Ferrochrome Market Overview 2017

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Key Themes

- Which factors define the chrome market?
  1. Chinese demand and the stainless steel cycle
     - Chinese credit creation
     - Inventory levels
     - Trade
     - Real demand
  2. Chinese Production costs
  3. South African Cr ore supply and price

- Explaining recent events
- Outlook global demand and supply
- Conclusions
Recent History

- 2017 looks like a high-side outlier in terms of pricing
- Too much ore stock in China, but otherwise current market fundamentals fairly neutral
- Market defined by Chinese FeCr production costs over the long term. Chinese production costs dependent on chrome ore price
- Risks to ore supply likely to grow—but barrier to entry into chrome mining fairly low
Understanding China: Real demand, apparent demand and production

Manufacturing FAI
Real Estate FAI
Infrastructure FAI
Stainless Steel production, y-y % growth (RHS)

Data: CRU, NBS
Chinese apparent stainless steel demand and the credit cycle

Allowing for some lag, there is correlation between credit creation growth and apparent consumption of stainless steel in China.
Understanding China: real vs. apparent demand

China’s stainless steel inventory cycle—not yet carrying excessively high stock

Stainless steel stocks, crude steel basis, week's supply in hand

Source: CRU
Understanding China: stainless steel production and the stocking cycle

Q-Q volatility in Chinese stainless steel production well reflected in the changing stock levels

Source: CRU
Chinese stainless steel production less dependent on exports...and that’s before Indonesia starts up

LHS axis: y-y change in global stainless steel production, tonnes, split by export/domestic market; RHS axis: % y-y change

Source: CRU
Explaining recent events in the chrome market

- Market fundamentals played an important role in the price volatility of late-2016 and mid-2017.
- Latest price rally harder to justify in terms of market fundamentals.
- A deeper look at recent price volatility suggests circumstances of 2016/17 were exceptional.

Source: CRU
Explaining recent events: Chrome ore stocks

- Late 2016/early 2017 prices defined by critically-low ore stocks in China and surge in demand (liquidity-driven)
- Pull back in prices in Q2 2017 coincided with collapse in demand, credit creation slowdown

![Graph showing weeks consumption in hand and Chinese monthly Cr Ore imports](image)

Source: CRU
Explaining recent events: Stainless steel stocks

- China’s stainless steel inventories also had a role to play—they grew rapidly in Q4 2016/Q1 2017; then fell in Q2 2017
- CRU doesn’t believe that stocks are currently close to problematic levels—even with large SS output in Q3, stainless steel stock only slightly higher than the long-term average

Stainless steel stocks, crude steel basis, week's supply in hand

Source: CRU
Explaining recent events: China’s credit cycle

- Recent price rally influenced by sentiment—credit creation eased in July 2017
- Positive sentiment on raw material prices, supplemented favourable inventory position

Source: CRU

y/y % change, wide indicator of credit creation in China (TSF=Total Social Finance)

Data: CRU, NBS

y/y % change
- Stock of TSF + Local govt bonds (LHS)
- Qtrly Crude SS Apparent Consumption (RHS)

Source: CRU
Explaining recent events: BM price moves

EU charge chrome benchmark has stuck to established trend

- EU BM (gross)
- China HC FeCr domestic spot, ex-VAT

Source: CRU
Outlook on FeCr demand: China

- Credit tightening, FAI slowdown contribute to slowing stainless steel demand growth
- Output growth to move in range between 3-5% y-y, 2018-21
Outlook on FeCr demand: China’s trade

LHS axis: y-y change in global stainless steel production, tonnes, split by export/domestic market; RHS axis: % y-y change

Source: CRU
Outlook on FeCr demand: Eurozone

- Steady growth forecast: investment growth to trend up in short-term, IP down
- Stainless steel output growth projected to be flat 2018-21—import competition to intensify

Source: CRU
Outlook on FeCr demand: USA

- IP, investment growth forecast to increase in 2018; decline thereafter
- Stainless steel production growth range forecast at 1-1.7% y-y 2018-21—running up against effective capacity limitations
Outlook on Global HC FeCr demand

- The combination of Chinese, Indonesian and Indian demand will define HC FeCr market in coming years
- HC FeCr demand growth forecast to be relatively flat over forecast period

Source: CRU
Outlook on Global FeCr supply

- Our forecasts expects supply growth from South Africa, Indonesia and India
- Chinese supply will swing into the market in response to pricing signals
Global HC FeCr supply/demand balance

- Global HC FeCr will tend towards oversupply over the forecast period.
- However, deficits will be required in order to prevent excessive stock accumulation.
- Chinese supply will swing in and out of the market depending on pricing signals.

Source: CRU
Production costs

- Rising power costs in South Africa (ZAR-terms) will push up production costs; effect will be offset by depreciating currency

- But South African marginal production costs will not be as important for global prices as Chinese production costs

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- **ZA power price increase in US$ terms (15% LC y-y increase post-2017)**
- **ZAR nominal ex-rate vs US$ (RHS)**

![Graph showing ZA power price increase and ZAR nominal ex-rate vs US$](image)

- **ZA FeCr producers, delivered costs, US c/lb (ex-VAT), 2021 projection**

Data: CRU

Source: CRU
Chinese production costs and ore

- Chinese supply will balance the HC FeCr market in the long term; cost of production is vital—and is largely defined by price of South African chrome ore.

![Graph showing Chinese production and South African production from 2011 to 2021.](source: CRU)
China’s dependence on ZA ore supply

- South African ore production projected to need to rise by about 2.5mtpy by 2021
- Outlook for PGM prices is not particularly positive—yet more UG2 concentrate is needed, or else expansion will have to be entirely conventional ore
- Costs will rise, but barriers to entry are low
China’s dependence on ZA ore supply

- ZA chrome ore exports responded quickly to the acute shortage of material in late 2016
- RoW supply also shows signs of being reasonably elastic
China’s dependence on ZA ore supply

- South African ore production projected to need to rise by about 2.5mtpy by 2021
- CRU’s outlook for PGM prices is bearish; risks to supply are acute

![Graph showing m tonnes UG2 concs capacity from 2015 to 2021 with a forecast for 2021 and an increase of 1.2m tpy.]

![Graph showing m tonnes UG2 ore milled from 2016 to 2021 with a forecast for 2021 and an increase of 7.5m tpy.]

Source: CRU
Conclusions:

- Short-term outlook dominated by chrome ore stocks in China.
- Chinese stainless steel stock levels not overly worrying at the moment—but there is the twin threat posed by bullish nickel market and Indonesian imports.
- Long-term trend towards lower global stainless steel production growth, but it retains late-cycle commodity characteristics.
- Chinese stainless steel cycle will determine when domestic Chinese HC FeCr production is required to swing into the market.
- HC FeCr production cost in China will be key—and that will be determined by ore availability and price.
- South African chrome ore is the key variable in the Chinese production cost calculation.