ICSG Environmental & Economic Committee Meeting
Global Copper Market Trends 2011-2012
Outlook for supply, demand and prices

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Summary

Reasons for cautious optimism

SECTION ONE: Macroeconomic and FX outlook
✓ Global economic recovery is gathering momentum but headwinds have emerged.
✓ No double-dip recession in the US or Europe is expected.
✓ The USD is expected to remain weak.
✓ Accommodative monetary and fiscal policies fueling ample liquidity, which is finding its way into commodity markets as risk appetite increases.

SECTION TWO: Copper market outlook
✓ Shifting tectonic plates: developing world growth the key driver of demand in the long run.
✓ Its all about China, China, China.
✓ Supply constraints at existing mines/smelters and delays to new projects.
✓ The credit crisis has significantly impacted supply growth.
✓ The concentrate market remains tight as reflected in low TC/RCs.
✓ Scrap supply is still relatively tight.
✓ Ore grades are materially diminishing, ageing mines; new mines at increasing depth.
✓ The mining industry is increasingly having to look to more risky regions to source production growth.
✓ Increased resource nationalism evidenced by local ownership laws, windfall taxes, royalties and super taxes.
✓ Relatively high marginal cost production needed to meet fast growing demand.
✓ With markets tightening, the potential for short-term disruptions is increasing (earthquakes, adverse weather, labour disputes, health and safety).
✓ Improving supply/demand to underpin stronger prices.
✓ Demand returning as manufacturers begin to restock.
✓ Smooth transition from restocking.
✓ Global inventories are low; only a modest rebuild during recession.
✓ Preference for those metals such as copper that are constrained in their ability to increase supply.
✓ The market is pricing in expectations of continued supply challenges and further tight market conditions in coming years.
Metals Markets – The current state of play

A number of headwinds are building:

- Crude oil prices are likely to remain elevated for longer following outbreak of civil war in Libya and airstrikes by Western powers to enforce a no-fly zone.
- Higher crude oil prices stemming from geopolitical tensions in the Middle East and North Africa threaten to derail the global economic recovery and, in turn, denting metals demand.
- Tightening monetary policy in China and the Eurozone and speculation on the US.
- Devastating earthquake/tsunami in Japan.

Japanese earthquake/tsunami: Most base metals are likely to gain longer-term from reconstruction after the earthquake/tsunami in Japan. Lead should be the first of the complex to get a demand-side boost from the crisis in Japan. Damage to infrastructure and a shortfall of power are seen as positives for lead, with back-up and standby generators for infrastructure, utilities and businesses boosting demand for the metal. Arguably, tin dominated by soldering and tinplate, is unlikely to benefit from any eventual reconstruction demand-side boost as the other metals.

China is much more significant than Japan for metals demand: Japan accounts for about 5% of global copper consumption and the same for aluminium. China accounts for around 40% of global consumption for each metal and is therefore much more significant as a driver of metals prices. Tightening monetary policy is reflecting a very strong economy and with real interest rates still negative remains accommodative.

Base metals gearing up for peak seasonal demand in Q2: The fundamental backdrop to the base metals complex remains broadly supportive ahead of peak seasonal demand associated with Q2. A floor to prices has emerged coincident with long-term support evident on the charts and bolstered by consumer buying on dips and renewed positioning on the long side of the market by the speculative/investor community. Risk appetite though remains hobbled by geopolitical tensions while doubts persist that the hitherto insatiable appetite of China for metals has been sated for the time being. The copper market remains finely balanced entering Q2 with a growing deficit projected over coming months. The latest statistical data showed that the global copper market moved into a deficit of 305kt in 2010 from a surplus of 175kt in 2009. Rio Tinto expects global copper consumption over the next 20-30 years to exceed the total historical consumption to date.
### Crédit Agricole CIB's macroeconomic forecasts

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**USD Exchange rates**

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<th>Dec-11</th>
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**Non-industrialised countries**

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Will the Fed expand its balance sheet further?

Risk aversion barometer rising

More QE in the US is now assumed in our base case scenario as deflation haunts the Fed.

The Fed is very sensitive to further declines in inflation. Even if economic growth continues to gradually improve (in line with our sluggish GDP growth projections), monetary policy could still be eased on deflation concerns.

We believe that the preferred accommodative measure would be to expand the Fed's balance sheet (quantitative easing) with the magnitude calibrated to the incoming data. But the policy could be coupled with others, such as trimming the rate of interest paid on excess reserves.

An effective policy mix of fiscal and monetary measures looks politically difficult.

The impact on macroeconomic growth is likely to be positive but small. Additional QE would be dollar negative and gold positive. Be prepared for an only limited impact along the interest rate curve.

Easy money policy/ample liquidity is likely to be supportive for the commodities sector as a whole. This would be especially the case for gold. Gold prices would likely move higher in this scenario as some investors would fear competitive debasement of fiat currencies and we have adjusted our outlook accordingly.

The metals sector would also benefit.

When compared to the drama of the financial market crisis, the recent push up in risk aversion may seem rather small, but our measure has risen 10% in the past month, driven by the tensions in North Africa and the Middle East, and more recently by the earthquakes in Japan and New Zealand. There is still plenty of scope for bouts of sharply higher risk aversion over 2011 thanks to these uncertainties, especially given the lack of resolution to problems in the Eurozone periphery.

Macroeconomic Summary

In the current uncertain environment, investors are looking for tags with which to mark market trends in the near future. Economic policy initiatives are less and less able to fill this role. At the time of the 'great moderation', policy rules were valuable signals about how officials’ actions would react to different circumstances in a predictable way. In this period of new normality, the details of which have not yet been precisely set out, discretion is increasingly replacing rules as the watchword for public actions. In reaction to certain events, policymakers have been forced to embark on further stimulus initiatives. This has been the case recently for central banks on both sides of the Atlantic.

The global recovery is continuing, but at considerably different paces in industrialised and emerging countries. The GDP growth differential between the two groups of countries is in the order of one to three, from 2% to 6%. From this simple observation emerge four concerns that form the backdrop to the doubts in the markets today:

1. The acceptance or otherwise of the current pace of US growth;
2. Diverging economic performances in Europe;
3. The ability of emerging countries to reconcile strong growth, macroeconomic stability and a home for Western capital inflows in search of attractive yields;
4. The difficulty, which at first sight seems paradoxical in an environment like this, of rebalancing the global economy, and above all reducing external deficits here and surpluses there at the same time.
Economic surprise indices in positive territory

We are in the relatively rare position of seeing all Economic Surprise Indices in positive territory, suggesting that either the market had become unduly pessimistic or the global economy is doing rather well. The US acceleration in positive surprises is encouraging, especially as it includes the high-profile disappointments on non-farm payrolls and the unemployment rate. The ISMIs, retail sales, consumer confidence and industrial production are among those doing better than expected, helping to provide the USD with a lift as the market pares back chatter of QE3.

US data generally better than expected despite soft labour market

Interest rate increases will be slow to arrive in the US

- The Fed is unlikely to trip up the recovery with premature rate increases.
- The decision by the Fed to maintain the size of its balance sheet highlights the Fed’s growing worries about the economic outlook.
- Faced with plenty of excess capacity, slow jobs growth and benign inflation the Fed will maintain easy policy for a prolonged period.
- We now do see the Fed embarking on further QE over coming weeks and hiking rates only in Q1 2012.
A re-run of the last bull market?

Copper and the USD Index

Current macroeconomic environment is neutral

Equities rallying...  ...Declining risk aversion...  ...Elevated 10Y CDS prices

Commodities rallying...  ...As global trade growing...  ...And weaker USD

Source: Reuters, LME, Crédit Agricole CIB
FX outlook

Short term (up to 1 month)
- Our 1M forecasts suggest being long commodity crosses, but very near-term prospects and momentum justifiably argue in the opposite direction until we have clarity on Japan.
- One example would be to sell AUD/JPY targeting 78.80 as the technical picture has changed sufficiently along the near-term fundamentals to justify chasing this move.
- Short-term EUR fortunes will be mixed depending on the opposite side of the trade, with upside opportunities against GBP but some vulnerability to a USD reprieve.

Medium term (beyond 1 month)
- We continue to paint a mixed picture for the USD, though the recent pull-back in commodity currencies will open up opportunities to get long afresh – just not yet.
- We retain our bearish stance on EUR, nervous still about the periphery and the impact monetary tightening might have on its fortunes. But downside risks have diminished.
- Our forecasts assume the current period of risk aversion will pass. This will likely translate into a marked reversal in CHF and JPY fortunes.

OECD industrial production and leading indicators are more positive

Sources: OECD, Crédit Agricole CIB
SECTION TWO

Copper market outlook

Copper prices close to record highs; where next?

Spot copper prices January 1980 – March 2011

Spot Copper ($/t)

10 year ave = $4,656/t

30 year ave = $2,899/t

Source: LME, Reuters, Crédit Agricole CIB
Tightening market balance supporting higher prices

Source: LME, Reuters, CRU, ICSG, Crédit Agricole CIB

-1,000 -600 -200 200 600 1,000

Market Balance (1000t) LME Cash Price (rhs)

Reuters January 2011 poll of 23 market analysts showed a range for the deficit of 90 – 825kt, average of 444kt

Supply and demand over the long-term

Source: CRU, ICSG, Brook Hunt, Crédit Agricole CIB
Stronger for longer remains valid because...

**Demand, demand, demand………………**

* Synchronized global economic growth to return
  - Strong growth in China allied with cyclical economic recovery in the OECD countries.
  - Undepins robust metals consumption growth.

* Demand surprises
  - Robust end-use demand.
  - Strong Chinese demand growth has raised global demand growth far above expectations.
  - The market deficits have become so large that demand “destruction” has been necessary to reduce actual consumption to below potential consumption.

* Investor/speculative buying
  - A viable asset class
  - Attractive returns
  - Portfolio diversification

Further Industrialization & Urbanization of Developing countries

- The BRIC countries and other developing world economies are likely to become a longer term global economic power that will lead to massive raw material and processed goods consumption.
- Developed world less important.

...And also

**But where is the supply response?**

**Lack of Capital Investment**
- Last major investment cycle was in the 1970's.
- Incentive pricing continues to rise.
- Deterioration in the quality and quantity of available resources – ore grades are falling.
- Exploration spending has picked-up but discoveries are few.
- Long lead-times to develop a mine.

**Supply response much slower than expected**
- Supply delays/disappointments, opex/capex cost increases, equipment and spare parts shortages (trucks, tyres), more militant labour, power and water shortages.
- Industry consolidation has led to better supply side discipline leading to preservation of higher prices for longer.
- Cash generation put to use in M&A rather than in the ground.
- It is not easy building or expanding new capacity.
- Analysts continue to over-forecast supply.

**Inventories under pressure**
- Strong demand growth and very muted supply response has resulted in a running down of inventories to historically low levels causing shortages (or risks of shortages).
- Most visible LME inventories have leveled off but generally lower than in previous down cycles.
Copper demand seeing strong rebound since financial crisis

Consumption by region/country

YoY % change in global consumption

Source: CRU, Crédit Agricole CIB

Consumption globally and in China

YoY % change in consumption by region/country

Source: CRU, Crédit Agricole CIB

LME stocks are trending up as cancelled warrants remain low

LME Cancelled Warrants

LME Stocks & Price

Source: LME, Reuters, Crédit Agricole CIB
Global exchange copper inventories are rising

Global reported copper inventories in tonnes and weeks of consumption

Global copper inventories low compared to past cycles

Global reported copper inventories in tonnes and weeks of consumption
Aluminium demand gaining at the expense of copper?

According to CRU:

- Within electrical applications, primarily winding wire, power cable and building wire, aluminium is gaining share. Importantly, the copper equivalent of an aluminium cable is around double the mass of an aluminium one, even after taking into account the additional size that is required for an equivalent aluminium conductor.

- Aluminium is also making inroads into the winding wire market.

- In the heat transfer market, copper faces increasingly stiff competition from aluminium. Gains for aluminium will mostly be in commercial air conditioner market. In general the weight savings should be around one-third, however, if air conditioner manufacturers move towards brazing – used in car radiators – then the weight saving could be as high as two-thirds.

- Tinplate is losing out to aluminium cans. Tinplate prices have been impacted by increases in the cost of raw materials such as iron ore and coking coal and this has also increased volatility.

Potential copper substitution

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<th>19Mt Refined Cu</th>
<th>Aluminium Replacement Examples</th>
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<td>Other</td>
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<td>• Building facades</td>
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<tr>
<td>Transportation</td>
<td>• Bussed electrical centre components</td>
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<tr>
<td>High Voltage</td>
<td>• Wire harnesses</td>
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<td>Low Voltage</td>
<td>• High Voltage Cables</td>
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<td>Electrical</td>
<td>• Utility buss bars</td>
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<td>wiring &amp; cable</td>
<td>• Low voltage installations in cities, Industrial or commercial buildings</td>
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<td></td>
<td>• Battery cables</td>
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Tinplate is losing out to aluminium cans. Tinplate prices have been impacted by increases in the cost of raw materials such as iron ore and coking coal and this has also increased volatility.

Source: CRU, Alcoa, Credit Agricole CIB

The forward curve has flattened

In the short-term

In the longer-term

Source: LME, Reuters, Credit Agricole CIB
The world is not running out of copper but...

Future supply growth will likely be constrained by dramatically reduced investment as a consequence of the credit crisis but also because traditional sources of mining capital are less readily available. As noted in previous downturns, capex budgets will lag demand while additional project delays are highly probable as feasibility studies are reworked.

Even before the current crisis, the metals industry faced a structural under-investment in mine capacity (Cu, Zn, Pb and Sn). New projects are located in challenging regions which are politically more unstable and/or lack infrastructure raising extraction costs.

Higher cost marginal production will be needed to meet rapidly growing demand requiring higher "incentive" prices.

**World class undeveloped copper projects**

Source: CRU, ICSG, Reuters, Brook Hunt, Crédit Agricole CIB

**Copper mines by discovery and production year**

**Copper production - a case study**

Planned Projects
- Many new mines or expansion plans cancelled altogether or significantly scaled back.
- Juniors struggling to get financing in this new credit environment.

Existing Operations
- Falling ore grades and other production challenges make achieving nameplate capacity difficult.
- Increased regulation, social and environmental pressures limiting growth at existing operations.

Source: Brook Hunt, Xstrata, Crédit Agricole CIB
Copper production - a case study (cont)

Reserves are adequate

Years of reserves

Mine utilisation rates falling

Mine-Capacity Utilisation %

Constrained by losses

Kt Cu

C1 Composite Cash Costs by mining method (2008, c/lb)*

* Cash costs are a weighted average based on paid copper production from Brook Hunt's Copper Costs: Mines and Projects 2009 Edition Study

Higher costs

 Stocks Ratio (Weeks)

Lost production

Stocks ratio (rhs)

Physical premia are falling

Regional premia mixed

Euro/Japan/China Premia (USD/t)

US Premium (USc/lb)

Divergence between prices and premia

LME Cash Price (c/lb)

Premium ($/t)
What does LME open interest tell us?

**LME futures open interest and prices**

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<td>Falling</td>
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**Speculative long on Comex sharply reduced**

**Net speculative long (futures only)**

Source: CFTC, Reuters, Crédit Agricole CIB

14 April 2011
Copper – Weak demand offset by supply constraints

Copper scrap remains tight

Concentrate TC/RCs low

Global copper consumption recovering but remains weak

Copper – What’s happening in China?

SHFE/LME arbitrage is currently closed

Imports remain strong

Apparent demand falling

Imports of copper scrap recovering?
Global refined copper supply/demand balance and prices

Supply/demand becoming more balanced and moving into deficit, with low global inventories supporting strengthening prices over forecast period.

Price Forecast (spot)

Source: CRU, ICSG, Reuters, Brook Hunt, Crédit Agricole CIB

* Long-term prices (or sustainable floor price) are derived using incentive prices and marginal production costs methodology.

Prices show strong floor is evident on the charts

Weekly chart

Source: Reuters, Credit Agricole CIB
Copper – The current state of play

Copper is being undermined by rising geopolitical risk – The unrest in the Middle East and North Africa has boosted crude oil prices which threaten to derail global economic recovery, which in turn, could depress copper demand.

LME copper stocks are rising – Inventories have risen almost 100kt to 450kt from a low of just below 350kt reached in early December 2010, reflecting weakening physical demand.

LME cancelled warrants are very low – Metal on cancelled warrants and awaiting shipment stands at a low 3.0% of total stocks compared to about 9% at the start of this year.

Nearby contango is evident – The growing accumulation of copper in LME warehouses has resulted in a nearby contango of around $15/t (LME cash vs. 3m) compared with a $70/t backwardation evident in mid-December 2010.

Physical premiums are weaker – Premiums for physical copper in Europe are lower: premiums for grade A copper in Rotterdam are currently quoted at $40-75/t, down from $60-75/t a week ago and from $95-105/t in mid-January. Spot premiums in China are reportedly as low as $0-50/t, compared to $30-60/t in January.

Consumers resisting high prices – A very high copper and a tight credit environment is leading to a working capital squeeze on fabricators and this is impacting on spot buying. This is further evidence of on-going price-driven demand destruction. Higher stocks in bonded warehouses in China due to copper used as a financing vehicle.

Treatment charges have doubled - Spot TC/RCs are currently $120/t and 12c/lb compared to $60/t and 6c/lb a month ago on increased availability of concentrates after the Japanese earthquake/tsunami.

The scrap market is well-supplied – Scrap generation continues to improve as industrial production is strengthening globally. Chinese importers had built up their scrap stocks in December ahead of the VAT rebate cancellation deadline on December 31, 2010. Imports of scrap reached 360kt in January, down from December’s 430kt.

Global copper output inches higher – Corporate reports show that 11 of the biggest publicly listed miners boosted output 2% in Q4 compared to the previous quarter, as a result of production restarts and expansion projects. According to the International Copper Study Group (ICSG), the global mine capacity utilization rate has risen steadily since August 2010 (at 80.8%) to stand at 84.5% in November.
Copper – Finely balanced and moving into deficit again

- In 2010 demand for refined metal was boosted by Chinese buying and stock building whilst scrap remained tight. Chinese fabricators (wired and cable manufacturers) substituted cathode in place of scrap copper. Global consumption rose by 7% in 2010 after falling 5% in 2009.
- Copper is deemed a strategic asset in China and a way to diversify from the USD and US treasuries.
- Refined production growth slower than expected due to ongoing constraints at existing mines/smelters and delays to new projects.
- The concentrates market is expected to remain tight.
- The scrap market is still relatively tight.
- A floor at USD5,500-9,000/t is evident and any dips towards this level will see consumer buying. Prices are expected to strengthen even further on the back of a sustainable recovery in global economic growth and demand, consistent with its role as a barometer of economic strength and a developing world infrastructure metal.
- Prices are expected to strengthen further in 2011-2012 as it becomes evident that economic recovery can be sustained. This will lead to more restocking outside of China and increasing real demand.
- IGSG data showed the global refined market was in a deficit of 305kt in Jan-Dec 2010 compared with a surplus of 175kt in the same period of 2009. The stocks ratio was 3.4 weeks at the end of December.
- Longer-term fundamentals supporting copper prices have not changed: Strong structural demand from newly industrialising economies, finite supply and rising extraction costs should continue to underpin the market.
- Future supply growth will likely be constrained by dramatically reduced investment as a consequence of the credit crisis but also because traditional sources of mining capital are less readily available. As noted in previous downturns, capex budgets will lag demand while additional project delays are highly probable as feasibility studies are reworked.

Disclaimer

The views expressed in this report are strictly those of the undersigned analyst. In addition, the undersigned analyst has not and will not receive any compensation for providing a specific recommendation or rating this report.

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Credit Agricole Corporate and Investment Bank

Copper

Global supply/demand balance

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<th>Year</th>
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<th>Demand</th>
<th>Balance</th>
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<tr>
<td>2009</td>
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Copper correlated to equities

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Source: Reuters, Credit Agricole CIB