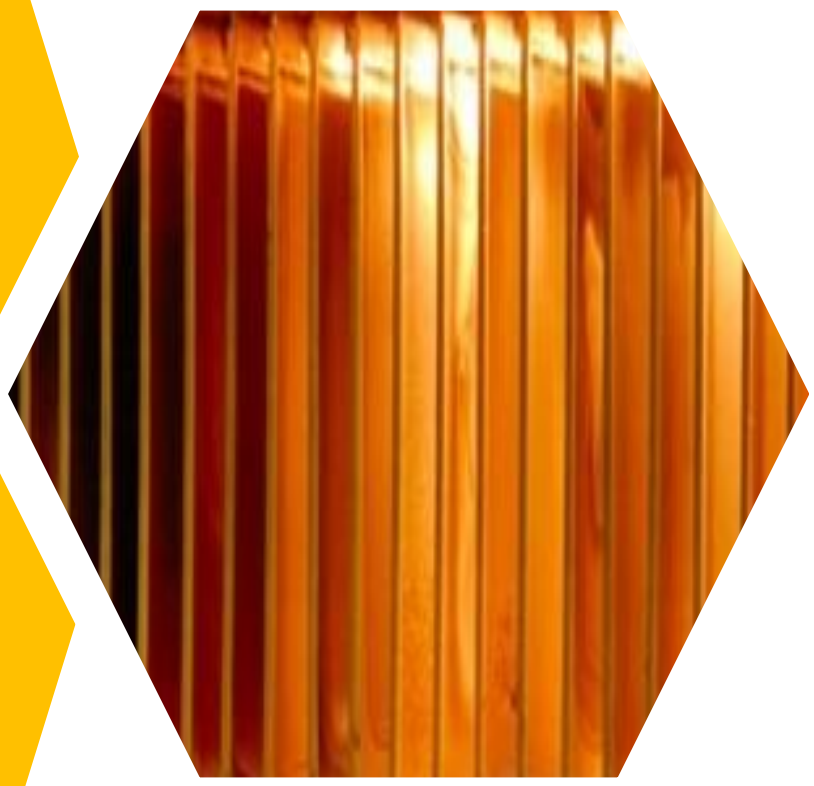


NSE COPPER DERIVATIVES

Performance Review

2022-23

Table of Contents

Performance Review of Commodity Products for FY 2022-23

Copper Futures & Options (On Goods)

1. Background

a. Brief about the commodity such as sample picture, lifecycle and various varieties/grade of the commodity found in India

Copper is usually found in nature in association with sulphur. Copper has been in use at least 10,000 years, but more than 95% of all copper ever mined and smelted has been extracted since 1900. As with many natural resources, the total amount of copper on Earth is vast (around 1014 tons just in the top kilometre of Earth's crust, or about 5 million years' worth at the current rate of extraction). However, only a tiny fraction of these reserves is economically viable, given present-day prices and technologies. Various estimates of existing copper reserves available for mining vary from 25 years to 60 years, depending on core assumptions such as the growth rate. Recycling is a major source of copper in the modern world.

Applications

The major applications of copper are in electrical wires (60%), roofing and plumbing (20%) and industrial machinery (15%). Copper is mostly used as a metal, but when a higher hardness is required, it is combined with other elements to make an alloy (5% of total use) such as brass and bronze. Main categories are Electronics, Architecture and Industry, Copper in Alloys, Antimicrobial Applications, Others.

Due to the rising economies of China and India, the demand for copper is growing rapidly. These booming economies require enormous quantities of copper in order to continue their development, which will drive up the prices. The remaining copper deposits are limited and current calculations determine they will be depleted between fifty and sixty years. This poses significant issues with consumption of copper still rising steadily. Consuming countries will start to look for alternatives or increase their recycling activities in order to increase their internal supply.

b. Commodity fundamentals and balance sheet as per the following format (to be prepared based on publicly available information on best effort basis):

Table – Fundamentals & Balance Sheet

Global Scenario	**2021**	**2022**
Opening Stocks	1236	1210
Production	24,938	25,641
Others (if any)	-	-
Consumption	25,204	26,609
Closing Stocks	1210	1373

Note: Quantity in '000 tonnes
Source: ICSG (International Copper Study Group)

Indian Scenario	**2021-22**	**2022-23**
Opening Stocks	-	-
Production	485.0	555.0
Imports	356.45	421.07
Total Supply	950.45	976.07
Exports	112.72	71.57
Domestic Consumption	837.73	904.5
Closing Stocks	-	-

Note: Quantity in '000 tonnes
Source: Ministry of Mines, Government of India
Import Export- Ministry of Commerce Data for HS Codes- 740311, 7407, 7408, 7409, 7410 & 7411
For Total Supply = Production + Imports
For Domestic Consumption = Total Supply - Export

Top 10 major producing countries ('000 MT)

Countries	**2021**	**2022**
China	10,500	11,000
Chile	2,270	2,100
Japan	1,510	1,600
Congo	1,450	1,700
Russia	981	1,100
US	971	1,000
Korea	647	660
Germany	615	620
Poland	578	590
Kazakhstan	500	510

Source: USGS (Refinery Production)

Major consuming countries ('000 MT)

Country wise data is not available in public domain, region wise data is provided below

Regions	**2021**	**2022**
Asia	18,345.4	19,311
Europe	3,967.6	3,924.5
America	2,705.6	2,651.7
Africa	180.6	176.9
Oceania	5	5

Source: ICSG (International Copper Study Group)

Top 10 major exporting countries (In Million $)

Countries	2021	2022
Chile	23,962.3	21,739.8
Germany	17,217.3	15,978.7
Japan	12,898.6	12,476.0
China	10,474.1	10,679.7
USA	10,380.0	10,050.0
Poland	5,971.8	5,503.6
Italy	5,909.5	6,133.4
Other Asia	5,401.1	NA
Spain	4,562.1	4,110.1
Canada	4,506.2	NA

Source: UN Comtrade Database, HS Code: 74

Top 10 major importing countries (In Million $)

Countries	2021	2022
China	66,088.4	68,705.2
USA	16,222.9	15,562.3
Germany	13,830.1	14,830.8
Italy	10,693.1	11,375.7
Other Asia, nes	7,115.6	NA
India	6,692.8	7,541.6
Turkey	5,265.61	5,510.3
Belgium	5,139.1	4,878.0
France	4,963.6	4,972.8
Mexico	4,684.4	3,750.3

Source: UN Comtrade Database, HS Code: 74

Top producing states (MT)

States	2021-22	2022-23
Madhya Pradesh	65,021	NA
Rajasthan	49,399	NA

Source: Ministry of Mines, Government of India

c. Major changes in the polices governing trade in the spot markets of the commodity

India has set itself a target of 500 GW of renewable energy capacity by 2030. Estimates suggest that over 3,000 kg of copper is required for generating 1 MW of power via the solar photovoltaic and onshore wind platforms. Power generation via offshore wind is even more copper-intensive, requiring over 8,000 kg of copper per MW.

Copper is going to be the key resource that will lead the transformation of India into a carbon-neutral country. The copper intensity of EVs, however, is four times as much as traditional vehicles. With India currently being a net importer of copper, it could potentially face a shortage or fail to achieve the 30% EV vision by 2030.

d. Geopolitical issues in the commodity and its impact on Indian scenario

Russia' war against Ukraine has been a key driving force behind Aluminium and nickel price movements, while high energy prices have affected most metals, especially copper. Metal

prices are projected to increase 16 percent in 2022 and ease somewhat in 2023. Almost all base metals, including copper, are in deficit this year, with depleting stocks leaving little buffer for the market to weather further disruption. Unsurprisingly, the price volatility looms. The ongoing war between Russia and Ukraine, high energy costs and stricter emissions standards in China have been cited as the main reasons for the continued shortage in copper.

Prices have been buoyed by low inventories and solid demand in China and advanced economies stemming from robust durable goods consumption. The world copper market has been affected by water shortages in Chile (the biggest producer and exporter) and labor disputes in Peru (2nd producer). Upside risks to the mid-term outlook include further supply disruptions in Russia, while a more severe slowdown in global growth poses the greatest downside risk.

In the longer term, copper will increasingly benefit from growing demand in the renewable (mainly photovoltaics) and electric vehicle (EV) sectors, as well as related grid and recharging infrastructure. Raw materials account for up to 80% of battery costs; therefore, the magnitude of the ongoing metal price rally will likely reverse the long-term trend of falling battery costs in 2022, which are the most expensive component of EVs.

Climbing manufacturing costs, coupled with the lingering autos chip shortage, could curb EV production capacity. They could also dampen EV sales, should manufacturers pass price increases onto consumers, particularly in emerging markets, where governments provide little-to-no subsidies for EV adoption. In particular, the decision by European countries to reduce their dependence on Russian natural gas in line with RePowerEu Plan could increase copper consumption as it provides for accelerating investment in renewable energy. It is a known fact that most renewable equipment components require copper. Thus, higher copper prices could delay installation of new renewable projects and the whole green transition process.

In general, world copper market has great prospects for development due to strong demand in renewables sector and supply deficit. Here comes an opportunity for Ukraine. Although, these days copper is not produced in Ukraine, there are nearly 150 copper occurrences in Rivne, Zhytomyr and Volyn regions. Therefore, copper deposits development in Ukraine can become an attractive investment project once the war ends.

Trading related parameter

a. Monthly and Annual traded volume (quantity in appropriate units)

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL.

b. Annual traded volume as proportion of total deliverable supply (quantity in appropriate units)

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

c. Annual traded volume as proportion of total annual production (quantity in appropriate units)

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

d. Annual average Open interest as proportion of total production

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

e. Annual average Open interest as proportion of total deliverable supply

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

f. Monthly and Annual value of trade (in Rs. Crores)

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

g. Monthly and Annual quantity of delivery (in appropriate units)

The delivery in Copper Futures and Options (On Goods) in FY 22-23 was NIL

h. Monthly and Annual value of delivery (in Rs. Crores)

The delivery in Copper Futures and Options (On Goods) in FY 22-23 was NIL

i. Monthly and Annual Average Open Interest (OI) (in appropriate units)

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

j. Annual average volume to open interest ratio

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

k. Total number of unique members and clients who have traded during the financial year

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

l. Ratio of open interest by FPOs/farmers/Hedge/VCP positions to total open interest (Annual average as well as maximum daily value)

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

m. Number of unique FPOs / farmers and VCPs/hedgers who traded in the financial year

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

n. Algorithmic trading as percentage of total trading

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

o. Delivery defaults
i. Number of instances
ii. Quantity involved
iii. Value involved

The deliveries in Copper Futures and Options (On Goods) in FY 22-23 was NIL

3. Price movements

a. Comparison, correlation and ratio of standard deviation of Exchange futures price vis-à-vis international futures price (wherever relevant comparable are available)

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL.

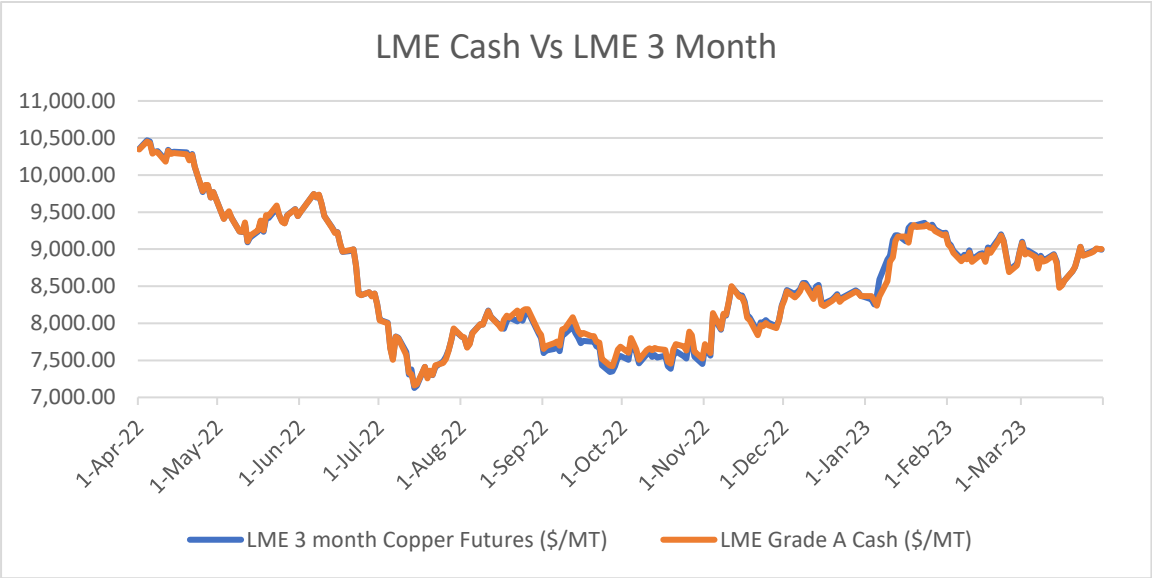
b. Comparison, correlation and ratio of standard deviation of Exchange futures price vis-à-vis international spot price (wherever relevant comparable are available) and domestic spot price (exchange polled price).

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

c. Correlation between exchange futures & domestic spot prices along with ratio of standard deviation.

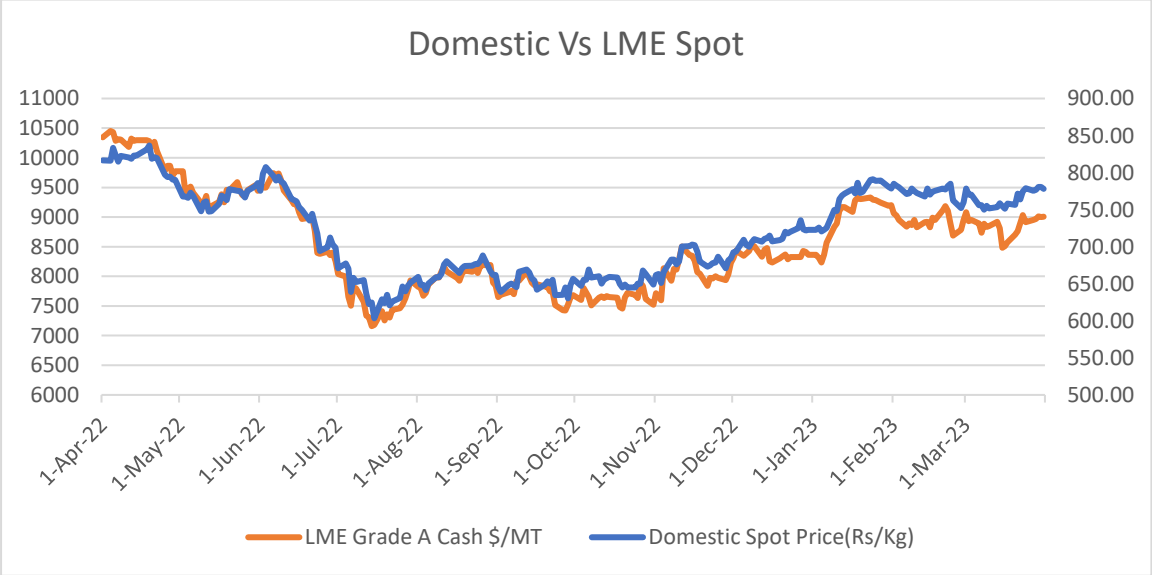
The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

d. Correlation between international futures & international spot prices along with ratio of standard deviation (wherever relevant comparable are available).



Source: Refinitiv & Investing.com

e. Comparison of Exchange polled price and mandi price (in case of agricultural commodities) / other relevant price (in case non-agricultural commodities) at basis centre.



Source: Refinitiv & NSE

f. Maximum & Minimum value of daily futures price volatility and spot price volatility along with disclosure of methodology adopted for computing the volatility.

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

Commodity	Max Volatility in Futures Prices (%)	Min Volatility in Futures Prices (%)	Max Volatility in Spot Prices (%)	Min Volatility in Spot Prices (%)
Copper	NA	NA	4.69	0.006

Volatility calculation: (Day – Previous day's price)/Previous day's price

g. Number of times the futures contract was in backwardation/contango by more than 4% for the near month contract in the period under review.

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

4. Other parameters

a. Qualitative and quantitative measure for Hedge effectiveness ratio and basis Risk (Volatility of Basis) along with disclosure of methodology adopted for such calculations.

The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

b. Details about major physical markets of the commodity vis-à-vis market reach in terms of availability of delivery centers (information to be provided state-wise and UT-wise).

With regards to imported copper cathodes, Mumbai Nhava Sheva port is one of the major entry points and accordingly physical market movement from Mumbai port to the Exchange warehouse location at Bhiwandi is quite convenient due to its proximity.

With respect to transport from domestic refineries, Hindalco's Dahej Harbor and Infrastructure Limited (DHIL) operates an all-weather jetty in the Gulf of Khambhat on the west coast of India to different port cities in west coast as well as east coast. Apart from that it is linked with a six-lane road with NH-8, and broad-gauge rail connection at Bharuch with good rake loading facilities. Good availability of trucks makes it well connected with the hinterland. Though quite an ideal place for customers from Maharashtra, Punjab, Madhya Pradesh, Gujarat, and Rajasthan, far off states also take deliveries.

c. Details about major physical markets of the commodity and average Open Interest for each month generated from those regions.

Major physical markets data provided in the point 4b. The traded volume for Copper Futures and Options (On Goods) in FY 22-23 was NIL

d. Details, such as number and target audience, of stakeholders' awareness programs carried out by the exchange.

For education initiatives the exchange has conducted 583 Investor Awareness campaigns across INDIA covering all the commodities available on the NSE platform from April 2022 till Mar 2023.

e. Steps taken / to be undertaken to improve hedging effectiveness of the contracts as well as to improve the performance of illiquid contracts

NSE is constantly striving to encourage hedgers to participate in the Copper contracts. We have value chain participants and associations such as Bombay Metal Exchange, Hindalco Ltd, Vedanta, Rashtriya Metal industries, Ravi Metal products, Parikh Metal Industries, Gujarat Copper Alloys, etc. as part of our Copper PAC, who guide us on how to get more participation from physical market participants.

5. Any other information to be disclosed as deemed important by the exchange or as suggested by the PAC.