

DSM financial cost and modelling

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Why get involved in DSM

Apart from geopolitical drivers, Deep Seabed Mining is driven by two aspects:

- * Supply and Demand
- * Profitability

The “simple” outlook of the investor

- How much
- What Risk
- What’s my return
- When can I get out

Financing evaluation tools

Tool	Definition	Application	Comment
WACC [Weighted Average Cost of Capital]	Weighted average of companies cost of financing mix (Equity, debt)	Gives the company a measure for cost of capital. Used to compare with return on a given investment	Cost of financing is typically reduced by having a higher ratio of debt (equity is expensive)
IRR [Internal Rate of Return]	Rate of interest used to discount future cash flow to an NPV of zero.	Gives a measure for comparing different investment projects – highest IRR wins...	IRR is best-suited for analysing venture capital and private equity investments, which typically entail multiple cash investments over the life of the business, and a single cash outflow at the end via IPO or sale.
NPV [Net Present Value]	Calculation that compares the amount invested today to the present value of the future cash receipts from the investment.	An amount invested is compared to the future cash amounts that the investment generates – after they are discounted by a specified rate of return.	The chosen rate of return used to discount the value back to year zero is both an expression of required return as well as an expression of perceived risk

WACC

Weighted average cost of capital (WACC) is the average rate of return a company expects to compensate all its different investors. The weights are the fraction of each financing source in the company's target capital structure.

$$WACC = ((E/V) * Re) + [((D/V) * Rd)*(1-T)]$$

E = Market value of the company's equity

D = Market value of the company's debt

V = Total Market Value of the company (E + D)

Re = Cost of Equity

Rd = Cost of Debt

T= Tax Rate

A company is typically financed using a combination of debt (bonds) and equity (stocks). Because a company may receive more funding from one source than another, a weighted average is calculated to establish the cost of financing future projects.

Startup company GSR (?) needs to raise \$40 million in capital so it can buy equipment. The company issues and sells 1,000,000 shares of stock at \$30 each to raise the first \$30 Million. GSR shareholders expect a return of 10% on their investment.

GSR then sells 10,000 bonds for \$1,000 each to raise the remaining \$ 10 Million in capital. The people who bought those bonds expect a 5% return.

GSR's total market value is now (\$30 Million equity + \$10 Million debt) = \$40 Million and its corporate tax rate is 25%. GSR's weighted average cost of capital (WACC).

$$WACC = ((\$30,000,000/\$40,000,000) \times .1) + [((\$10,000,000/\$40,000,000) \times .05) * (1-0.25)] = 7.0\%$$

This means for every \$1 GSR raises it must pay its investors almost \$0.07 in return.

It's important for a company to know its weighted average cost of capital as a way to gauge the expense of funding future projects. The lower a company's WACC, the cheaper it is for a company to fund new projects.

A company looking to lower its WACC may decide to increase its use of cheaper financing sources. For instance, GSR may issue more bonds instead of stock because it can get the financing more cheaply. Because this would increase the proportion of debt to equity, and because the debt is cheaper than the equity, the company's weighted average cost of capital would decrease

Financing in different DSM phases

Phase	Investor	Capital	Evaluation Tool	Time Line	Return
Pre-feasibility [proof of resource]	Angel Private Equity Private Investor (Venture)	Equity Convertible loan	Multiple	2-5 years	20-40X
Feasibility [proof of concept]	Private Equity Private Investor Company	Equity Convertible loan	Multiple	5-10 years	10-20X
Construction [cash flow]	Bank Company Corporation Public	Debt Share Cap Leasing Credit	Collateral (CG) IRR WACC ROI NPV	10-30 years	Interest Dividend EPS

DSM Financing cost & model variables

	Financing	Cost	Model Variables
Pre-Feasibility & Feasibility	Equity/Cash Corporate Guarantee Public Grants	Return Broker fees (cost of raising capital) Lost return (alternative use) n/a	Multiple (10-40X) Commission percentage Interest
Construction	Equity Debt Bonds Leasing Supplier Credit Customer Credit	Dividend Interest, repayment Broker fees, interest Fees and upfront cost Payment terms, interest Payment terms	Dividend percentage Secured/unsecured Fixed/variable interest Length of term Pricing Down payment, "balloon", .. Interest Discount

In conclusion

Financial modelling requires to take into account the complexity of:

- Financing cost of Pre-feasibility
- Financing cost of Feasibility
- Financing cost of Construction
- Combinations of all 3 phases into an overall

Appendix – forecasting methodology

Monte Carlo method

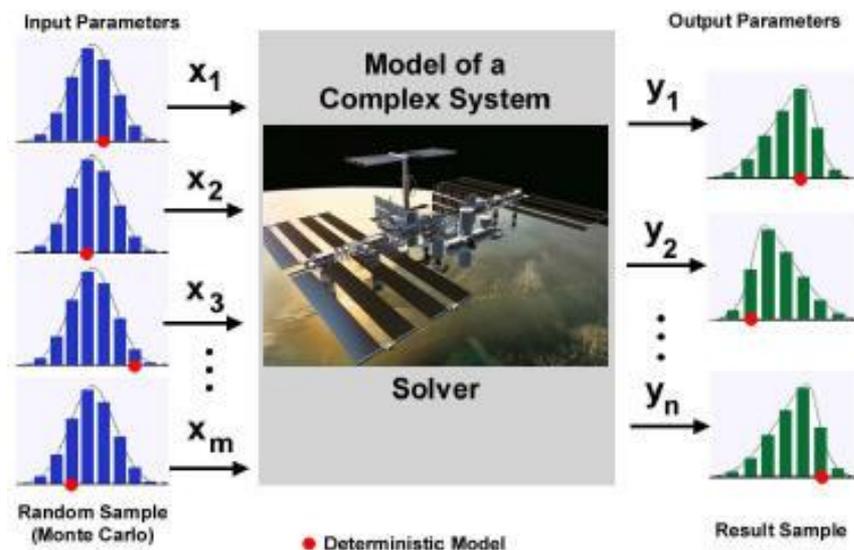
DSM Modelling: stochastic simulation to capture the complexity of Deep Seabed Mining

Some of the fundamental aspects to be modelled

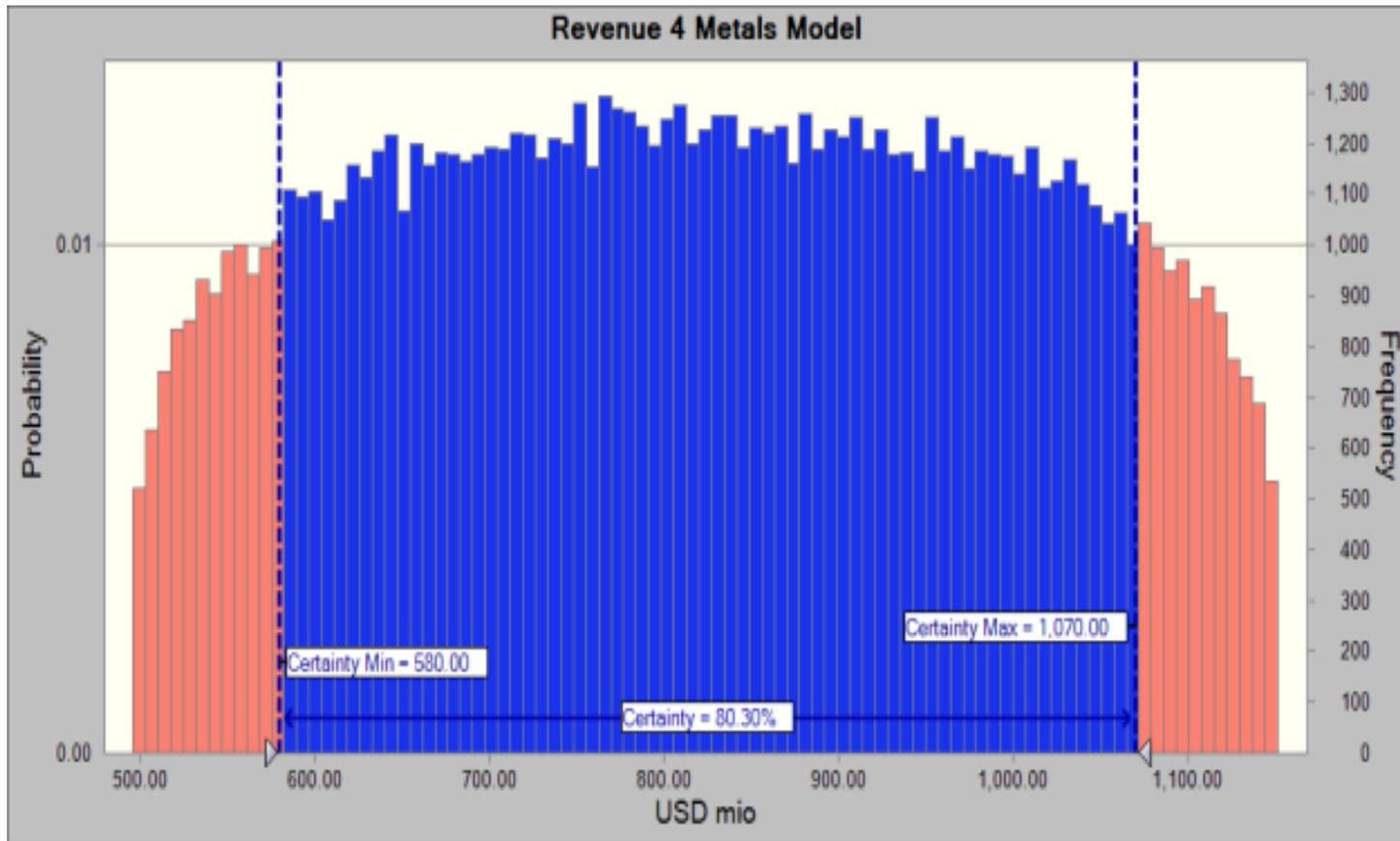
- Development of Commodity prices
- Variance in production
- Variance in nodules abundance and composition
- Different operative model for different contractors
- Different cost base for different contractors
- Different expectations of the profitability
- Different financing schemes
- Different jurisdictions
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A model which is only deterministic will fail to capture the complexity at the least, and most likely will not be representative of a venture engaged in nodule exploitation.

A stochastic model (e.g. with Monte Carlo method) is the modelling technique which is necessary to build a workable tool which can support sound and objective decision making



Illustrative model for Revenue for Monte Carlo Simulation



Nickel, Copper, Cobalt and Manganese modelled with uniform probabilistic distribution: Prices can range from a min to max with same probability. The correlation between the for metal is set at 0.8.

In this illustrative case, the Revenues range from USD 580 million to USD 1,070 millions with a certainty level of 80%.

A deterministic model of the revenue would have failed to capture the importance of the variability of the material price and lead to a suboptimal decision.