a primer on
Project Evaluation
(How much can an idea be worth?)
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Coverage
• Investment appraisal
• Cashflow over project lifetime
• Measures of profitability based on cashflow analysis
• Time value of money, discount rate and its effect
• An example of actual IP valuation

You think that you have a seemingly practical idea.
What is its utility (what is it worth)?

You want to interest industry in your idea.
... so that you can sell it (but how much to ask for?),
or
... raise research funding (but why should they risk the funds?).

How much would it cost ...
to commercialize or buy a project?
You have several options for proceeding with an idea. How would you evaluate them?

You have several options for proceeding with an idea. How would you evaluate them?

Spend? Invest?

- The commercialization of ideas costs money. Projects cost money.
- Project expenditure is usually justified by the expectation of a future return. e.g. prestige; goodwill; political advantage; amenity value; social value; economic benefit.
- When the cost of resources and effort needed to bring a project into being is compared against the value of the resulting benefits, the evaluation is economic or financial.

Project evaluation

Similar species:
Economic evaluation; financial evaluation; profitability analysis.

Is
- Investigation of cash flow and risk to determine a project’s eventual financial benefit.
- Assessment of activities that are funded for a defined period of time to perform a specified task.
- Appraisal of factors which are quantifiable, measurable and comparable in money terms.

Project Evaluation

Is a good tool:
- For ranking or comparing projects
- For the valuation of intellectual property
Project evaluation

- ensures the right project is undertaken
- the right timing
- the best chance of success
- provides information for making good investment decisions

What is the role of project evaluation in business?

Firstly, we need to consider ...

Why companies try new ventures

This is actually the reason why ...
you might have R&D funding from industry

Financial objectives in a commercial organisation

- Decisions are taken by companies so as to maximise owners’ wealth.
- Owners’ wealth can be maximised through maximisation of owners’ purchasing power.
- Purchasing power can be maximised by:
  - maximisation of dividends,
  - and top value of shares when sold.

Maintenance of maximum company valuation

- Over time, the objective is to maximise dividend flow to shareholders, and share value.
- The maximisation of the value of the dividend flow through time maximises the stock market’s valuation of the company’s ordinary share capital.
- Dividend flow is determined by profitability.
• Profitability is determined by the success of a company's commercial activity.
• To maximise profitability, commercial activity must be appropriate in a commercial environment which is constantly changing in:
  - market share; competition; product improvement;
  - new products; lower prices.

To increase or maintain profitability, a company can:
• Increase productivity
• Risk new ventures

Both alternatives require investment appraisal.

Investment appraisal via profitability analysis

Information from project evaluation is
• quantifiable, measurable and comparable factors in money terms
• based on forecasts or estimates
  … monetary costs and timing of the effort and resources
  … monetary value and timing of the resulting benefits

Costs
In project proposals, estimation of costs is usually less difficult.
• More immediate in time
• Proposers are relatively more familiar with their technology

Returns
How returns (revenue) are estimated is usually relatively more difficult for proposers.
• Conventions used
• Methodology
A: Development, design and other preliminary activities.

B: Max. debt accumulated by the project

C: Project starts to earn.

D = Break even point

E: Rate of positive flow decreases.

F: Plateau; no further cash flows.

Future cashflow is referred to as “projected”

Measures of Profitability

Non-Discounting methods

Payback period (PB)

= number of years from plant set-up to recover all expenses in a project if all the pre-tax profits were used for this purpose.

Disadvantages

• provides no indication of the expected return on investment or cash return of a project.
• Ignores everything in the time beyond the breakeven point.
• Ignores the changing pattern of cash flow with time.
• Ignores the time value of money.

Measures of Profitability 2

Return on investment (ROI)

The (potential) financial benefit expressed as a percentage of the costs of generating that benefit. e.g.

\[
\text{ROI} = \left( \frac{\text{Net profit}}{\text{Total funds invested}} \right) \times 100\% 
\]

Disadvantages

• Ignores the time value of money.
• Ignores the changing pattern of cash flow with time.

Measures of Profitability 3

The Time Value of Money and Discounting

• Timing preference
  Receipt is preferred sooner than later: risk; inflation.

• Opportunity cost
  The earlier the receipt, the greater the potential for increasing wealth.

To account for time value and since projected cash flows are future events, discounting is used.

• Discounting brings cash flows to a common time basis for comparison.
• Discounting gives the Net Present Value.
Discounting Methods

- **Internal Rate of Return (IRR)**
  The discount rate that reduces to zero the net present value of a stream of income inflows and outflows.

- **Net Present Value (NPV)**
  A measure of the absolute economic profit expected as the result of investing in a project (the net value of all cash flows for the project)

Consider ....

- **Payback Period analysis**
  Measure is **TIME**.

- **Return on Investment analysis**
  Measure is **%**.

- **Internal Rate of Return analysis**
  Measure is **%**.

- **Net Present Value analysis**
  Measure is **$**.

Which measure is useful in valuations of IP?

NPV of projected cashflow (discounted cashflow)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cashflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>-50</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
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</tr>
<tr>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>16</td>
<td>413</td>
</tr>
</tbody>
</table>

Cumulative Cashflow: 413

![Diagram showing NPV of projected cashflow (discounted cashflow)]
The effect of discount rate on NPV

- The further into the future projected revenue is, the lesser the relative contribution to the analysis.
- The bigger the discount rate, the larger this effect is.

Ranking projects by NPV

- Project C is ranked highest by NPV
- Projects A and D are similar in NPV but have different cashflow patterns.
Thus, the discount rate
has a profound effect on the estimated
value of a project

How are discount rates derived?
• can be subjective
• Systematically such as:
  \[ K_j = R_f + b_j \times (k_m - R_f) \]
where
- \( K_j \) = required return on project (discount rate)
- \( R_f \) = risk free rate of return
- \( b_j \) = beta coefficient
- \( k_m \) = market return

How potential investors can beat you
down on price

• Choosing an unfaltering discount rate
• Use the cost of further development to dilute your equity share

Consider:
• The R&D Spectrum

<table>
<thead>
<tr>
<th>Idea</th>
<th>Basic Research</th>
<th>Applied Research</th>
<th>Development</th>
<th>Commercialization</th>
</tr>
</thead>
</table>

How Potential Investors Can Beat You Down on Price 2

Cost escalation from lab to plant

Cost

Lab | Pilot | Plant

Stage

After Hacking (1986)
Your equity share is diluted because initial investment < total investment required

The biological phenomenon

Ectomycorrhizal fungi
Manifest themselves as mushrooms or truffles

An example of Project valuation via NPV

Mycobead
Inoculum for plantation forestry

An ectomycorrhiza
Effect of inoculation with ectomycorrhizal fungi on eucalypt seedlings

The concept

Mycobead inoculum

SEM of bead exterior

SEM of bead interior
Pisolithus tinctorius
Outgrowth of mycelium from a Mycobead

Test mycorrhization with a Mycobead
Mycorrhiza
Mycelial outgrowth
Mycobead
Eucalypt seedling

Eucalypt seedlings successfully inoculated with Mycobead

The partners
CSIRO Div of Forestry
(Fungal collection & efficacy data)
Company
(Fermentation technology)
University
(Research location)
R&D Project

Contract
Contract
Contract
The question

How much would such technology be worth?

Who were needed in the valuation?

Independent assessments by experts in:
- forestry/ectomycorrhiza
- fermentation technology
- cashflow/profitability analysis (accountants)

Estimation of the unit price of the product
(1989 dollar values)

i. Estimation of plantation costs

<table>
<thead>
<tr>
<th>Item</th>
<th>$ ha⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual lease payment for land</td>
<td>72</td>
</tr>
<tr>
<td>(6% of land value)</td>
<td></td>
</tr>
<tr>
<td>Site preparation and establishment</td>
<td>668</td>
</tr>
<tr>
<td>Additional weeding (Year 2)</td>
<td>31</td>
</tr>
<tr>
<td>Additional fertiliser (Year 5)</td>
<td>96</td>
</tr>
<tr>
<td>Annual maintenance (Years 1-5)</td>
<td>38</td>
</tr>
<tr>
<td>Annual maintenance (Years 5-10)</td>
<td>25</td>
</tr>
</tbody>
</table>

ii. Calculating the benefit of improved rate of tree growth

Using a coppiced rotation scenario and assumptions as follows:
- 40 hectare, leased, ex-pasture sites.
- Benefit = monetary value (in NPV) of the increase in MAI of plantation trees @ a discount rate of 5%.
- Increments @ 10, 20 and 30% over a base MAI of 22 m³ ha⁻¹·year⁻¹.
At:
- Stumpage = $20 per m³
- Growth improvement rate of 30%

The benefit to a plantation is $952 ha⁻¹ NPV

iii. Unit product price

If the cost:benefit ratio that is the threshold for product adoption = 1:5

Then, the value of growth improvement is $952/5 = $190

If planting density is 1000 seedlings ha⁻¹ in a plantation,
Then price that might be commanded by ectomycorrhizal inoculum is 19 cents per dose.

Valuation of project worth

Cashflow projection

Inputs
- Revenue
  - Project life
  - Unit product price
  - Market size (Australia and globally)
  - Market penetration
  - Discount rate on projected cashflow

- Costs
  - R&D
  - Fixed costs e.g. production plant; office; staff; marketing
  - Variable costs e.g. production inputs

The agreed valuation was $A4.2 million NPV in 1989

[= AU07.93 million in 2012 (RBA 2013)]

This represents the potential earning capacity of the project and can be used as the value of the project’s IP.
Remember

• NPV is but one method for assessment.

• In the end, There is nothing to sell (no value) unless there is a buyer.