Commercial space resources: what investment hurdle rates are appropriate?

UNSW SYDNEY
Australia's Global University | Faculty of Engineering | School of Electrical Engineering and Telecommunications

Space Resources Roundtable

June 2024

ACSER
Australian Centre for Space Engineering Research

Ben McKeown

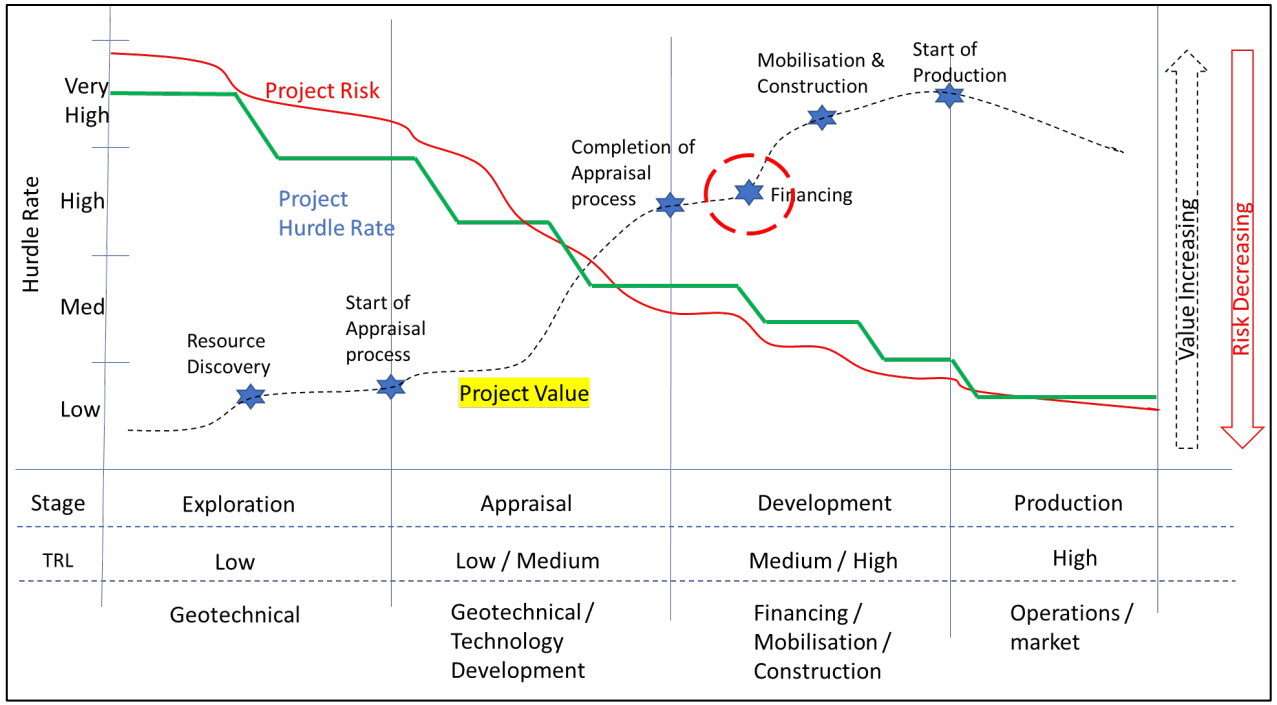
Some Context

- **Long life high cost commercial projects typically evaluated using DCF financial analysis**
  - Generates investment metrics such as NPV & IRR
  - IRR typically compared to pre-determined hurdle rate (HR)
  - HR is minimum acceptable rate of return
  - IRR > HR => Go decision / IRR < HR => No go decision
- **No consistency in economic evaluation of space resource projects!**
- **Why does this matter?**
  - Space Resource projects will be expensive
  - 3rd Party capital (investors) may be required
  - Communication with investors will be key!

Space Resource project development will be expensive (ref [1])

[1] Sowers, G., *NASA Innovative Advanced Concepts (NIAC) Phase I study: Thermal Mining of Ices on Cold Solar System Bodies*. 2020, Colorado School of Mines.

Hurdle rates can change during the life of a project



Hypothetical development curve for a commercial space resources project

- **Hurdle rates reflect perceived project risk at each stage**
  - Hurdle rates decrease as project risk decreases
- **We are focused on determining the HR at the development financing stage**
  - This is where most capital is (usually) required

How are hurdle rates determined?

Hurdle rates are subjective!

- Usually pre-determined by management / investors
- Not often determined theoretically

Often incorporate perceptions around factors such as

- Commercial risk/cost of capital/ access to financing

Hurdle rates ≠ Discount rates

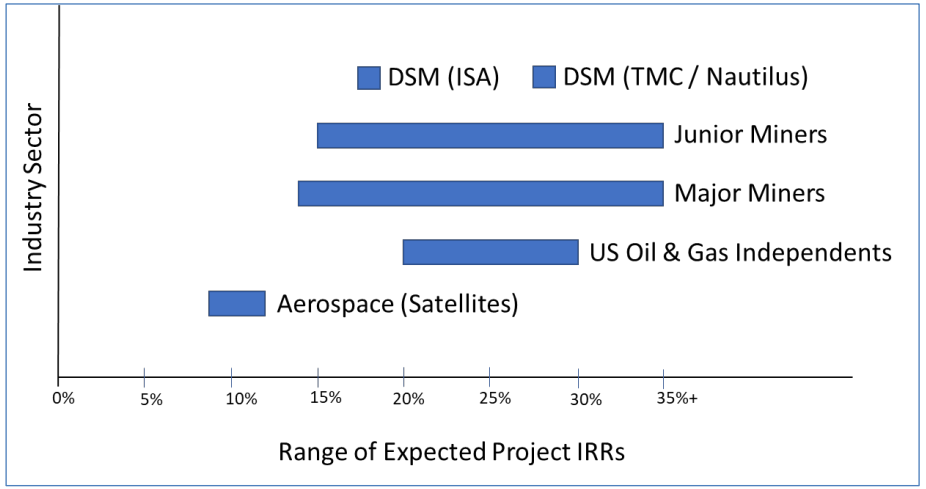
- Hurdle rate - compared to IRR for capital investment decision
- Discount rate – interest rate used to discount NPV cashflows for valuations

Several methods typically used:

- Based on 'common practice' in an industry
- By reference to comparable firms/projects in comparable industries
- Using a 'Risk Build Up Method'

Project hurdle rates in comparable industries…

- **Consider Mining (including Deep Sea) / Oil & Gas / Aerospace**
  - Use ‘expected IRR’ (EIRR) as hurdle rate proxy
- **EIRR for extractive industries (including DSM) clusters between 15-30%**
  - EIRR for all but 1 mining project ≥ 15%
  - EIRR ≥ 20% for almost 80% mining projects
- **EIRR reference point for commercial satellites is 8%-12%**
  - More typical of infrastructure projects?



Range of Expected Project IRRs by Industry

Percentage of Mining Projects by Expected IRR (for 54 projects)

Some observations

- **15% could represent the lower bound of hurdle rates for mining**
  - High no. of projects with EIRR ≥ 20% could indicate hurdle rate is commonly 20%+
  - Corporate Cashflow Return On Investment (CFROI) provides a ‘sense check’
- **Extractive industry project EIRRs appear consistently higher than infrastructure projects**
  - Possible reasons include commercial risk associated with subsurface (geology) & market (price)
- **Satellite EIRRs appear low (counter intuitively?)**
  - Reasons could include mature technology and/or ability to insure riskiest elements of operations?
- **DSM is at a nascent stage, but could be closest analogue to space resources?**
  - Indicative EIRRs for 2 projects >25%, within the typical extractive industry range
  - ISA assumptions for benefit sharing could be unrealistically low?

Risk Build Up Method (RBUM)

- **A framework to translate perceived commercial risk into a 'risk premium' to determine an appropriate hurdle rate**
- **Puts a 'cost' on commercial risk**

Steps:

- Determine **Cost of Capital** (here av. **WACC**)
- Determine commercial risks & '**Risk Weightings**'
- Determine project '**Risk Rating**'
- Calculate '**Risk Score**'
- Use '**Risk Premium Scale**' to generate '**Risk Premium**'
- Add **WACC** to **Risk Premium** to generate **Hurdle Rate**

Commercial Risk Factor	Risk Weight	Project A – Low Risk		Project B – High Risk	
		Risk Rating (1-10)	Risk Score	Risk Rating (1-10)	Risk Score
Legislation	9	3	27	9	81
Geology	8	6	48	8	64
Price / Demand	7	5	35	7	49
Technical	6	6	36	9	54
Mob / Access	5	6	30	8	40
Infrastructure	4	6	24	9	36
Const / Ops	4	5	20	8	32
ESG	4	7	28	6	24
Financial	3	5	15	8	24
Project Risk Score	50		**263**		**404**

Summary of hypothetical examples of the RBUM framework for 2 projects

Hurdle Rates for 2 Hypothetical Projects

	WACC	Risk Premium	Proposed Hurdle Rate
Project A	7%	18%	25%
Project B	7%	36%	43%

Takeaways

- Meeting investor hurdle rate expectations could be key to funding future commercial SR development projects
- Difficult to address for a nascent industry
- Unlikely that investors in a SR development project would accept hurdle rates ≤ terrestrial resources hurdle rates
- But if too high, a project may never be deemed to be commercial
- Suggestion is to use a hurdle rate of around 25% p.a. for project evaluations based on comparable industries
- A Risk Build Up Methodology could be used to refine & iterate this hurdle rate