DETERMINING APPROPRIATE INVESTMENT HURDLE RATES FOR COMMERCIAL SPACE RESOURCE PROJECTS

B. McKeown[1], A.G. Dempster[2], S. Saydam[3], J. Coulton[4]
[1]UNSW, Sydney, NSW 2052, Australia. b.mckeown@unsw.edu.au, [2] UNSW, Sydney, NSW 2052, Australia. a.dempster@unsw.edu.au, [3] UNSW, Sydney, NSW 2052, Australia. s.saydam@unsw.edu.au, [4] UNSW, Sydney, NSW 2052, Australia. j.coulton@unsw.edu.au.

Raising finance for commercial space resource development projects could be challenging. Meeting the requirements of investors will be key in overcoming this challenge. The use of a 'hurdle rate', or minimum acceptable rate of return is an integral element in the evaluation of investment projects. It represents the financial hurdle a project must exceed for a particular investor to consider investing. Such hurdle rates facilitate decision making by investors, helping to decide how to allocate investment capital between investment opportunities. Determining an appropriate hurdle rate for a project, or class of projects, is therefore pivotal in communicating with and attracting potential investors. There are various methodologies to evaluate capital investment decisions. The most common methodology, particularly for long life projects such as resource or infrastructure projects, is the Discounted Cashflow Methodology (DCF) which facilitates the generation of investment metrics such as the Internal Rate of Return (IRR) for a project. The IRR generated from the economic evaluation of a particular project can be compared to a hurdle rate previously determined by the team (or company) responsible for an investment decision. Hurdle rates are often subjective, factoring in perceptions around risk, the cost of capital and access to financing etc. One challenge with establishing an appropriate hurdle rate for projects is that they are often considered confidential. Another challenge is that the theoretical determination of a hurdle rate may not be reflected in industry practice, although in many industries there are rules of thumb that can help in determining appropriate hurdle rates. Absent an established space resource industry however, there are no rules of thumb or benchmarks for a nascent space resources industry to use. Indeed, there has been little consistency in the methodologies and investment parameters used in the economic evaluations of space resource project proposals published to date.

In order to establish appropriate hurdle rates for commercial space resource development projects, we consider hurdle rates (or proxies to hurdle rates) in terrestrial industries comparable to a possible space resources industry – specifically the mining, oil & gas and aerospace industries. We also look at practice in the Private Equity / Venture Capital (together 'VC') sector. In the first part of the study, we review expected IRRs from feasibility study results reported for mining projects operated by junior mining companies that had secured development financing or had been sold at valuation reflecting a viable project development. The study also looks at expected project IRRs for mining projects operated by major mining companies. These results are triangulated with practice in the US upstream oil & gas and the aerospace industries. Finally, practice in VC is considered. Figure 1 shows the expected IRRs reported from 54 projects operated by both junior and major miners and Figure 2 shows the range of expected IRRs by industry. Observations from Figure 1 include: (i) almost 100% of all mining projects reviewed have an expected IRR above 15%, with almost 80% of all projects having an expected IRR above 20%. Observations from Figure 2 include: (i) expected IRRs for projects in the extractive resource industries cluster between 15% - 30%; and (ii) commercial space focused projects (satellites) appear to have IRRs more representative of infrastructure projects. One possible reason for the higher expected IRR range in the extractive resources industries is the level of commercial risk that could be perceived around geological and price uncertainty in resources projects, two factors that could be relevant to space resources. The lower IRR range indicated for satellite projects appears counterintuitive, given the risks involved in space activity. However, these IRRs may apply principally to communication satellites, a more mature technology with substantial flight heritage. Additionally, it is common to insure the riskiest elements of commercial satellite operations, that of launch and deployment. These factors could combine to reduce perceived risk and therefore hurdle rates required for such projects. While expected IRR is not directly equivalent to the minimum project hurdle rate, Figures 1 & 2 suggest that the 15% could represent the lower bound of hurdle rates used in the mining industry, and that more typical hurdle rates could be in the range of 15–20%+. This ties in with anecdotal evidence.

The study also reviews average Cashflow Return On Investment (CFROI)[1] for operating companies in each of the mining, oil & gas and aerospace industries. This is compared to average Weighted Average Cost

[1] CFROI measures the return generated by a company's cashflows relative to capital invested. It can be used as a proxy for the IRR of the projects of a company.

of Capital (WACC) in each industry to gain insight into the indicative premium over the WACC each industry may be generating (Table 1). The CFROI provides a 'sense check' for hurdle rate estimations on the basis that high hurdle rates lead to a high corporate return on capital over longer time periods. Observations from Table 1 include (i) the CFROI premium over WACC has been consistently high, suggesting all these industries use a hurdle rate significantly higher than the theoretical minimum hurdle rate (the company's WACC); and (ii) the CFROI premium over WACC is significantly higher for the extractive industries than for aerospace. Both these points are consistent with the observations in the first part of the study.

A review of the VC sector indicates that investments tend to be evaluated on their potential to exceed a target IRR. VC firms typically market net fund IRRs to their investors. These marketed net fund IRRs range from 15% to 30%+, with a median net fund IRR of 20-25%. However, research by KPMG indicates that there is a difference between fund net IRR and fund gross IRR that averages 9% [1], implying that target gross IRRs for VC funds could be in the region of 30%+[2]. As gross fund IRRs reflect the returns of a portfolio of individual investments, the target IRR for an average VC fund investment could therefore be close to or exceed this gross fund IRR. Indeed this appears to be reflected in practice [2].

We conclude that a hurdle rate in the range of 25% could be appropriate for commercial space resource development projects. This is on the basis that commercial space resource development projects could incorporate aspects of commercial risk similar to the terrestrial extractive industries, specifically geological and price risk, that there could be an addition component of risk related to operating in space and that, at least in the early stages of the development of a space resources industry, there could be a VC aspect to investment in such projects.

Table 1: Summary of CFROI, WACC and Premium of CFROI over WACC for 3 Industries

Industry	5yr av CFROI	5yr av industry WACC	Indicative 5yr av premium CFROI over WACC
Metals & Mining	20.33%[1]	6.93%	13.4%
Oil & Gas	18.67%	7.05%	11.62%
Aerospace / Defence	15.01%	6.78%	8.23%

[1] *This does not include the Junior Miners, as positive cashflow is required to generate a meaningful CFROI.*

This presentation draws on findings in our research article titled "What is an appropriate investment hurdle rate for commercial space resource development projects?" [3].

References: [1]. Courtois, Y., D. McPhee, and J.F. Rerolle. *Evaluating Private Equity's Performance*. KPMG 2016; [2]. Damodaran, A., *Valuing young, start-up and growth companies: estimation issues and valuation challenges.* Available at SSRN 1418687, 2009. [3]. McKeown, B., J. Coulton, S. Saydam and A.G. Dempster, *What is an appropriate investment hurdle rate for commercial space resource development projects?* Space Policy (under review).

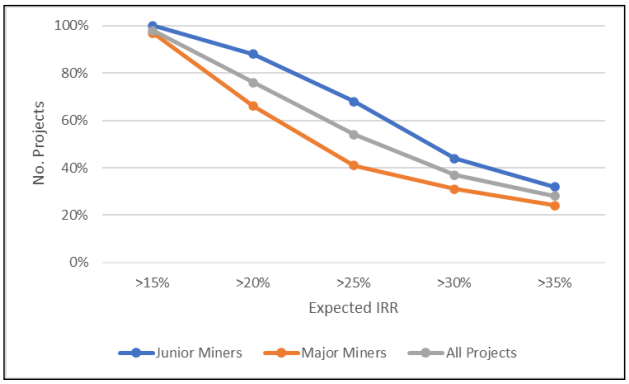

Figure 1: Percentage of Mining Projects by Expected IRR

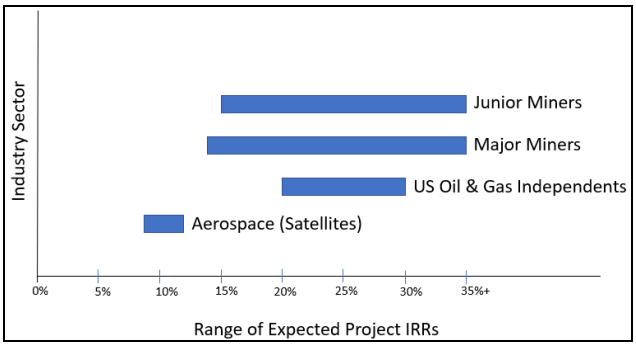

Figure 2: Range of Expected Project IRR by Industry

[2] Fund expenses account for the difference between gross fund IRRs and net fund IRRs.