

# Copper Price and Market Analysis

Author: Eshan Mukherjee

2021-2026)

## Executive Summary

- Price rally with swings: COMEX copper (HG00-USA) rose 67% from \$3.55/lb. (Feb 2021) to \$5.93/lb. (Feb 2026), with a -34% plunge to \$3.23/lb. (Jul 2022) and peak at \$6.28/lb. (Jan 2026).
- High volatility: 30-day annualized volatility averaged 25%, spiking >30% in 2022 sell-off and 2023-2024 rally; max drawdown was one-third.
- Inflection windows: Extreme moves included -31% (Mar-Sep 2022) and +38% (Nov 2023-May 2024); full list in Appendix B.
- Supply vs. demand signals: Rallies tied to falling open interest/low volume (supply tightness); declines to high volume (demand weakness).
- Seasonality: Positive returns Jan-Mar (restocking); negative Jun-Jul (softer demand).
- Policy levers: Supply expansion (permitting, incentives, recycling) moderates prices; demand curbs (efficiency, substitution) and regulations reduce swings.

## Data & Methodology

The main dataset for this project was obtained from Market Data and consisted of daily

- COMEX copper futures data, including dates, closing prices, open interest, and trading volume, covering the period from February 4, 2021, to February 4, 2026. Before beginning the analysis, the data was cleaned by correcting formatting issues, removing missing entries, and converting all values into a consistent numerical form.
- After cleaning, the data was processed using Python to calculate daily and cumulative returns, rolling returns over 3-, 6-, and 12-month periods, as well as 30- and 60-day volatility, drawdowns, and monthly averages. The final dataset was then organized and saved in a separate file for further analysis and visualization.

Additional spreadsheets from Market Data containing information on inventories, futures

- curves, and seasonal patterns were also reviewed. However, most of these sources contained overlapping or incomplete data, so they were not included in the final analysis. More details are provided in Appendix C. Data from online financial platforms could not be incorporated due to access limitations.

## Evidence of Dramatic Price Change

- Prices moved dramatically over the period. After rising above \$4.50/lb. in mid-2021, copper plunged to \$3.23/lb. on 14 Jul 2022, a -34 % drawdown, before recovering above \$5/lb. by May 2024 and reaching \$6.28/lb. in early 2026.
- Average 30-day realized volatility was around 25%, with spikes above 30% during the 2022 sell-off and late-2023 rally.
- Rolling return analysis highlights windows of extreme change: a -31% drop from Mar 2022 to Sep 2022 and a +38 % rally from Nov 2023 to May 2024, among others.
- Detailed inflection windows, charts of prices, volatility and drawdowns, and associated interpretations are presented in Appendix B.

## Driver Decomposition: Supply vs Demand

### Demand - side influences

The demand curve for copper shifts with industrial activity, income, and preferences. Evidence pointing to demand's role includes:

- Seasonal patterns: Mean monthly returns are positive in January-March and negative in June-July, reflecting manufacturing restocking early in the year and softer consumption mid-year. A seasonality chart appears in Appendix B.
- Demand-driven declines: The steep -31% drop in Mar-Sep 2022 coincided with a broad economic slowdown. Generic economic theory indicates that recessions or expectations of weaker growth shift the demand curve left, lowering price and quantity.
- Currency effects: A stronger US dollar reduces dollar-denominated commodity demand, effectively shifting demand left. While we could not include USD data, the qualitative linkage is acknowledged.

### Supply - side influences

Copper supply responds to input costs, natural conditions, and technology. Indicators from the data suggest:

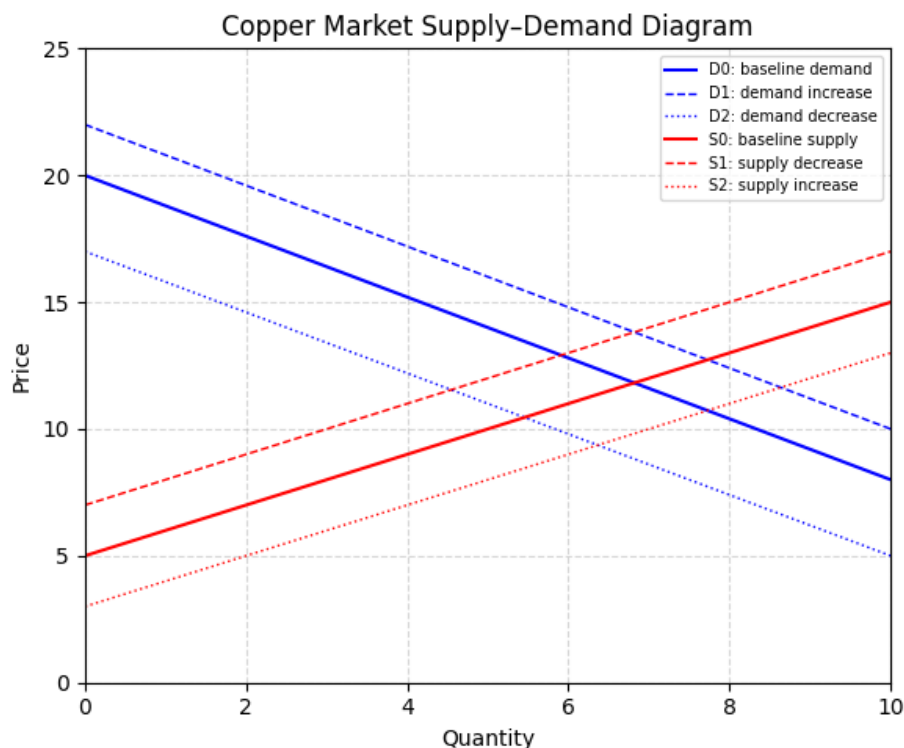
- Inventory proxies: During rallies (late 2023-2024 and late 2025) open interest and trading volume declined while price increased, signaling tight supply or inventory drawdowns. Conversely, high volume during sell-offs implies abundant supply entering the market.
- Correlations: Price is weakly positively correlated with open interest ( $\approx 0.16$ ) and negatively correlated with volume ( $\approx -0.21$ ), supporting the interpretation above.
- Supply disruptions: Although the spreadsheets lack explicit inventory series, economic theory notes that strikes, regulatory changes or depletion of ore reduce supply, shifting the supply curve left and raising price.

## Charts supporting drivers

Charts illustrating open-interest and volume proxies and the monthly seasonality appear in Appendix B. They reveal falling open interest during rallies, high volume during sell-offs and the positive Q1/negative mid-year seasonal pattern.

## Supply-demand framework

To interpret the price movements described above, we refer to a supply-demand model. The baseline demand curve ( $D_0$ ) slopes downward and the supply curve ( $S_0$ ) slopes upward. An increase in demand (shift to  $D_1$ ) raises both price and quantity, while a decrease in demand (shift to  $D_2$ ) lowers them. On the supply side, an increase in supply (shift to  $S_2$ ) lowers price and raises quantity, whereas a decrease in supply (shift to  $S_1$ ) raises price. The diagram below labels each curve shift with the driver evidence:



Stylised Supply-demand diagram for copper Figure 1: Demand increases from industrial growth ( $D_0 \rightarrow D_1$ ); demand decreases from economic slowdowns ( $D_0 \rightarrow D_2$ ); supply decreases due to mining disruptions or regulation ( $S_0 \rightarrow S_1$ ); supply increases from investment and recycling ( $S_0 \rightarrow S_2$ ).

## Policy Options

Policymakers have several levers to moderate extreme copper price swings. These options are organized by which curve they shift and the associated time horizon:

- **Supply-expanding policies:** Streamlining permitting and environmental approvals for new mines, offering tax incentives for exploration and smelting, encouraging recycling and urban mining, and releasing strategic stockpiles can all shift the supply curve right ( $S_0 \rightarrow S_2$ ). Such measures are medium- to long-term and entail capital investment and environmental trade-offs, but lower prices if demand remains robust.

- **Demand-moderating policies:** Promoting energy-efficiency standards, material substitution in construction and electronics, encouraging scrap reuse, and supporting copper-saving technologies shift the demand curve left ( $D_0 \rightarrow D_2$ ). These actions typically operate over a medium horizon and may increase costs or slow innovation but reduce pressure on the market.
- **Trade and market regulations:** Adjusting tariffs, quotas, or export taxes, offering import subsidies during shortages and establishing transparent reserve auctions can influence both supply and demand. Tightening position limits and margin requirements on futures can curb speculative demand and reduce volatility. These interventions act mostly in the short to medium term, but they can distort global trade or reduce liquidity.

## Appendix

### A. Data tables

The cleaned time series `copper_timeseries.csv` contains daily observations from 4 Feb 2021 through 4 Feb 2026. Table A1 shows a handful of rows (rolled returns and volatility are undefined at the start because of look-back windows).

| Date       | Price | Daily  | 3M      | 6M     | 12M     |
|------------|-------|--------|---------|--------|---------|
|            |       | return | return  | return | return  |
| 2021-02-04 | 3.55  | -      | -       | -      | -       |
| 2021-02-05 | 3.64  | 2.5 %  | -       | -      | -       |
| 2021-05-04 | 4.53  | 0.4 %  | +27.9%  | -      | -       |
| 2022-07-14 | 3.22  | -1.8 % | -27.7 % | -31.2% | -       |
| 2024-05-20 | 5.10  | 0.6 %  | +29.8%  | +38.2% | +20.0 % |
| 2026-02-04 | 5.93  | -2.6 % | +25.4   | +36.8  | +47.9 % |

| Date       | 30D    | 60D    | Draw-   |
|------------|--------|--------|---------|
|            | vol    | vol    | down    |
| 2021-02-04 | -      | -      | 0.00    |
| 2021-02-05 | -      | -      | 0.00    |
| 2021-05-04 | 19.6 % | -      | 0.00    |
| 2022-07-14 | 34.3 % | 31.2 % | -34.4 % |
| 2024-05-20 | 21.5 % | 23.0 % | -1.4 %  |
| 2026-02-04 | 33.0 % | 32.9 % | -5.6 %  |

**Table A1: Sample rows from the cleaned time series. See the CSV file for the full dataset.**

**B. Inflection windows and visuals**

Table A2 lists the major six- and three-month windows of extreme price movements derived

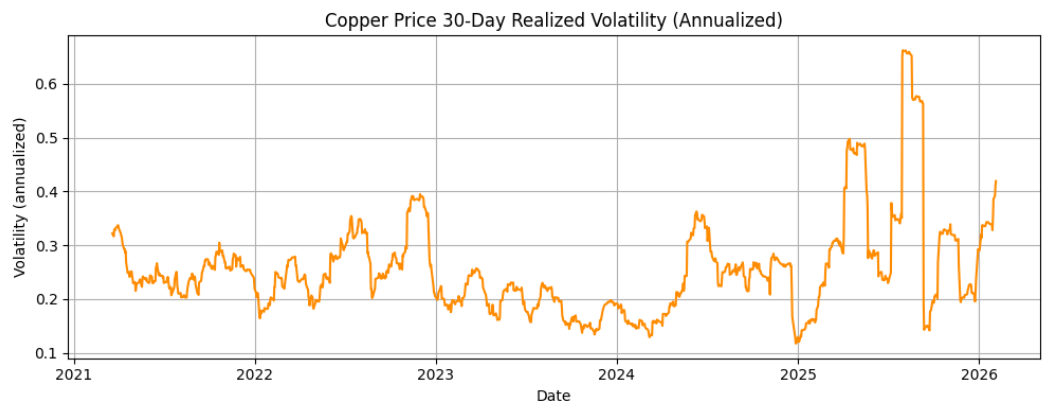
| from rolling returns. The associated charts - price level, realized volatility, drawdowns, open interest and volume proxies, and monthly seasonality - follow below |             |             |           |         |               |                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-----------|---------|---------------|-----------------------------------|
| Start date                                                                                                                                                          | End date    | Start price | End price | Return  | Window length | Classification                    |
| 04 Mar 2022                                                                                                                                                         | 02 Sep 2022 | \$4.9185    | \$3.4010  | -30.9 % | ~6 months     | Sharp decline (demand shock)      |
| 18 Apr 2022                                                                                                                                                         | 19 Jul 2022 | \$4.8025    | \$3.2930  | -31.4 % | ~3 months     | Sharp decline (max drawdown)      |
| Start date                                                                                                                                                          | End date    | Start price | End price | Return  | Window length | Classification                    |
| 16 Nov 2023                                                                                                                                                         | 20 May 2024 | \$3.6950    | \$5.1055  | +38.2 % | ~6 months     | Sustained rally (demand recovery) |
| 08 Apr 2025                                                                                                                                                         | 10 Jul 2025 | \$4.1160    | \$5.6275  | +36.7 % | ~3 months     | Rapid rally (seasonal demand)     |
| 04 Aug 2025                                                                                                                                                         | 03 Feb 2026 | \$4.4560    | \$6.0940  | +36.8 % | ~6 months     | Sustained rally to record highs   |

**Table A2: Detailed inflection windows derived from rolling returns.**

**Price Levels and Volatility**



**Copper Price Figure A1: Daily copper price (HG00-USA), February 2021-February 2026.**

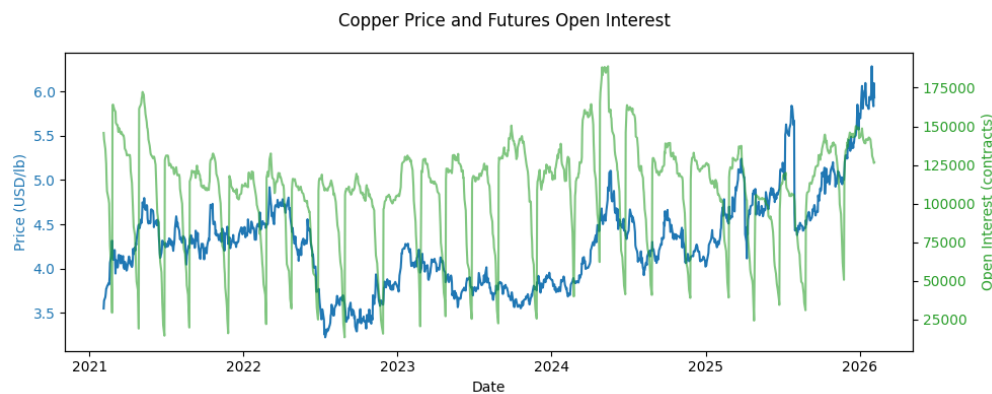


Realized volatility Figure A2: Thirty-day realized volatility (annualized). Volatility spikes accompany dramatic price moves.

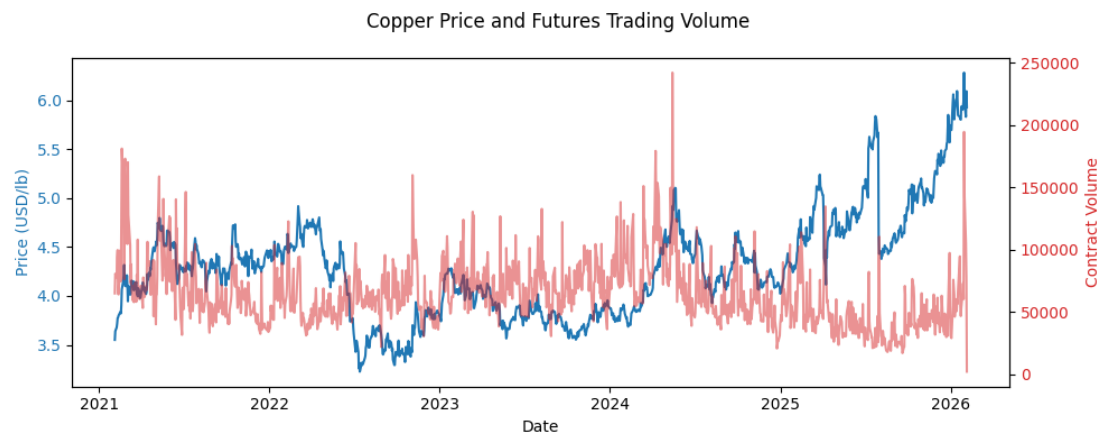


Drawdown Figure A3: Drawdown relative to the running peak. The maximum drawdown reached about - 34 % in July 2022.

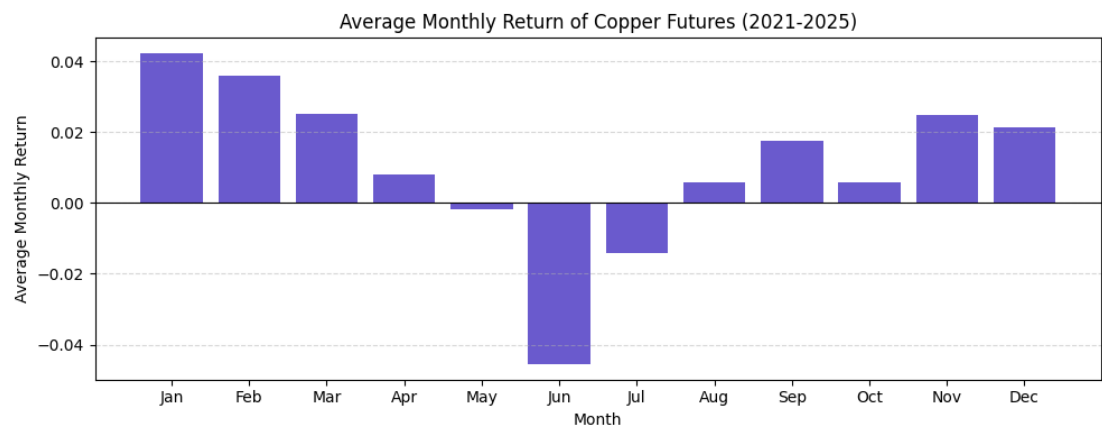
## Driver Proxies and Seasonality



Open interest and price Figure A4: Copper price versus futures open interest. Falling open interest during rallies hints at tight supply.



Volume and price Figure A5: Copper price versus trading volume. High volume accompanies sell-offs; low volume accompanies rallies.



Seasonality Figure A6: Average monthly return (2021-2025). Positive seasonality in Q1 and negative in mid-year indicate demand fluctuations.