

## **THE COPPER MARKET**

### **1. INTRODUCTION**

Copper was the only non ferrous metal that defied the world's economic recessionary conditions which recently affected other non ferrous metals, lead and zinc in particular.

During 1992-1993, copper prices remained relatively firm, compared to the negative trend that affected other non ferrous metal prices. The price for year 1992 varied between 0.95\$/lb and 1.17\$/lb with an average of \$1.04/lb. This level was 2% lower than the 1991 average (1.06\$/lb) and 20% lower than the 1989 average price of 1.29 \$/lb. During the same period, other non ferrous metals decreased more than 30% from 1989. Consequently, copper producers still enjoyed profits while many other non ferrous metal producers suffered losses. Several reasons explain the relative stability of copper prices. On the demand side, China is a strong purchaser of copper (520 kt Cu in the form of concentrates, refined copper and semi-products), to supply its fast growing economy. Japan and South Korea are strong consumers of metal. On the supply side, copper supply was still affected by the closure of the large Bougainville mine in Papua New Guinea which took place in 1989 (3.1 Mt Cu were produced before closure). In Zaire, there was the collapse of copper production from 440 kt Cu to less than 60kt Cu, due to political problems, coupled with the absence of investments in the past years and which now dramatically affects Zaire's copper industry.

The year 1993 saw the copper industry's performance fall more into line with other non ferrous metal producers. The first half of the year saw a price of 0.92 \$/lb and the second half an average price of 1.22 \$/lb.

In 1994, copper prices have continued to rise. In 1994, the world economy picked up, particularly in the US. Recession seems to be ending in West Europe; and the unification of Germany seems to have been absorbed. The economies of the new industrial countries of far East Asia, in addition to China are buoyant. The increase of global demand therefore led to significant recovery in the prices of non ferrous metals, including copper, towards the end of the year. Late 1994, copper prices had shot up above 1.15\$/lb.

The question is what can be expected in the future, over the long term. It is well known that commodity prices are cyclical and non ferrous metals more particularly. Copper will therefore probably continue to respond to the fundamental relation of supply and demand and to the effect of stocks. Copper producers, faced with long

investment decisions, are concerned with the medium and long term outlook, i.e. the five, ten and twenty year period.

Cyclical price trends are most apparent over the medium term period (5-6 year cycles). In making projections, one must avoid to consider high prices which occur at the top of price cycles. Over long term periods, copper producers must have fundamental belief in the role and probable evolution of copper in global economy, which in turn depends on the growth of its traditional market industries and the advent of new technologies but which are more conjectural. Copper producers must realise that the key to sustained industrial success is the ability to remain quality and cost competitive, especially at the bottoms of copper price cycles, and with the possibility of constituting reserves during the tops of the cycle.

## **2. COPPER METAL DEMAND**

In order to understand the global copper industry, one must appreciate the fundamental importance that copper plays in the economy. In the West, the demand for copper is driven by industrial production in the major industrialised economies: North America, Western Europe, and Japan. The traditional industrial sectors for copper are the electrical and electronical industries, (electric wire and bars for electricity production, motors, power distribution, household appliances etc.), and the building industries (more on this below)

In order to develop an economic forecast and the resulting demand forecast for copper, Paribas/Sofremines relies on econometric sector/branch consumption matrices. Also, an end use trend analysis is made to determine the effect of possible long term changes in the copper markets as well as those that may emerge in the future as new technologies develop.

As regards the prospects for economic growth, it is generally believe said that recession in the United States probably ended in the second quarter of 1991. Since then, the rate of growth is expected to be lower than in the past and more regionally distributed. The current outlook is that during the next years, the average annual growth rate in the United States would be around 2-2.5%. However, it is possible that the slowing of the labour force growth will eventually constrain long-term average growth below that level. This rate contrasts with the robust 2.7% average rate during the 1970-1990 period.

Similar forecasts apply to West Europe, in particular the EEC, where the economy is anticipated to grow at a much slower average rate than in the period 1960-1990. Germany appears to have overcome the problems of unification and is expected to show a growth rate of above 4% for several years corresponding to the equalisation of

economic conditions between the former East and West länder. Germany is an important copper consumer in the World and in Europe as it consumes more copper than any other European country.

Japan, another important country in the structure of copper consumption, is also experiencing economic recession. However, over the medium term, the country plans to reshape its economy, modernise its infrastructure and invest in production and technology, to offset its ageing labour force. During the past twenty years, Japan's export driven economy has experienced an average growth rate of 4.5% per year. The new outlook has scaled this figure back to a 3.5-3.7% average annual figure, which is still higher than in Europe and North America. Beginning of 1995, the destruction of Kobe by a major earthquake suggests increased copper demand in Japan for reconstruction of that major city. At short term, the effect of this event has even led to copper price increases.

While their copper consumption per capita remains relatively low, the major developing countries of the world probably offer higher growth rate prospects than the more mature industrialised countries. For example, Mexico now benefits from the Brady Plan to restructure the debt problems of the developing countries and will eventually benefit from the recently-passed NAFTA agreement. In the developing countries of East Asia, growth rates are high and economic development plans are more free market oriented than before, primarily because of economic policy changes that took place during the 1980's. As a result, industrial production is growing, infrastructures are being built and ultimately, consumer purchasing power and demand for all goods and services are growing fast. This is the part of the world where copper consumption is likely to increase most, i.e. China, Taiwan, Singapore, Indonesia, Thailand, India, and other East Asian countries to follow such as Vietnam.

In the ex-USSR, a similar evolution as in the East Asian countries is likely to take place in the medium to long term perspective because of the major economic change from planned to market economy. In the short and medium terms, the economies of the ex-USSR, now the CIS, have experienced severe contraction of production, after to the introduction of market economy, price liberalisation and disintegration of their traditional economic ties with Russia. Price liberalisation has led to a long overdue adjustment of supply to demand. Economic recovery is believed to be dependent on the continuation of economic reforms, coupled with the advent of social and political reforms. Thus, the attraction of foreign investment to provide western productive technology and capital funds, is conditioned by the progress of economic, political and social reform. If both are forthcoming, small industries producing manufactured goods and equipment will start growing, then increasing the demand for semi-products, of which copper will be a major one. It is likely that recovery in the CIS countries will be

led by Russia in the same overall process. In the meantime, CIS countries and Kazakhstan will have to look for increasing their exports to far away countries. Overall, the prospect for growth is high, although we do not wish to propose any figure.

In terms of the actual end-use markets for copper, most industry observers generally agree that the outlook for new copper uses is probably limited. Fiber optics continue to displace one of the traditional markets for the metal. Eventually, fiber optics will saturate the telecommunications market and much of this has already taken place in long-haul and trunk communications cables. However, the economics of feeder and subscriber loops continue to favour the use of copper and this should continue even in new installations. It has been estimated that the combined impact of fiber optics and other reductions on copper use will reduce the overall demand for the metal by approximately one million tonnes annually by the end of this century.

Possible opportunities for expansion exist in such areas as electric cars, solar applications, superconductivity materials, electronics, agricultural markets, cupronickel boat hulls and alloying additives in structural steels.

While new use applications for copper are not very promising in terms of growth, demand for copper does continue to increase. This results from the innovations in the use of electrical and electronic equipment in industrial, commercial, transportation, and home appliances. The most basic use, electrical power transmission, wiring and cabling, is fundamental to every modern economy and we see no substitute for this so it should remain indefinitely. Construction is another an important use of copper which includes piping for plumbing and fire sprinkler systems. Construction also includes other uses such as copper roofs, sidings and gutters. There are also other household uses such as pans, building decoration. Finally copper alloys (brass, bronze) and chemical uses are also significant.

Utilising the various econometric forecasting models and the end-use, sector analysis of the copper markets, Paribas/Sofremines has estimated that average annual copper consumption in the World would increase by 2% on average from the present through the year 2010. Actual consumption of refined copper in the World, in 1992, was 11.1 Mt Cu. By year 2010, copper consumption is forecast to be 40% more, i.e. 15Mt Cu, or approx. 4Mt more. Beyond 2010, the consumption growth rate will further slow which is consistent with a maturing commodity serving established markets.

### **3. COPPER METAL SUPPLY**

To project future mine output, Paribas/Sofremines does a mine-by-mine compilation of individual mine production for each year up to year 2010. Since 1989,

the average annual production increase was about 2%. In 1992, global mine production was estimated to be more than 9 Mt. If both the forecast for demand and for mine production are achieved in the year 2010, there will be a shortfall of approximately 4 Mt. In order to make up this short fall, new production will have to come on stream, from yet unidentified mining and smelter refinery operations. There are a number of projects in the world now but at this point, it is impossible to say which projects will actually be developed.

As a component of the copper supply base, the share of leaching and SX/EW is regularly increasing; it now represents almost 20% total copper mine output. Paribas/Sofremines believe that further additions will be forthcoming from the most of the copper producing countries and that by the end of the century the share of copper production from this low-cost source will be well over 20%.

#### **4. COPPER PRICE OUTLOOK**

In preparing a price outlook, Paribas/Sofremines relies primarily on the estimated marginal cost of production in the copper industry. This information is supplemented with information on the overall supply/demand balance for refined copper and for copper intermediate products. Historically, copper prices have had a close relationship to the levels of stocks relative to the overall demand for the metal. It is interesting to note that the ratio of stocks relative to demand, reached historically low levels in the late 1980s which coincided with a high copper price that year of 1.40 \$/lb. In the industry, copper stocks of approximately two months of consumption, have normally been the reference for measuring whether stocks are high or low. The relatively high level of stocks in 1991-1992 is a factor that explains the lower prices in those years. Paribas/Sofremines anticipates that the gradual recovery in the world economy will result in higher demand for copper and that stocks will decrease. So prices should remain firm around the present levels in the short and medium term. However, it seems unlikely that prices would remain above \$1.00/lb, in average long time periods, first because of demand supply relationship, second because of cost trends in the mining industry, particularly the growth of the share of leaching and SX/EW. Indeed, the marginal cost of mine production is decreasing as more and more copper production is derived from leaching and SX/EW technology. Therefore, our forecast for the price range is \$0.90-1.00/lb and the average long term price (i.e. from now to year 2010), may be at the lower end of the range.

NB: The average long term price considered is constant 1993 dollar terms.

#### **5. THE COPPER CONCENTRATE MARKET**

Past analyses of the copper industry do not pay much attention to copper concentrate trade or to the state of the copper smelter industry. However, in the past several years that situation has changed. Much of the investment in the copper industry in the past 10-15 years went into new mine development where the economic returns were expected to be higher than with smelter investments. The result today, on a global basis, is that there is a shortage of smelter capacity which produces a surplus of concentrates looking for smelters. Smelters in turn can purchase good quality concentrates on the market, make competition play, enjoy good prices and pass on higher treatment and refining charges. The high treatment and refining charges which miners have to bear can occur at a time when copper prices are low for cyclical reasons.

While some modernisation and incremental expansion has taken place at existing smelter operations, closings of obsolescent smelters has also taken place. Most of these closings have occurred in the more industrialised countries because of the pressure of environmental pressure. Combined with other economic issues, this has forced smelter and refinery management teams to take action and reduce negative environmental impacts. Despite increases in Chilean smelter capacity in recent years, mine production in Chile has exceeded new capacity, and foreign smelting capacity must be used.

The situation of glut of concentrates leads some smelters to think that they should concentrate on custom smelting rather than rely on own copper resources, particularly in view of comparative cost advantages of procuring foreign concentrates. However, we believe this situation is only temporary and that eventually, smelter and refining capacity will again meet demand, the more so as higher treatment and refining charges will stimulate new investment in that branch of the industry. Currently, there are new expansions and modernisation's taking place in the United States, Chile, and in the Far East.

Some examples of recent smelter developments include the installation of Outokumpu flash furnaces at Magma Copper and at Chuquicamata in Chile. Also, new furnaces were installed at Naoshima, Port Kembla, El Paso, and Miami. For some time, the industry was focused on the possible construction of a new copper smelter at Texas City; this was to be developed by Mitsubishi to treat South American concentrates. However, the project was cancelled in early 1992 primarily due to the environmental opposition of nearby Gulf Coast residents. The capital requirements for a new smelter are quite high. For example, the cost for a modern plant such as the Magma Copper San Manuel smelter/refinery is \$2 500 per annual tonne of copper production or 1.15 \$/lb (650 M\$). Elsewhere, the cost of a 150 000 t Cu smelter in Thailand is 450 M\$ or 1.36 \$/lb.

The economics of a smelter refinery investment definitely favour adding incremental capacity to an existing operation. There are several examples in the United States where expansions and modernisation's have cost approximately 1 000 \$/t Cu (0.45 \$/lb); this is less than half the comparable price for a new smelter. Currently, expansions are taking place in the United States, Japan, the Philippines and Chile.

Over the past twenty years, treatment and refining charges have been in the range of \$0.17-0.35/lb (constant 1993 US\$). These charges are based on smelter contracts in the Pacific rim; they assume the processing of clean 30% copper concentrates. Paribas/Sofremines expects that the effects of a concentrate surplus and the continuation of the appreciation of the Japanese Yen will keep these charges at the high end of the range through the end of the century. Eventually, a tightening of concentrate supplies vis à vis smelting and refinery capacity, toward the end of the century or by year 2010, should cause a reduction in smelting and refining charges.

1. Copper mine production, historical statistics 1989, 1993
2. Copper mine production, distribution by major producing countries 1989 1993;
3. Copper: mine, smelter, refined, and consumption of, 1989 1992;
4. Copper price US\$/lb grade A, historic prices and constant prices 1993 values
5. Copper uses by sectors (OECD 1992)