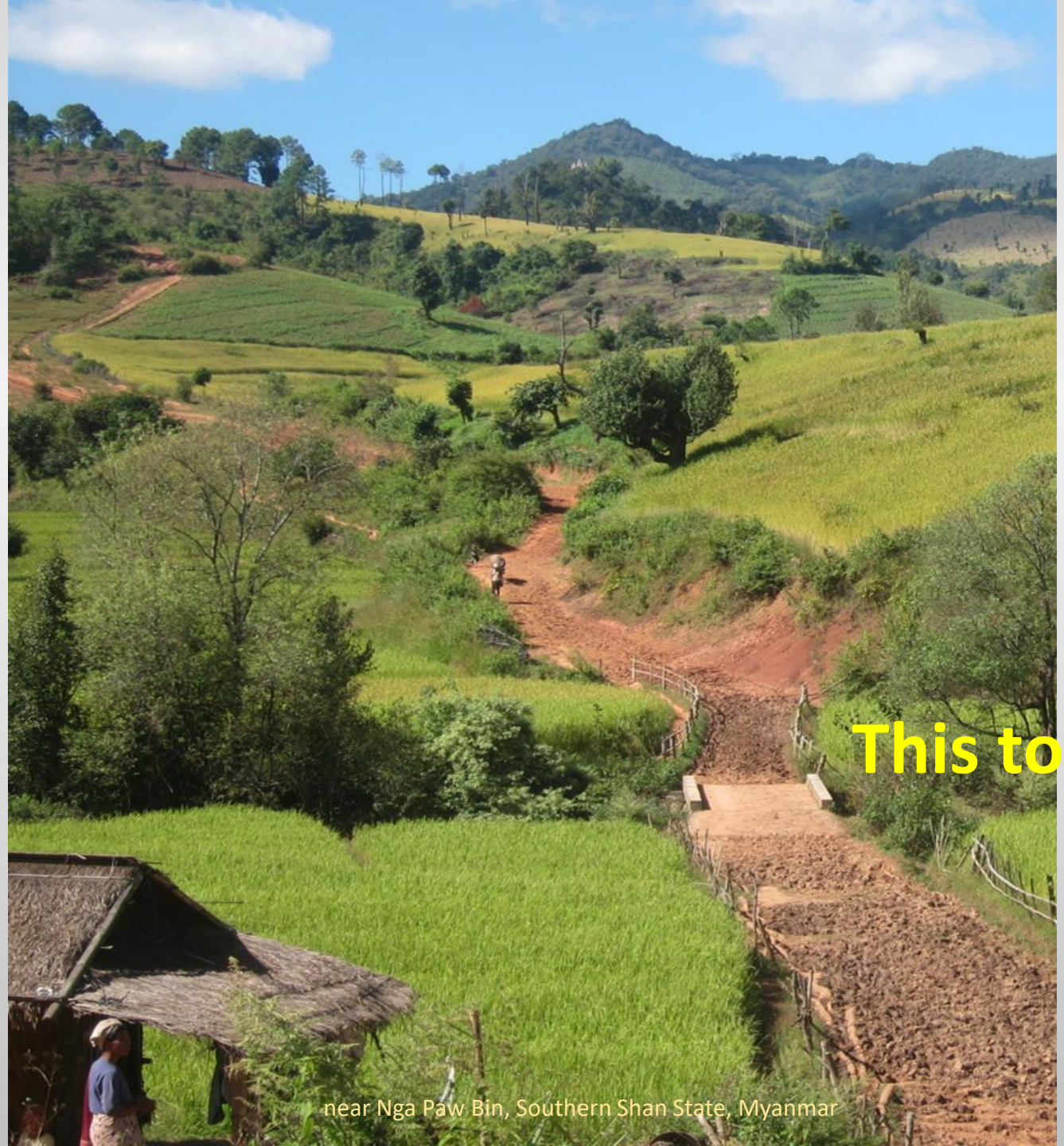
near Nga Paw Bin, Southern Shan State, Myanmar

Teach yourself how to build a Business Case for any industry including mining

1e Hands-On Modelling: Why four cashstreams!

This too is absolutely fundamental!

The purpose of this module is to explain why we simplify a business model to **four cashstreams**

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

Suu Pan Inn, Southern Shan State, Myanmar

Contents: -


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Where the idea started: -

Years ago economic evaluations usually were computed by **Accountants.** They used their income statements, balance sheets and accounting cash flow statements.

This method is valid, but it is a complicated mystery for most operational and technical professionals. These non-accountants had to accept the results at face value for two reasons:

1) this was the domain of Accountants and
2) most operational/technical professionals did not have the confidence to get inside the accounting computations.

Most unhealthy!

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The dark mysteries of the accounting route: -

Work down through the accounts

Typically a business or project has operations that produce goods and/or services. It has sales, revenue, stockpiles, capital costs, maintenance, operating costs and taxes. Each of these activities has cash inflows or cash outflows. (The economic evaluation methodology simply uses these actual cash flows as they occur.)

But the whole principle of the **accounting methodology** is to exactly match all these costs, taxes, stock movements, debtors, creditors, etc with the sales. Accountants re-arrange all these cash inflows and cash outflows backwards and forwards in time so that each matches the formal volume of sales; whether or not the products have been received by the customer and paid in full. Operating costs are matched by detailed computations of movements in stockpiles of finished products, intermediates and raw materials. Past and new capital costs are allocated by some accounting policy to past, current and future sales volumes as 'accounting depreciation and amortisation'. Debtors and creditors are incorporated. The actual tax paid is recalculated to match the reconstruction of depreciation and amortisation above. This is the **Income Statement** (Profit & Loss). It is very detailed, very precise and entirely valid. It is a most useful measure of the performance of the business/project.

The accounting **Cashflow Statement** is derived from this Income Statement. A forward looking 'budget' is used to forecast net cash flow into the future and to derive metrics such as NPV, IRR and payback. This requires the Accountants to reverse out most of the above accounting adjustments. Again this method is entirely valid – if doubly puzzling for non-accountants.

For people trained in or familiar with accounting these computations are normal, everyday activities. For others it can be mysterious and baffling.

Gradually senior managers recognised …

Multiple scenarios needed to be assessed rapidly after the ‘base case’ was established.

i. Assessing a business or project was a lot, lot more than computing its NPV
ii. Therefore, a less convoluted method of computing ‘net cash flow’ was badly needed
iii. Operational and technically qualified people often were best suited to evaluate a project or business.

Suu Pan Inn Village

Must be practical, visual and intuitive

So what shall we do?

It was recognised that the simplest method would follow the natural flow of the business/project:

- It should start with the sales plan
- This would generate the revenue (bring in cash)
- These sales would need a production plan.
- Which would require capital investment for plant and equipment (spend cash).
- And would consume resources to operate (spend cash).
- The business would incur a range of taxes (spend cash)

Rather than working through accounting policies & procedures it would be far simpler to start with production & sales and work through capital costs, operating costs and taxes to compute net cashflow (and NPV, IRR, etc).

Far better to use an approach that everyone can visualise and understand.

- So it must be in natural work-blocks with clear headings and obvious computations.

The new method must be intuitive!

From this evolved the concept of four cashstreams: -

Cashstream #1 - **Sales, production, revenue**
minus: -
Cashstream #2 - **Capital costs**
Cashstream #3 - **Operating costs**
Cashstream #4 - **Taxes**

= net cash flow

compute NPV, IRR, Payback, etc

= so easy to follow!

Four cash streams methodology:

These four cashstreams incorporate **all** the other items in a business or project: -

1. **Sales, production, revenue –** including working stocks, finished stockpiles, logistics, VAT, debtors, etc

minus:

2. **Capital costs** – including study costs, initial capex, sustaining capex, development capex, tax deductions, VAT, creditors
3. **Operating costs -** including fixed & variable costs, closure, private royalties, working stocks, VAT, indirect taxes, creditors
4. **Taxes –** including income tax, minimum taxes, Government Royalties, net VAT, special taxes

= **net cash flow**

In early phase evaluations, some of the less important items might be omitted then as the evaluation progresses these the items may be incorporated.

→ Include the lesser items when they become relevant – not just to may the model look more impressive!

An economic evaluation of a business or project is first computed on a stand-alone basis to understand its inherent viability.

It does not include financing - such as equity, debt, interest on debt or interest during construction.

How good or bad is the underlying business/project – before considering financing and ownership.

The status of the four cash streams methodology

As has been stressed before, **Accounting** is an entirely valid method of measuring the performance of a business or project. It has a specific purpose and employs Accounting professionals. There is no competition between Accounting and Business Evaluation – they have very different purposes.

This **economic evaluation methodology (four cashstreams)** has evolved in parallel over the past 20 years and now is very well established. It is has been adopted by a wide range of companies including some of the world's biggest resource companies. Time is ripe for a formal professional qualification in business evaluation. This website is the closest there is!

Unfortunately, an alternative **free-for-all methodology** has evolved too. This is widespread and is characterised by numerous worksheets of convoluted calculations, no obvious flow, complex algorithms that chase through numerous worksheets, minimal headings and sheet labelling, advanced Excel, multiple inputting of the same data, etc. The person who created the model probably is terribly proud of its 'sophistication'. Almost everyone else hates it and does not trust it because it is too tedious to audit. These evaluation models are akin to **cancers** that are out of control!

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First let's look at the four cashstreams inside the simplest of the three layouts:

i. **A Simple Assessment**
ii. Comparing Alternatives
iii. One long, detailed, complex model

i. A Simple Assessment

comprises obvious work blocks: -

Cashstream #1 – **Sales, production, revenue** →

Cashstream #2 - **Capital costs** →

Cashstream #3 - **Operating costs** →

Cashstream #4 - **Taxes** →

➢ **Net cashflow** and NPV & IRR etc →

A Simple Assessment											
NPV	A$ millions real	26									
IRR	Real	16.8%									
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 1: Production and Revenue											
Production											
2 Nov 2020 Michel Basil. Email of production throughputs and output of saleable products											
Waste processed	000 tonnes	11,000		3,000	3,000	2,500	1,500	1,000	0		
Ore mined	000 tonnes	4,800			800	1,000	1,000	1,000	500		
Head Grade - acid soluble copper	% Cu	0			2.1%	2.1%	2.1%	2.1%	2.1%		
Contained acid soluble copper	000 tonnes	90	0	0	17	21	21	21	11	0	0
Recovery of soluble copper in processing and SX-EW	% Cu	90%			90%	90%	90%	90%	90%		
Output and Sales of Cathode Copper	000 tonnes	81	0	0	15	19	19	19	9	0	0
Sales and Revenue											
5 Nov 2020 Peter Murphy: Company paired forecasts of copper price and exchange rate											
Copper price - SX-EW cathode	US$/lb real		3.00	3.00	3.00	3.00	3.00	3.00	3.00		
Output and Sales of Cathode Copper	US$ millions real	588	0	0	100	125	125	125	63	0	0
Fares A$	A$1.00 = US$...		0.80	0.80	0.80	0.80	0.80	0.80	0.80		
Cashstream 1: Revenue	A$ millions real	672	0	0	125	156	156	156	78	0	0
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 2: Capital Costs											
Major Development Capex											
1 Dec 2020 2014 Carlo Embre: Email - initial capex estimates											
Major Development Capex	A$ millions real	123	25	98							
Ongoing Capex											
5 Dec 2020 2014 Carlo Embre: Email - on-going capex @ 5% of total initial capex											
ongoing capex	% of initial capex		5%	5%	5%	5%	5%	5%	5%	5%	5%
ongoing capex	A$ millions real	31	0	0	6	6	6	6	6	0	0
Cashstream 2: Capital Costs	A$ millions real	154	25	98	6	6	6	6	6	0	0
Tax deductions for Capital Expenditure											
This assessment:-											
15Nov 2020 G Rose: For this business, tax legislation reads that the bulk of the capex is deducted over 5 years straight line. So in the calculations below the diminishing value rate is 100%/5 years *150% = 30%.											
23Nov 2020 G Rose: And the tax legislation is that deductions for new equipment start with commercial production, with capex being deducted fully in the year in which it is spent.											
look inside this cell to see the logic											
Tax Deduction for Capital Expenditure	% diminishing value		30%	30%	30%	30%	30%	30%	30%	30%	30%
23Nov20 G Rose, Accountant emailed that $7M has been spent on the project (and is capitalised in the accounts) but only $2M remains unclaimed deductions in the tax returns.											
Undeducted capex - opening balance	A$ millions real		2	27	125	92	69	52	41	0	0
Undeducted capex - added to pool	A$ millions real	154	25	98	6	6	6	6	6	0	0
Undeducted capex - in pool	A$ millions real		27	125	131	98	75	58	47	0	0
Undeducted capex - available for deduction	A$ millions real	409	0	0	131	98	75	58	47	0	0
23Nov20 G Rose: Unclaimed tax deductions can be claimed in the final year of use.											
tax deduction for capital expenditure	A$ millions real	156	0	0	39	29	22	18	47	0	0
Undeducted capex - closing balance	A$ millions real		27	125	92	69	52	41	0	0	0
Check if deductions = capex		OK									
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 3: Operating Costs											
3 Nov 2020 Carlos Bas: email outlined operating costs											
variable opex											
waste cost - variable	A$ Real/ tonne waste		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
waste cost	A$ millions real	28	0.0	7.5	7.5	6.3	3.8	2.5	0.0	0.0	0.0
ore cost - variable	A$ Real/ tonne ore		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
ore cost	A$ millions real	13	0.0	0.0	2.4	3.0	3.0	3.0	1.5	0.0	0.0
processing cost - variable	A$ Real/ tonne ore		35	35	35	35	35	35	35	35	35
processing cost	A$ millions real	151	0.0	0.0	28.0	35.0	35.0	35.0	17.5	0.0	0.0
SX-EW cost - variable	A$ Real/ tonne cathode		950	950	950	950	950	950	950	950	950
SX-EW cost	A$ millions real	77	0.0	0.0	14.4	18.0	18.0	18.0	9.0	0.0	0.0
fixed opex											
supervision and technical	A$ M/annum Real		2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
General & Admin	A$ M/annum Real		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
fixed opex	A$ millions real	41	0	0	8	8	8	8	8	0	0
private royalty											
private royalty rate	% of sales revenue		2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
private royalty	A$ millions real	17	0	0	3	4	4	4	2	0	0
rehab											
rehabilitation	A$ Real/ tonne waste & ore		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
rehabilitation	A$ millions real	15	0	1	4	4	3	2	1	0	0
closure											
closure	A$ millions real				45	45	45	45	45	45	45
closure	A$ millions real	45			0	0	0	0	0	45	0
Cashstream 3: Operating Costs	A$ millions real	386	0	11	67	78	74	73	39	45	0
opex per ore (incl closure)	A$/tonne ore	90	0	0	84	78	74	73	77	0	0
opex per tonne final product (incl closure)	A$/tonne cathode	4,752	0	0	4,457	4,117	3,932	3,839	4,088	0	0
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 4: Taxes											
Government Royalties											
21Dec20 G Rose: The government royalty rate is 6% of gross revenue											
government royalty rate	% of sales revenue		6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
government royalty	A$ millions real	40	0	0	8	9	9	9	5	0	0
Income tax											
21Dec20 G Rose: The company income tax rate is 30% and the company expects to be paying income tax in future years so any losses can be used immediately.											
Cashstream 1: Revenue	A$ millions real	672	0	0	125	156	156	156	78	0	0
less											
Cashstream 3: Operating Costs	A$ millions real	386	0	11	67	78	74	73	39	45	0
government royalty	A$ millions real	40	0	0	8	9	9	9	5	0	0
tax deduction for capital expenditure	A$ millions real	156	0	0	39	29	22	18	47	0	0
Accessable income	A$ millions real	90	0	-11	11	40	50	57	-12	-45	0
Company Income Tax Rate	% of assessable income		30%	30%	30%	30%	30%	30%	30%	30%	30%
Income Tax	A$ millions real	27	0	-3	3	12	15	17	-4	-14	0
Cashstream 4: Taxes	A$ millions real	67	0	-3	11	21	24	26	1	-14	0
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
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											
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 real	26	-24	-94	34	39	36	33	20	-18	0
Cumulative NPV	A$ millions real		-24	-118	-84	-45	-9	24	44	26	26
NPV	A$ millions real	26									

remote Nyaung Mye Char, Shan State, Myanmar

Next let's look at the four cashstreams when comparing alternatives:

i. A Simple Assessment
ii. **Comparing Alternatives**
iii. One long, detailed, complex model

ii. Each alternative has the four cash streams in obvious work blocks: -

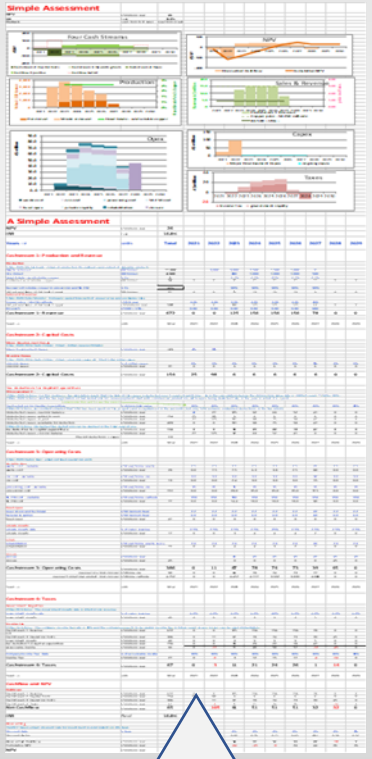
Cashstream #1 - **Sales, production, revenue** →

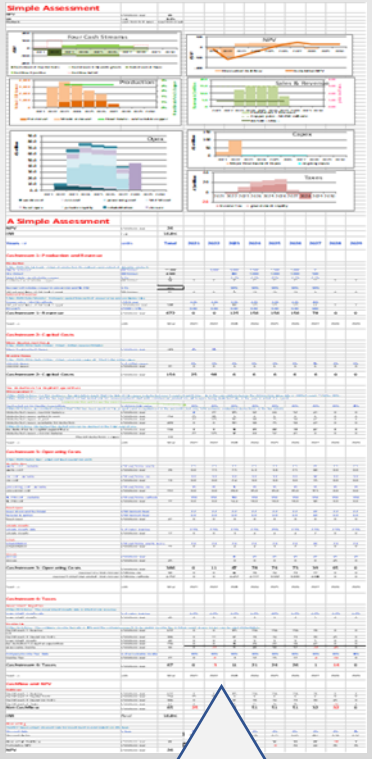
Cashstream #2 - **Capital costs** →

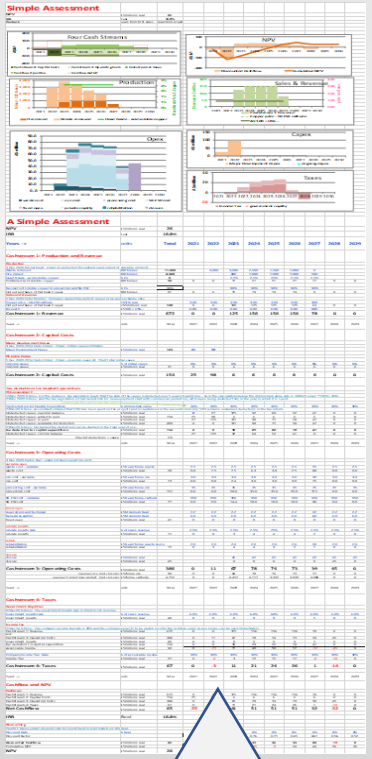
Cashstream #3 - **Operating costs** →

Cashstream #4 - **Taxes** →

➢ **Net cashflow** and NPV & IRR etc →







Base case

Alternative A

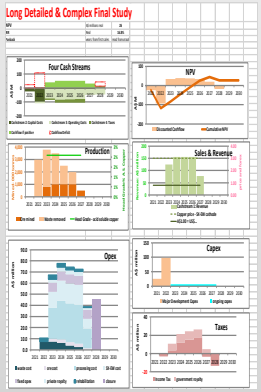
Alternative B

New school & old school at remote Nyaung Mye Char, Shan State, Myanmar

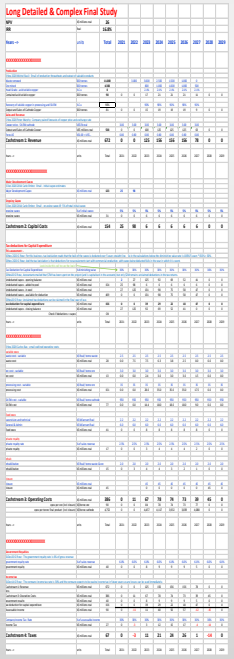
And the four cashstreams in:

i. A Simple Assessment
ii. Comparing Alternatives
iii. **One long, detailed, complex model**

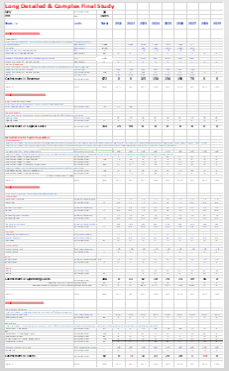
iii. A long, detailed and complex model may have a worksheet or two for each cashstream: -



key inputs & results



Cashstream 1: sales, production, revenue



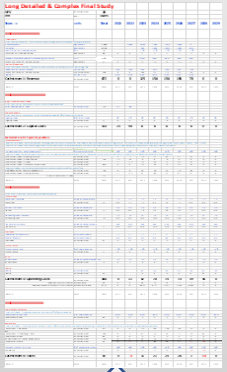
Cashstream 2: capex

Cashstream 3: opex

Cashstream 4: Taxes

Cash flow NPV, IRR, etc

accounting



financing

For every model: -

It does not matter where any particular item is positioned in #1 Revenue, #2 Capex, #3 Opex or #4 Tax providing:

1. it is obvious to everyone and
2. its tax treatment is correct

For example: -

- Logistics such as product freight can be deducted in the revenue cashstream or included in the operating costs
- VAT or GST can be included in revenue, capex and opex or computed in taxes.
- Environmental taxes and Government Royalties can be in the taxes or in the operating costs or deducted from revenue
- Closure costs can be in opex or in capex
- In mining, the pre-strip can be in opex or capex

Capital cost estimates: If an estimate of capital costs includes items that technically are operating expenses in the tax computation, it may be best to show them in capex for other people's benefit. Then in the tax cashstream explain where they are derived.

new school at Nyaung Mye Char, Shán State, Myanmar

Most Important

1. **There never-ever is a Fifth Cashstream!!!**
2. An Accounting worksheet can be derived from these four cashstreams – add if/when needed
3. If a Financing worksheet is added, it never feeds back to this economic evaluation!
   Refer to later modules about the common mistake of thinking financing significantly improves NPV/IRR
4. In an economic evaluation, use your own discretion to decide the importance of each item and how much detail is required.

Biodigester, Pyi Lone, Shan State, Myanmar

Advantages of the four cashstream methodology: -

There are several considerable advantages in using the four cashflow methodology to assess and evaluate a business or a project: -

1. It follows what is actual happening in the business or project
2. The flow of calculations and worksheets can be made intuitive
3. Disciplined construction in small obvious steps, makes the logic relatively easy to follow and to audit – even when it becomes long, detailed and complex
4. It focusses on the parameters that most impact the net cash flow and hence the value.
5. It allows items that have minimal impact on value to be approximated, which eliminates hundreds of rows of highly precise but unwarranted computations. (By contrast accounting must be precise on every item.)
6. The classification of an item as 'capital' or 'operating expense' is unimportant – so long as the timing of the cash outflow is correct and its treatment in income tax is appropriate. (By contrast accounting will have detailed procedures which might result in its 'depreciation & amortisation' being out of phase with those in the actual tax calculations and so introduce the accounting concept of 'deferred tax'.)

And most importantly: -

7. The models usually are in real terms so that computations are far simpler and trends over the years are far easier for everyone to follow. (Accounting and tax returns must be in nominal terms.)
8. Unlike the Accounting and most 'free for all' methodologies, the 'four cashflow' model can rapidly evaluate a whole range of scenarios where each is obvious and easy to audit. (It does not use draw down menus, Links, Tables where results are a matter of trust in the 'black box'. This is when most people quickly lose confidence and become overwhelmed by someone else's magical modelling whether it is correct or has hidden errors.)

Why Four Cashstream Models have flourished …

Everything is visual and intuitive!

Modelling specialists find:
The people around are enthusiastic for the model because …

- The model flows directly from actual activities and physical quantities
- The model's framework is simple but rigorous
- The model is based on four simple building blocks
- Modelling is fast but comprehensive
- Errors are greatly reduced
- Auditing by others is speedy

Managers and colleagues find:

- Models are readily understood
- Errors are easily identified
- The business is more quickly understood
- People feel in control and so confidence is high

Everyone can readily understand the underlying business!


Daybreak, Suu Pan Inn, Shan State, Myanmar

www.economicevaluation.com.au

Further Reading:

Tax, Accounting and Economic Evaluation

Each uses the same data for different purposes. One is not inherently better than the other
Economic Evaluation runs in parallel with Accounting – They are not rivals but are complementary.

Why is there different depreciation & amortisation for Accounting and for Tax?

When computing income tax for each year, all the genuine expenses of running the business or project can be deducted from the revenue to get the assessable income.
In broad terms, the day-to-day operating expenses are deducted immediately whereas the capital cost of assets lasting more than one year are deducted over several years. The income tax laws of the country stipulate how these capital costs are to be spread over the years. Some countries have laws that are similar to accounting methods whereas other countries have fast deductions to encourage investment. Income Tax requires precise calculations so usually there will be many, many rows of calculations and records.

By contrast, Accounting always spreads the 'depreciation & amortisation' over the life of the asset in a logical way. It may be by years of life or prorata by quantities of production/sales. Like Income Tax, Accounting requires precise calculations so usually there will be many, many rows of calculations.

If there is a difference between the Income Tax and Accounting rates of depreciation then the Accounting Balance Sheet will have the running amount of this difference, which may be called 'deferred tax'. This is an accounting non-cash concept and eventually it should fall to zero for each item.

Economic Evaluations should not include the accounting depreciation & amortisation nor any 'deferred tax'. It should include only the calculations that are needed to compute the income tax for each year. As explained, these computations can be approximated/simplified where the impact on cashflow and value is minimal. This means many rows of computations can be replaced by a few rows where sensible.

> Very poor economic evaluations contain hundreds of rows of precise calculations for income tax but have inadequate consideration of the key parameters that swing value, such as sales quantities, price, foreign exchange rate, overheads, variable operating costs and sustaining costs. Usually the future values of these key parameters are nothing more than best estimates by experts. Most of these major impactors cannot be defined with absolute certainty so it is not sensible to compute minor items of tax and depreciation in extended detail.


Suu Pan Inn Village, Shan State, Myanmar
END