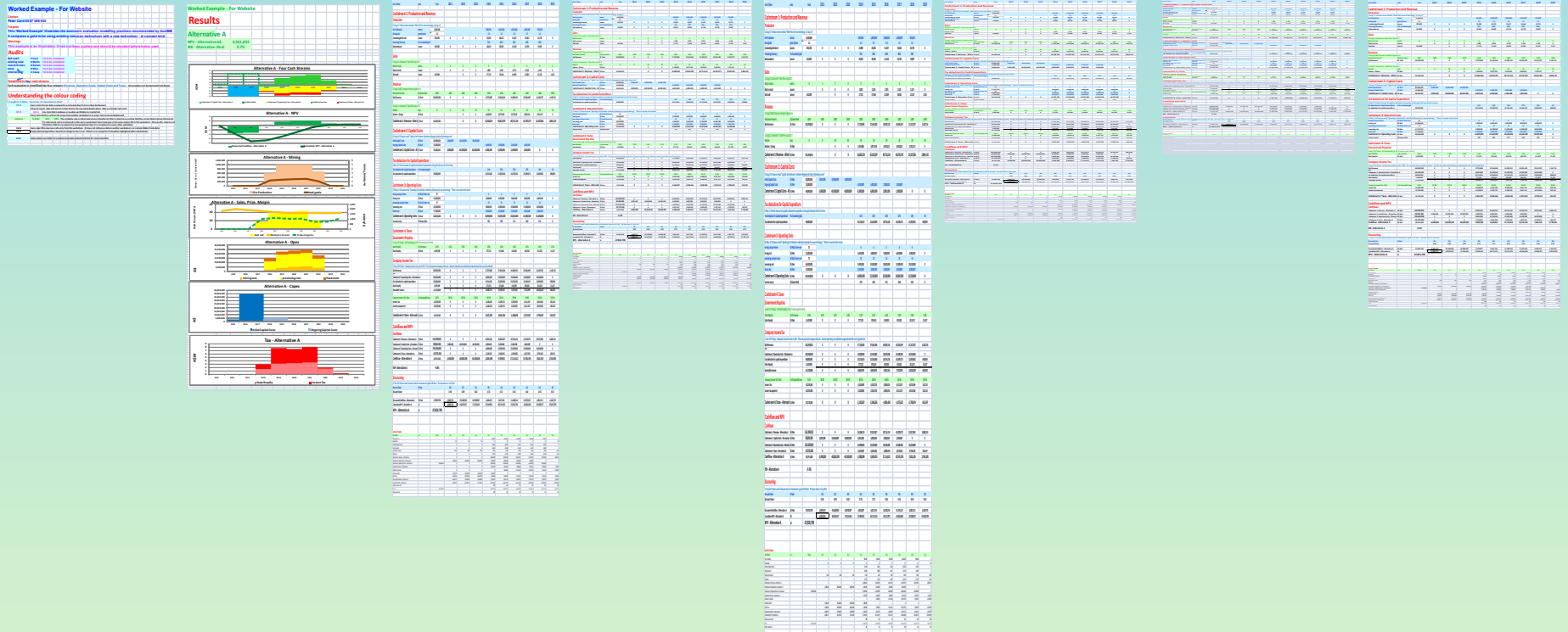
Existing case

Alternative A

Alternative B

Intro & Audit

iii. a worked example of a long, detailed evaluation



It will look something like this: –

Worked Example Comparing alternatives - For Website

Contact

Peter Card, Melbourne, +614 07 508 924

Date

Initially created 2011 for MetPlant2011 and updated March 2013

Purpose

This 'Worked Example' illustrates the economic evaluation modelling process. It compares a gold mine using existing common technology with a new

Warnings

This example is an illustration. It has not been audited and should be checked

Audits

Self audit	P Card	Yet to be completed
existing case	D Martin	Yet to be completed
new tech case	G Darwin	Yet to be completed
taxes	G Wise	Yet to be completed
external peer	C Casey	Yet to be completed

Simplified to four cash streams

Each evaluation is simplified into four streams: Revenue, Operating Costs, Capital Costs and

Understanding the colour coding

13 Aug 2011 B White, "Sales Plan for Operations to 2025"

67.4	Every item of input data is exposed in a cell using blue font on a blue background. It has its source, date and person in blue font in the row immediately above. (Not as a hidden cell note)
67.4	202.2 Any item that is dubious or needing verification is in pink font. Every item which is referenced across from another worksheet is in green font on green background.
recovery	% silver 36% 36% The complete row is referenced across including its title in column A as a check that the correct data is used. If a referenced cell is in Column B in the source worksheet then it appears in the same column (B) in this worksheet. (It is not in column B in every other worksheet. Therefore if 2013 is in column K in one worksheet then it is in column K in every other worksheet)
134.8	Every algorithm must use cells only from this worksheet. (It does not reference data in another worksheet, nor contain hidden formulas)
134.8	Computational algorithms should not change across a row. If there is an exception it should be highlighted with a red border
67.4	Some people use italics for nominal terms data and vertical font for real terms data

1. Title of model which is referenced to cell A1 in every other worksheet
2. Who to contact
3. When created and updated
4. What the model is doing
5. Warnings
6. Audits completed
7. Colour coding being used

Old fashioned modellers are 'too busy' to include this worksheet and do not like being so open with colleagues because they feel the model is their 'private domain' that should look baffling to others.

Competent modellers realise this will set other users of their model off in the right direction.