The Metals Markets
A Primer for Deep Sea Miners

Singapore, DSM WS3
April 2017
Overview

- The relevant metals
- Fundamentals
- How they trade & market participants
- Price action & forecasting
- Inputs in the development decision
The Relevant Metals

- Ni, Cu, Co & Mn
- Sources & Uses
- Substitutes
Fundamentals

- Cost Curves, Supply and Demand Shocks

Major cost components differ by mine and mineral

Est. BHP Cu Cost structure (2015)
• Revenue = 
  \((\text{Benchmark Price} \pm \text{Premium or Discount}) \times \text{Volume} + \text{Credits}\)

• Benchmark: Ni, Cu & Co typically price vs London Metal Exchange

• Adjustments include:
  • Quality → % of metal, impurities, wet or dry, TC/RC’s
  • Location → FOB or delivered – i.e., freight & insurance costs
  • Period → when is delivery to be made - spot or forward

• Credits are revenues from ‘by product’ minerals
• Market participants: Miners, Traders, Smelters, Speculators & Hedgers
• Trading is physical, OTC and listed
Medium term commodity prices tend to reflect medium term costs of supply plus a return on capital.

- Mean reversion with steps
- Operating cost efficiency and technological gains drive price path
Long cycle, capital intensive, cyclical commodity business
Price Fundamentals

• High prices cure high prices:

Source: Woodmac, Morgan Stanley Research
Price Fundamentals

• As lower quartile mines become more profitable, more efficient mines try to reduce costs

Source: Rio Tinto: Aluminium Seminar (2015), Morgan Stanley Research
· Investments drive cost deflation which in turn drives price deflation
Price Fundamentals

- Major cost components differ by mine and mineral

Est. BHP Cu Cost structure (2015)
Price Fundamentals

The 5 stages of exploration

1. Area selection – deciding where to explore
2. Target identification – determining whether a potential deposit exists
3. Target test – assessing the nature of the mineralization
4. Resource delineation – determining deposit size, grade and metallurgy
5. Resource evaluation – judging whether a deposit will be economical

Source: Rio Tinto – Exploration: Creating value through discovery (2013)
References

- Morgan Stanley Research: Mining 101, March 2017 & others
- Citibank, Citi Research: Deep Dive, Manganese, April 2016
- US Geological Survey, Mineral Commodities Summaries, Jan 2017
- London Metal Exchange: LME.com
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