

## Brady Bulletin - Issue 5, March 2006

### There is still no consensus in the copper market

#### Copper prices – raising the bar?

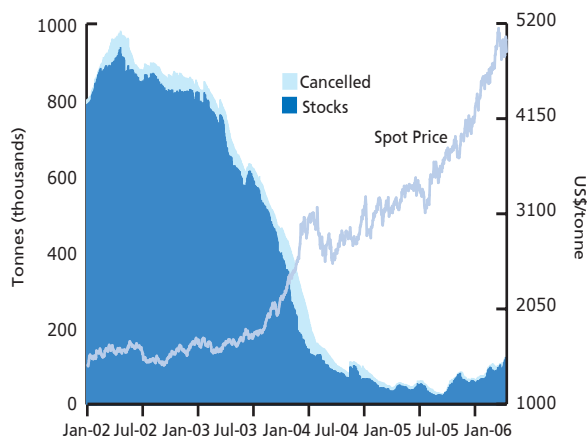
In issue 2 of the Brady Bulletin in April 2005, we cautioned that it was a time to steer clear of consensus forecasts given the inflated level of prices. At the time, the year-to-date average of \$3,256/tonne (\$1.48/lb) was above the mean average forecast in the Reuters Annual Survey of Analysts of \$2,7212/tonne (\$1.23/lb). Last year's outcome of \$3,684/tonne (\$1.67/lb) was 36% above the mean projection and 19% higher than the most bullish forecast of \$3,085/tonne (\$1.40/lb).

Analysts' projections of the market balance were more accurate as the reported stock decline of around 100,000 tonnes was broadly in line with consensus. In terms of prices, it was difficult to quantify the impact of investment funds, rumours concerning the short position held by the SRB in China, and the myriad of problems that affected copper supply.

#### More converts to the supercycle theory

Although it might be unrealistic to expect significant advances in copper prices from the levels of around \$5,000/tonne (\$2.26/lb) in early March 2006, many industry observers expect a continuation of high prices judged by historical standards, and not a return to the typical boom and bust conditions. What is different about this cycle is that economic activity in a number of key copper consuming regions such as the Euro-zone and Japan is accelerating. It is certainly rare at this stage of the commodity price cycle for nearly all the forward-looking business confidence surveys to be positive.

Copper Daily Stocks vs Price



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The Brady Bulletin examines general issues and themes facing the base and precious metals sector. To ensure you receive future issues of this report contact: [b.collins@bradyplc.com](mailto:b.collins@bradyplc.com). Previous issues are available on [www.bradyplc.com](http://www.bradyplc.com).

#### Activity in the Eurozone improves

The Euro-zone business and consumer survey has been trending higher since the summer of last year. This is backed up by the NTC-Reuters Purchasing Managers survey, which in Q1 reached its highest level since July 2004. Importantly, it is comfortably above the 50 level that signals the difference between economic expansion and contraction. Within the Euro-zone it appears that Germany will be the driving force in 2006. The two most closely watched indicators – the IFO business climate and the ZEW economic sentiment indices – have increased sharply over the last nine months, with the former at 14-year highs.

In Japan, the Tankan manufacturing index is published on a quarterly basis. The 2005 Q4 survey showed the third consecutive rise to +21. Similar to the Euro-zone recovery, it is still heavily dependent on exports. However capital expenditure in fiscal 2005/06 is set to rise sharply by 17.3%. In addition, there are tentative signs of a recovery in consumer confidence.

Given the out-performance of the US economy compared to its major rivals – the Euro-zone and Japan – the US surveys are not showing the same large year-on-year increases seen elsewhere. However, importantly, they all remain in positive territory suggesting continued economic expansion in the USA. The ISM index remains well above 50, while the Conference Board leading economic indicator set its highest level in over two years in early 2006.

These positive developments within the mature economies are taking place against a background of

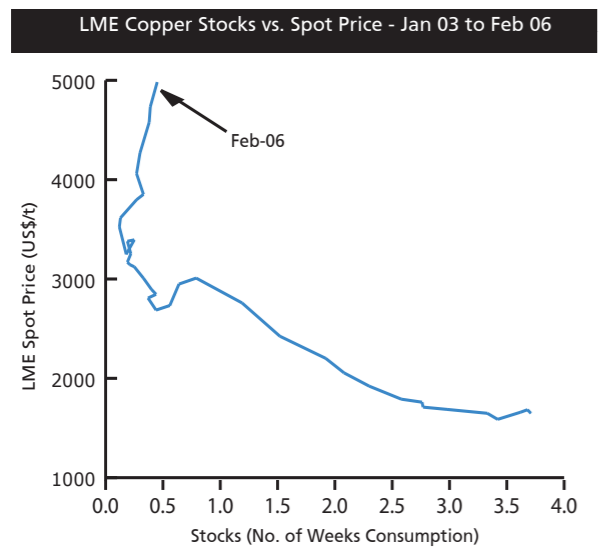
	2003	2004	2005	2006(1)
Average	1780	2868	3684	3788
High	2321	3287	4650	4769
Low	1545	2337	3072	3000

Source: LME and Reuters  
(1) Refers to Forecasts in Reuters Poll

strong metal-intensive growth in China, India and a number of other emerging economies (see article on page 4 for more details on consumption patterns in Brazil, Russia, India and China).

### Is weak demand a bullish or bearish factor?

One surprising aspect of copper's bull run in 2005 is that it came about despite lacklustre demand conditions in many markets, with the notable exception of China. Data from the International Copper Study Group (ICSG) suggest that global copper demand actually declined in 2005 despite the continued strong growth in China. Copper consumption is estimated to have fallen by just under 1% to 16.55m tonnes following growth of 6.7% in 2004 and 3.2% in 2003.



### Inventory adjustment affects copper demand...

The decline in copper consumption can in part be attributed to a reaction to the above trend growth in 2004, and there was destocking right along the production chain from cathode to copper semis. In the US and the EU, this translated to declines of 5.5% and 8.1% respectively last year, while demand in Japan was off 5.8%. The weakness in demand was not restricted to what are generally termed as the mature economies, as sharp declines also took place in South Korea and Taiwan. The developments more than offset the rapid growth in countries such as China and India.

### ...but the process has come to an end

If the process of inventory adjustment has come to an end, and as suggested above the economic environment is favourable, there is the potential for a sharp improvement in demand in 2006, which could provide some support to high copper prices. Demand for copper wire and cable finished 2005 on a strong note after a weak start to the year. Conditions in the US market were particularly robust towards the end of last year. Anecdotal evidence suggests that activity in this market remained strong in the first quarter. Conditions in the copper and copper alloy markets have been slower to improve; however with inventories at minimum levels, there are some signs of a Q1 improvement after a very weak 2005.

The optimism concerning demand prospects is shared by the producers. For example, Norddeutsche Affinerie has stated "demand for copper products has developed very positively. Enquiries from the semi-finished metals and cable industries noticeably increased in February. This is a result of low stocks and the improved order books held by manufacturing industries".

### Physical premiums are increasing

The improved environment is reflected in high physical premiums. In March, European premiums were over \$100/tonne compared to a recent low of \$40/tonne

in September last year. In Asia, demand looks set to remain robust in China, and the emergence of Japan from a long period of sluggish economic growth should lead to a typical early-cycle rebound in copper demand. Premiums in Asia have doubled to \$100/tonne. Despite the likelihood of much stronger demand conditions in 2006, this may not filter to higher prices. In some respects, 2006 may turn out to be a mirror image of 2005, when demand was weak but prices soared.

### Funds or fundamentals?

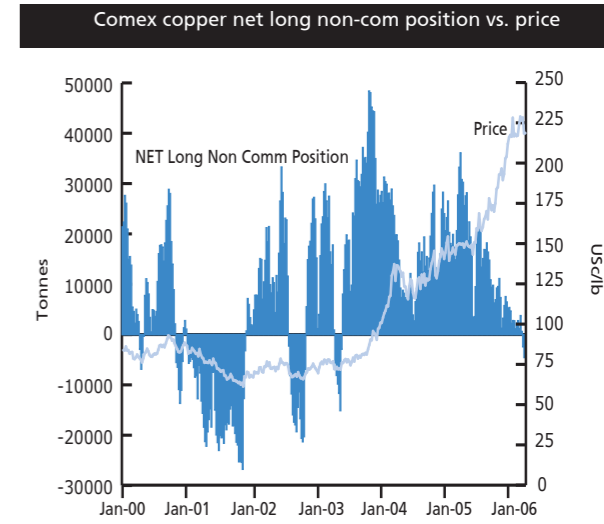
The question often posed is whether it is the investment funds or the fundamentals that are driving copper prices higher. It is, of course, somewhat a circular argument in that the funds would not be interested in the copper market if there was no underlying fundamental support.

Initially the general perception was that funds' interest in the market would be short-lived and as prices reached previous cycle highs, investment funds might move on to pastures new. However, it has become increasingly clear that investment funds cannot be treated as a homogeneous group. The term covers a myriad of companies with very different trading strategies.

### Commodity indices attract longer-term investors

One particular feature has been the huge surge of investment in commodity indices such as the GSCI and Dow Jones-AIG. It has been estimated that up to \$70bn has been attracted to these commodity indices. While oil accounts for the bulk of the investment, applying the weightings of industrial metals within these indices, base metals may have attracted over \$5bn. Providers of the indices need to hedge their risk, which has provided support to the base metal sector.

Pension funds are believed to have been attracted to these instruments that may provide a greater degree of "stickiness" to the investment. However, other pensions



funds have invested in commodities via hedge funds, which are much more active traders. The trading that took place in the base metal sector in February 2006 may be viewed as instructive concerning future price trends. The initial correction was initiated by momentum-based funds (primarily the Commodity Trading Advisers - CTAs); however other parts of the investment fund community saw the correction as a buying opportunity and prices recovered most of their losses.

### More buyers than sellers

One reason for the impact of funds has been the lack of natural sellers. The high prices have yet to lead to significant hedging by producers. Partly this reflects the desire of shareholders for companies not to cap the upside (although this pressure is not as strong as in the gold market). In addition, some companies that have hedged have missed on the last stage of the bull market, which has discouraged others from hedging.

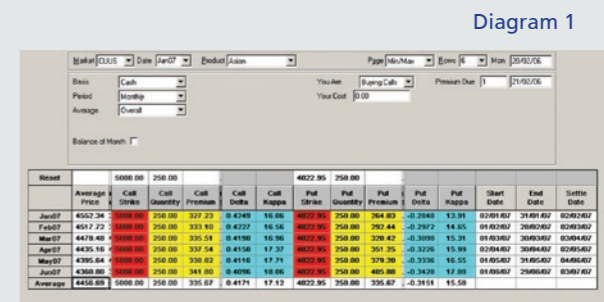
There have been a number of high profile casualties among companies/organisations that went short of the market. This combined with the continued low level of inventories has discouraged short selling. This may be about to change as in early March the non-commercial

### Hedging with Options.

#### The Producer Min/Max. - Buying Put option(s) whilst simultaneously selling Call option(s).

One way in which a producer or an asset holder can fully or partially hedge risk or exposure to falling metal prices is to enter into an option strategy known as a Min/Max, or Collar. There are several variations of this strategy, by using Brady plc Option Pricing and Risk Management Systems we can look at the behaviour of one such strategy known as the 'Zero Cost Producer Min/Max'.

This strategy gives the asset holder protection from downward price moves in the market without having to payout a large premium for doing so. In order to achieve this a single, or a series of Put Options are purchased, whilst at the same time an equal number of Call Options are sold for an equal premium, thus resulting in no cash flow being paid or received. The premium values for both these options can be calculated quickly and accurately using one of Brady's Option Calculators (see diagram 1)



position on COMEX (used as a proxy for the fund activity) was a net short for the first time for two years.

### Steer clear of consensus?

In this year's Reuters survey, the spread of analysts' price projections has widened considerably, varying from a low of \$2,900/tonne (\$1.32/lb) and a high of \$4,770/tonne (\$2.16/lb) and a mean of \$3,785/tonne (\$1.72/lb). With copper prices beginning to exhibit increased volatility, 2006 may be another year to steer clear of consensus forecasts. With prices so far above the marginal costs, should the fundamentals and/or sentiment deteriorate then the downside is significant. Even the most bullish forecast in the Reuters survey suggests limited upside from the levels of around \$5,000/tonne (\$2.27/lb) seen in early March 2006.

### Building BRICs for copper consumption

First, there were the Tiger economies, which in the 1980s proved to be a source of rapid demand growth. The initial "Tigers" were South Korea and Taiwan. In 1980, copper consumption in both countries was approximately 80,000 tonnes; by 2004 offtake had increased to 933,000 tonnes and 690,000 tonnes respectively. However, demand fell sharply in 2005 to 875,000 tonnes and 650,000 tonnes.

In the 1990s, the ASEAN countries, which at the time included countries such as Thailand, Malaysia and Indonesia, provided a boost to copper demand. They are the largest consumers within the ASEAN nations, even though the organisation has now been expanded. Last year, these countries accounted for 595,000 tonnes of copper compared to 150,000 tonnes in 1990.

### The "Tigers" are getting bigger

The latest grouping to attract the attention of the copper market are the BRICs – Brazil, Russia, India and

China. The key difference of this group compared to the early "Tigers" is the level of population involved.

For 2004, the population of these countries are estimated at Brazil 185m, Russia 145m, India 1.07bn and China 1.3bn, compared to a combined population of 75m in South Korea and Taiwan. Although per capita consumption is still low, the sheer weight of numbers means that these countries now account for 30% of global consumption compared to 17% in 2000.

Since 2000, China has enjoyed robust copper consumption growth from a high base, expanding at 14.4% per annum. Strong growth has also been seen in Russia, albeit from a low base (+28.5%) and in India (+8.3%). Consumption in Brazil has been muted reflecting more uncertain economic conditions earlier this decade and the average annual demand growth since 2000 has been just 1%.

### Per capita differentials are back in vogue

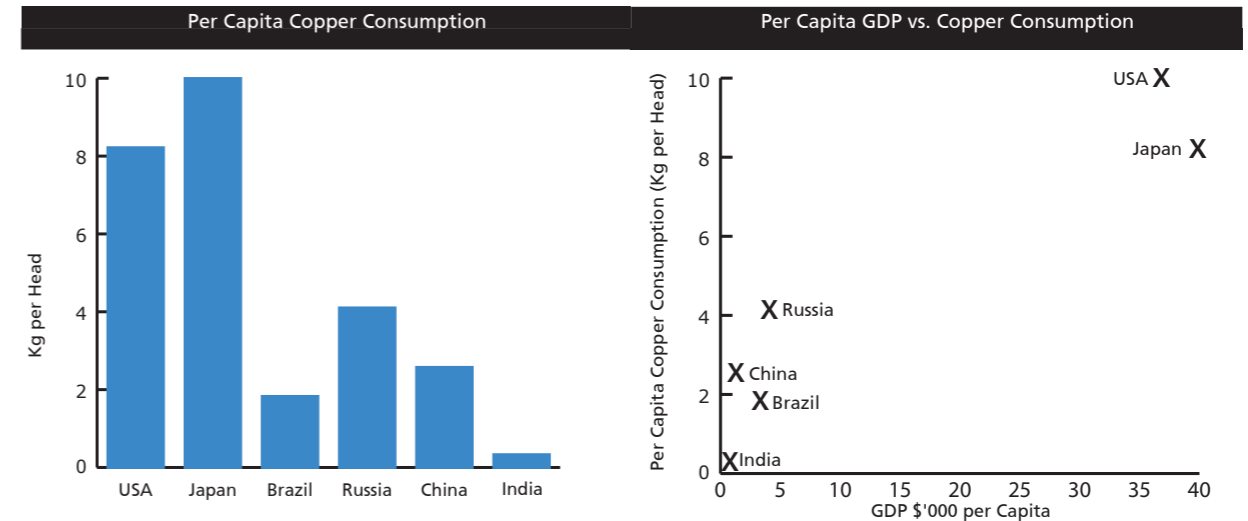
There are two basic indicators that highlight the growth potential for copper consumption. First, is the simple comparison of per capita copper consumption between the BRICs and the developed economies. Such arguments have been put forward many times over the years and until this decade little had changed.

On the chart on page 5 however, we note the relationship between copper consumption and per capita income. It highlights that the level of GDP in the BRICs is at a take-off level where copper demand growth accelerates. However these comparisons always tend to ignore the fact that higher consumption growth in the BRICs, and other emerging markets, is often at the expense of consumption in the mature economies given the relocation of manufacturing capacity.

Buying the Put Option reduces risk or exposure if the market price should fall. In our example price protection would be guaranteed at \$4022.95/tonne (by exercising the long Put Option into an equivalent short Futures/Forward position). If the Market price were to go up, participation would be restricted (capped) at \$5000/tonne (having the short Call Option exercised into a short Futures/Forward position).

By looking at a graphical representation produced by Brady we can see the Profit and Loss profile. Diagram 2 shows the effect of combing the two options with the natural long position of the underlying asset.

We can see as the market price moves down it is having a negative effect on the P&L due to the natural long asset position



### Has there been a fundamental change in copper demand?

For the copper industry to fully benefit from the rapid expansion in the BRICs, overall long-term global consumption growth rates for copper must be increased. In some respects the jury is still out. Initial data for 2000-2005 is not encouraging as demand growth just 1.7% per annum since 2000 compared to 3.7% in the previous five-year period. As always the data needs to be treated with some caution given that 2000 was a peak year for demand at the height of the IT/internet boom and as noted elsewhere in the Brady Bulletin, consumption was weak last year due to destocking.

Going forward we believe that the fast rate of copper consumption growth will continue within the BRICs. By no means all of this growth will be at the expense of other regions, as infrastructure expenditure and per capita incomes continue to increase in these countries. Copper consumption over the next five years is likely to far exceed the low level of 1.7% that characterised the first half of the decade.

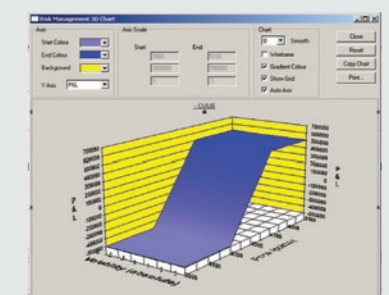
### Higher prices = higher production?

As highlighted in the market outlook on page 1, over the course of the last year copper prices have been on an unprecedented run, which has resulted in the red metal trading in excess of \$5,000/tonne, a level which many thought unachievable early on in the cycle. One reason for the caution was the belief that rapid copper supply growth in 2005 would return the market to surplus. However, lower mine production caused by a myriad of supply disruptions (largely in Chile and the US), and the mining of high molybdenum grades at the expense of copper (in response to the bull market where the increase in moly prices far exceeded that of copper) helped to support prices.

In addition the occurrence of a 'smelter/refinery' bottleneck, initially caused by the industry being caught off guard by the rate of Chinese consumption, but later exacerbated by as strikes at plants such as Kidd Creek and Asarco, added to the supply tightness.

being de-valued, however when the price gets to \$4022.95 the long Put Option negates any further downside losses being incurred. In contrast as the market price moves up it is having a positive effect on the P&L due to the natural long asset position increasing in value, however when the price gets to \$5000 the short Call Option negates any further upside profits being generated.

Diagram 2



### ICSG reduces its supply projections

The result of this was the downgrading of the ICSG forecasts (in September) for global mine and refined production for 2005. Mine output was reduced by 685,000 tonnes to 14.98m tonnes (still representing 3.1% growth year-on-year), while refined production was also downgraded to 16.34m tonnes, (831,000 tonnes down on March projections).

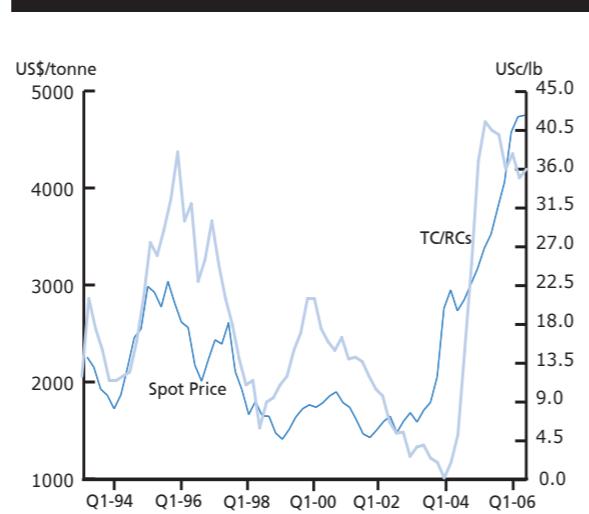
Despite such disruptions, however, refined producers seem to have finally caught up over the course of 2005 with the large increases to mine output over the last few years. ICSG data for the first 11 months of last year shows that primary refined production rose by 4.3% year-on-year, supported by growth of 17%, 20% and 27% from China, India and Indonesia respectively, translating into a 4.1% growth in total refined production (primary + secondary), to 15.009m tonnes. While mine production growth was limited to just 2.6% to 13.483m tonnes, due largely to reduced output in Chile.

### Are Chilean output woes now behind the industry?

Chile, the world's largest producer of copper, was hit hard for most of last year by a series of supply disruptions, which in addition to declining ore grades and a reduction in copper production from mines (as a factor of increased molybdenum output), limited the country's expected growth. This resulted in a 1.6% year-on-year decline in 2005 to 5.33m tonnes.

However, the country's output has since recovered, with Codelco announcing its projection for 2.6% growth to 5.511m tonnes this year. Looking further ahead, Cochilco expects copper production in Chile to expand by up to 26% by 2012. The expansion is based upon, in part, the continued investment into new capacity by both BHP Billiton and Codelco.

Copper Treatment Charges vs. Price



Currently Codelco is under going an expansion program on its existing mines worth \$11.5bn and scheduled for completion by 2012, as well as set to open its Gaby mine in 2007 (which is targeted to produce up to 1.9m tonnes of copper over 14 years or 150,000 tpy). In addition, BHP Billiton's expansion of Escondida and opening of its Spence mine in northern Chile are also set to come on stream over the next few years, which combined with the above, as well as expansions at Antofagasta's Esperanza and Los Pelambres mines, has led to the expectation for Chilean output to rise to around 6.72m tonnes by 2012.

In addition to the proposed expansions in Chile, Mexico has announced that it is to boost its metal production over the next 5 years with over \$2bn invested in project developments. Copper is one of the biggest benefactors of this development (along with gold and silver), with new mining projects including the Milpillas copper mine, which has an estimated capacity of 55,000 tpy and began testing in Q4 of last year.

Brady's solutions streamline the entire metal supply chain; from the smelter, physical shipping right through to the end consumer. Fully integrated with sophisticated trading tools for averages, location spreads, spot, futures, warrants, options, exotic options and associated FX trades, Brady's products support over-the-counter and exchange traded instruments, including COMEX and London Metal Exchange. Our systems are used by the leaders in the industry to reduce operational costs, provide sophisticated risk analysis, and to support regulatory compliance.

### Chinese refined output set to continue to see strong growth

However, it is not just mine capacity that is expected to increase substantially over the next few years. So is refined production, backed by continued growth in the Chinese copper industry, following the 22% expansion in 2005 to 2.53m tonnes. This growth is set to increase further this year, as producers forecast widespread increases to their output, including 20% and 40% rises in Tongling Nonferrous Metal Group and Jinchuan's annual production targets respectively, boosting them to 530,000 tonnes and 220,000 tonnes as well as 7% growth to Jiangxi Copper Co.'s output and a similar rise in Yunnan Copper Co.'s. This has led to the government organisation the Industrial Department of National Development and Reform Commission, projecting that the country's smelting capacity if not curbed, will reach 3.7m tonnes by 2007.

With regard to this year however, ICSG is forecasting that global mine output will reach 15.74m tonnes (+5.1%), while refined production is forecast to reach 17.81m tonnes in 2006 (+9.0%). This increase to refined output is likely to eat into the current surplus of concentrate, which has developed over the last few years.

### Spot treatment charges fall as concentrate surplus erodes....

Currently with the concentrate market oversupplied, the market is favourable to higher TC/RCs, but the further increases to smelting capacity this year as many smelters either come back on-stream (Thai Copper Industries' smelter) or returning to full capacity (numerous Indian smelters), suggest a reduction in TC/RCs as the year progresses.

Benchmark contracts look to have now been settled at \$95/tonne (9.5 cents/lb) compared to \$88/tonne (8.8

cents/lb) at the same time last year. Spot market TC/RCs are currently at around \$140/tonne down from a peak of close to \$200/tonne.

### ...however, this is having little effect on prices

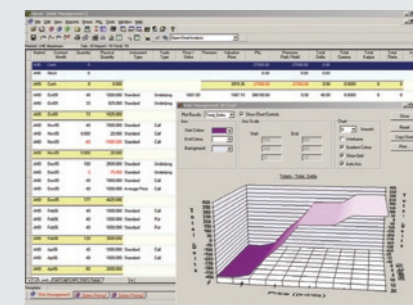
Turning points in the spot TC/RCs market are usually closely correlated with those in the refined metal market. At the bottom of the price cycle treatment charges tend to be low reflecting cutbacks by the miners. Normally (with a slight lag) TC/RCs rally as higher metal prices encourage the reactivation of idled capacity and higher mine utilisation rates. At the top of the cycle, high TC/RCs (reflecting oversupply of concentrates) usually signals a turning point for metal prices. As the chart shows, spot TC/RCs have peaked but metal prices have continued to rally.

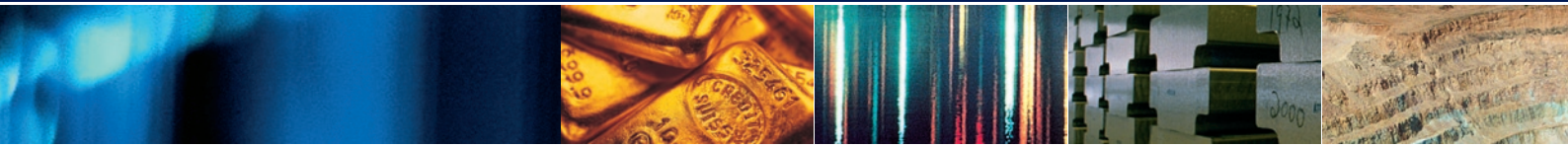
The breakdown of the relationship is primarily down to investment funds extending the bull market. In addition strong demand growth in China is helping to absorb the higher mine output (via imports of concentrate and cathode). Unless there are some supply disruptions at the concentrate stage, we expect that the traditional relationship will begin to re-assert itself. We believe that in the short-term copper prices are more likely to fall than TC/RCs are to rise.

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Brady offers a solution to all participants in the metals and mining sector to manage the purchase and sale of physical commodities, together with complete coverage of financial market instruments and corporate treasury functions. Being modular in design, our systems can be tailored to meet your individual requirements; from stand alone option pricing screens through to fully integrated multi-user/location network environments, encompassing all aspects required from an effective risk management tool, we can provide a solution for you.

Diagram 3





## About Brady plc

Founded in 1985, Brady is a Software Solution provider whose main product, Trinity, is targeted towards the Commercial and Corporate Treasury activities for companies in the Metals and Mining Industry.

Trinity specialises in Physical Material Management, Financial Transaction Management, Treasury, Risk & Contract Management. Brady is acknowledged as a leading provider of Trading and Risk Management Software for the global metals marketplace, installed with producers, merchants, banks, brokers, and end users around the globe.

In 2004, Brady acquired Colplan bringing Opval to the Brady suite of products. Opval compliments Trinity by offering a highly focused front/middle office solution encompassing pricing, deal capture management and risk analysis. Both products are distinguished within the industry and use leading technology within their fields. Brady believes in continuous development and works closely with existing customers to enhance their products.

Brady is listed on the London Stock Exchange with headquarters based on the Cambridge Science Park in the UK, with offices in London and the USA.

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