

BROOK HUNT

Mining & metal industry consultants

The Impact of Production Cost Analysis on Metal Market Forecasting Techniques

Presentation to the Joint Study Groups' Forecasting Seminar

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Production Cost Analysis - Methods

- **Operating Costs and Margins**
 - Calculation of Brook Hunt C1 costs – direct cash costs
 - Minesite and realisation costs, less credit to offset by and co product production - with costs through to refined metal
 - M1 margin – price received less C1 costs
 - C2 operating costs include depreciation, M2 margin
 - C3 Total costs include indirect cash, M3 margin
- **Incentive Pricing (sometimes referred to as Trigger Pricing)**
 - Metal price required to achieve a given rate of return using DCF
 - Revenue, capital and operating costs modelled
 - BH models pre-tax, producer models take post-tax
 - Hurdle rates can be adjusted to compensate for risk and tax
 - Cumulative stack of potential production ranked by incentive price indicates potential supply that is viable at a given price expectation



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Metal Market Forecasters

Comments that follow are based upon conversations with analysts and bankers from around a dozen banks and with those responsible for the long-term price forecasts at a number of the larger copper producers.

The broad generalisations made hide a wide variation in responses

- **Governments**
- **Commodity & Equity Analysts**
- **Investment Bankers**
- **Producers**
- **Independent Consultants – e.g. Brook Hunt view**



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Governments and their agencies

- **Forecasts required for revenue estimation and infrastructure planning**
- **In selected countries, e.g. Chile, there can be significant economic dependence on a single or small group of commodities**
- **In these instances government agencies conduct in-depth market analysis to a level of breadth and depth not possible in the commercial sector**
- **In depth analysis is conducted at all levels of the market from consumption trends through to supply issues and production cost analysis forms a significant element of the analysis**

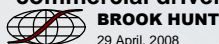


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Commodity and Equity Analysts

- **The commodity analysts tend to take a longer-term view than other forecasters – sometimes beyond 15 years**
- **All commodity analysts build up supply-demand models and most use either margin analysis based on predicted future operating costs when markets are in balance (aluminium, coal), or incentive pricing when markets are in structural deficit (copper, oil).**
- **One commodity analyst we spoke with places greater weight on long-run mean reversion arguments with e.g. real prices, or barrels of oil per G7 per capita income**
- **Many equity analysts do not forecast beyond five years and some favour use of the forward curve**

Tendency to have higher price forecasts than other groups owing to the commercial drivers of their businesses



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Investment Bankers

Tend to be price forecast takers.....

Feedback from Brook Hunt investment banking clients suggests merchant bankers can adopt these forecasts;

- In-house view
- Consensus forecasts
- A view from a single independent consultant (which may have been chosen to match the client view ?)
- The forward curve
- Uncritically adopting what the client wants

Construction of an independent price forecast and supporting evidence appears exceptional



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Producers

- Longer-term forecasts usually based on production cost analysis;
Margin analysis on predicted operating costs
Incentive price analysis
both of which tend to be based on the analysis of independent consultants modified to the companies macro economic forecasts
- Some of the larger producers incorporate exchange rate adjustments,
More-so than other forecasting groups

Sanity checks against consensus forecasts
- Very significant variation between companies as to weighting of incentive price analysis in particular – and peer group of projects used
- Some companies having rigidly defined forecasting protocols and others are intentionally flexible



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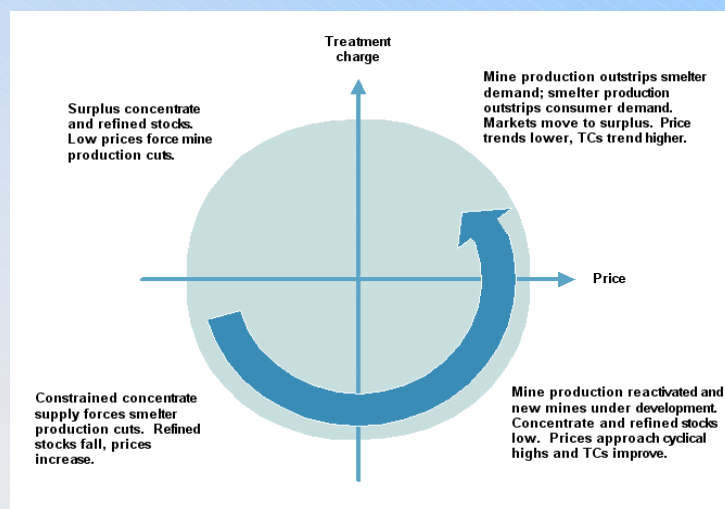
Independent Consultants e.g. The Brook Hunt Approach – Longer Term Forecasts

- Supply/Demand driven approach to quantify requirement for additional capacity
- Objective analysis of individual projects to quantify financial returns
- Analysis of company strategy to select group of projects with greatest potential for development – more subjective
- Analysis of future operating costs (including selected projects) to provide guidance on cycle low prices, and for mid-cycle price forecasts (in balanced markets)
- Analysis of the incentive price to bring in sufficient capacity to meet future demand growth to provide principal indication of cycle average prices over the e.g. 5-15 year forecast period (in structural deficit markets)
- Detailed analysis of supply-demand, stock movements both at metal and intermediate product (e.g. concentrate) levels, potential supply disruptions and fund activity to derive shorter term outlook (e.g. next four years)



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The Brook Hunt Approach – Shorter Term Forecasts The Price Cycle



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Operating Cost Analysis Issues

- Will future relationships replicate those of recent years?
- Requirement for adequate industry coverage
- Increasingly limited company disclosure owing partly to mergers
- Requirement for sufficiently granular models to allow incorporation of forecast future changes in input costs (labour, energy etc) and revenues (prices and realisation terms)
- Forward looking curves critically dependant upon
 - Exchange rate assumptions
 - Country inflation and cost escalation assumptions
 - Choice of projects to include



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Incentive Price Issues

- Macro economic assumptions as per operating cost issues
- Assumed hurdle rate sought and allowance to be made for country risk
- Pre-tax or post-tax
- Tendency to exaggerate long-term price requirements with approach “hostage to fortune – changing events”
- Love or hate in producer price forecasting protocols – some very heavy weighting to this approach – other companies protocols specifically state this method not to be used
- The further out in time one looks, the higher the prices inferred – choice of optimum timescale



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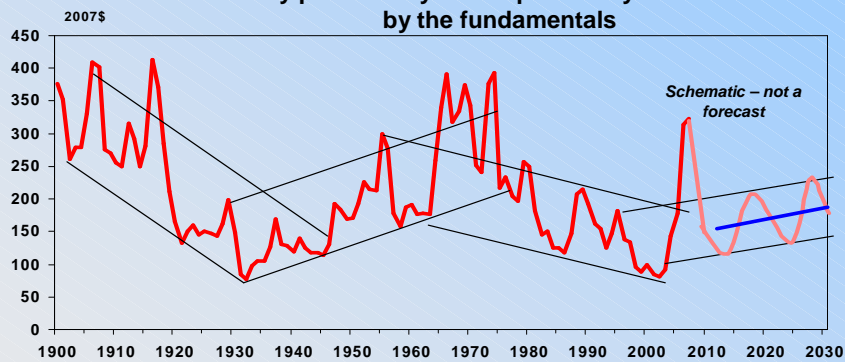
Wild Cards

- **Demand**
Economic Shocks – Credit Crunch – Availability and cost of finance
- **Supply**
Production Disruptions
Merger activity could slow project development
- **Operating Costs**
Oil and energy pricing in particular
- **Capital Costs**
Potential Chinese entry into EPCM could lower costs longer term ?
- **Incentive Price**
Follow through from Capital & Operating Costs, change in WACC
- **Political Instability**
Significant potential for project deferment

Conclusions

Production Cost Influences on e.g. Future Copper Price

**Basic premise – global economy and prices remain cyclical
Market activity periodically drives prices beyond levels warranted
by the fundamentals**



Industries in structural deficit - Incentive Price indicates future mid-cycle expectations

Industries in market balance – operating costs better indicator

Thank You

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