Copper: Charting a course to $10,000/t

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The bull market for copper is now fully underway with prices up 50% from the 2020 lows, reaching their highest level since 2017. This current price strength is not an irrational aberration, rather we view it as the first leg of a structural bull market in copper. Going into 2021, the copper market should face the tightest market conditions in a decade owing to a substantial deficit (327kt). This will now be followed by a continuation in tight copper markets into 2022 (153kt deficit) and 2023 (35kt surplus). This period will be framed by a robust cyclical and policy driven demand environment set against already low inventories, a fast-approaching peak of base case mine supply and a falling dollar. We believe a significantly higher copper price is needed to help balance this structurally tight fundamental backdrop. Accordingly, we raise our 12-month copper target to $9,500/t ($7,500/t previously), and now expect a sustained, higher average price for both 2021 ($8,625/t average) and 2022 ($9,175/t average). We believe it highly probable that by 1H-2022 copper will test the existing record highs set in 2011 ($10,170/t). Higher prices should ultimately help defer peak supply and ease market tightness, but this first requires a sustained rally through 2021-22.

We see four key incremental drivers underpinning this bullish projection for copper prices. First, China's onshore market has tightened faster than our earlier expectations, driven by exceptional end-demand trends in 2H and greater government stockpiling. As a result, the continued strength in China's copper imports has destocked Western copper markets as regional demand has started to recover. We estimate China's net refined imports have reduced ex-China inventories by 1.5Mt over the past 2 years. Second, recent China policy announcements related to the 14th 5-year plan raised demand expectations for a number of key copper consuming sectors. These adjustments have tightened the 2022/23 balances, which means there should be no comfort in what follows the large 2021 deficit. Third, the concentrate market remains very tight — reflected in the recent roll over of annual benchmark terms at 10-year lows. Depressed TCRC's will continue to restrain primary metal supply growth next year, with mine supply likely to increase to only just above 2018-2019 levels. Finally, peak base case copper mine supply is fast approaching on the horizon (end of 2023) and is now closer than at any point in the last 20 years. This means the 10-year supply shortfall is now at a record level for copper. Only a very strong copper price signal can reverse the growth capex restraint that predominates the mining sector currently, to then defer peak supply and reduce the long-term supply shortfall.

The path to $10,000 will not be without hurdles, however. In the near term, a seasonal slowdown in copper demand should ease tightness in the refined market as Western producers look to offload additional inventory by year-end. If the Chinese import arb remains closed, they will likely deliver into LME warehouses driving up on-exchange stocks. Chinese on-shore stocks are also likely to rise during the Chinese New Year holiday. While simply a transitory softening, together they may restrain sentiment in 1Q next year. In addition, copper prices will face a sustained scrap headwind moving into 2021 as a vaccine drives a V-shaped recovery and higher copper prices incentivize marginal supply. This growth in scrap supply (expected to continue through 2022) is incorporated in our estimated deficits for both years. Finally, we expect several periods of price consolidation after market positioning becomes overextended. That being said, with Chinese investor participation only just emerging and still limited Western discretionary involvement, we believe speculative length in the market is some way from its limit.

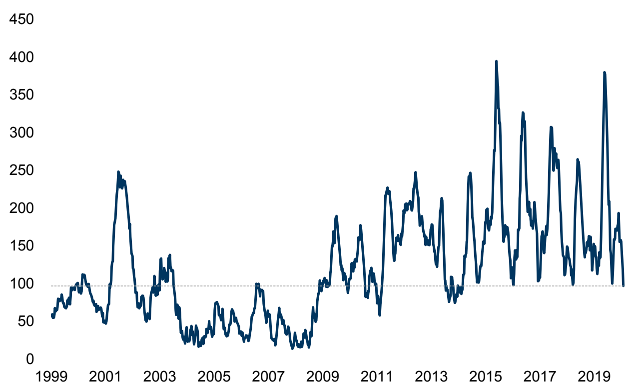
Exceptional Chinese demand alongside strategic stockpiling has accelerated re-tightening in the onshore refined market

China's refined copper demand strength has been a key factor driving the tightening trends and price support through the COVID shock in 2020. From mid-2020, the Chinese market entered a destocking phase, as the downstream part of the supply chain positioned to digest the cathode stock built somewhat opportunistically in 1H. At the start of 3Q, a weaker import arb amid depressed onshore premiums and rising bonded copper stocks raised risks that Chinese imports would fall below the 300kt/mth threshold required to keep Western markets in deficit. However, China continued to destock the West as imports remained strong, while visible stocks began to fall sharply at the start of 4Q. This tightening of the onshore market now points to an earlier than expected inflection in Chinese refined copper imports in mid-2020 — we now see import growth stabilizing and rebounding in 1Q2021, just as Western demand recovers in the first half of 2021.

The above-expectations tightening is the result of a combination of strong end user demand and government stockpiling. In a push to sustain a full recovery from lockdowns at the start of the year, COVID-related stimulus is driving property and infrastructure construction and, hence, refined copper demand. Recent data suggests China end-user copper demand will rise 3% this year (versus 2% previously) and end-demand related primary refined copper consumption rose 6% y/y (reflecting scrap tightness). As part of the government's broader move to secure versatile supply chains, we believe SRB stockpiling will be 600kmt for the year, up from our prior 300kmt estimate. These stronger demand numbers are important as they more completely explain the final destination for higher Chinese imports, leaving us confident that there has not been a large unexplained refined metal inventory build in the onshore market that could be a material downside risk to price.

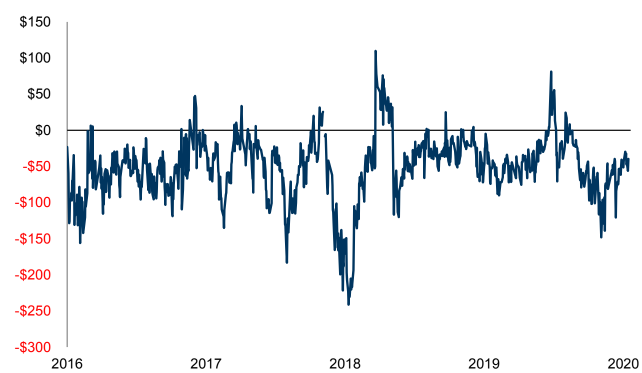
Looking forward into 2021, we now estimate that China's end demand for copper will grow 3.6% y/y next year, with robust support from property/infrastructure in 1H as well as strong y/y revival in consumer related sectors (autos, home appliances). Given our expectations of materially higher prices for 2021, we do expect a recovery in scrap (or secondary) supply back near 2019 levels. This additional scrap supply acts as a headwind to primary end-user demand, which we expect to grow just under 2% y/y. SRB copper purchases are likely to be substantially lower in 2021 (GSe 150kt) than in 2020 (GSe 600kt). In this context, we expect China's net refined copper imports to fall from 4.4Mt in 2020 (360kt/mth average) to 3.7Mt in 2021 (310kt/mth). This will still be the second highest annual volume of refined copper imports in China's history (equal with 2018), helping keep the ex-China refined market in a deficit. Trader feedback has supported this projection, with indications that the Chinese are planning to take at least the same level of contracted refined volumes in 2021 as in 2020.

Exhibit 1: SHFE Copper inventories have fallen to the lowest in 7 years
SHFE Copper Stocks, kmt



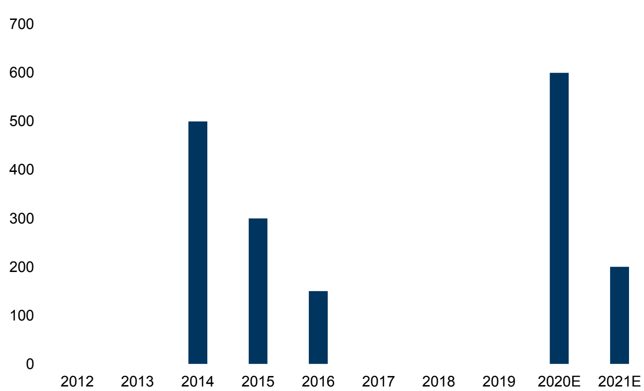
Source: SHFE, Bloomberg, Goldman Sachs Global Investment Research

Exhibit 2: China copper import arb trending back towards open in late Q4
SHFE/LME Import Arbitrage $/t



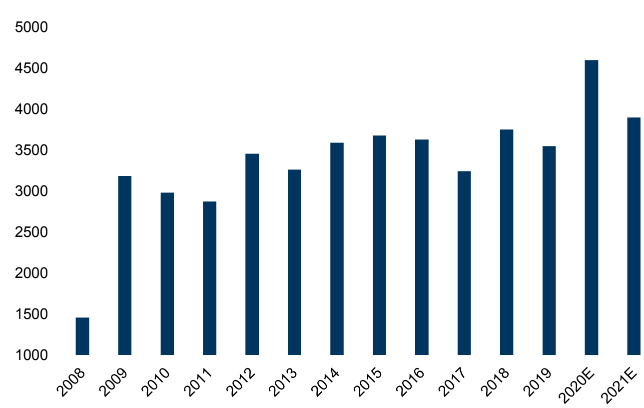
Source: Wind, SHFE, LME, Goldman Sachs Global Investment Research

Exhibit 3: China SRB copper purchases likely to continue in 2021 albeit at lower levels than 2020
China Strategic Reserve Buying, annual kmt



Source: Wind, Goldman Sachs Global Investment Research

Exhibit 4: China refined copper imports expected to moderate next year but still at the second highest level on record
China Refined Copper Net Imports (kt)



Source: Wind, Goldman Sachs Global Investment Research

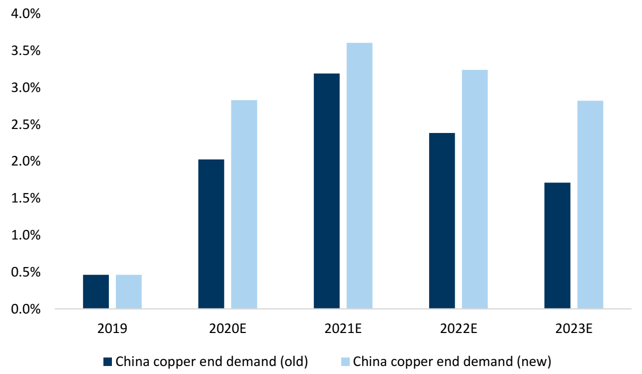
China demand upgrades on 5YP policy goals, tightening mid-term balances

Looking out beyond 2021, we see a structural rise in Chinese demand for copper as a result of the preliminary focus of their 14th 5-year plan. We now project China copper end demand to grow 3.2% y/y in 2022 (2.4% previously) and 3% in 2022 (1.7% previously). In volume terms, these demand upgrades amount to onshore consumption additions of 120kt in 2022 and 165kt in 2023. Unlike-in previous iterations, the current five-year plan is likely to offer a supportive environment for copper prices, synchronized across support for traditional demand channels and emergent sectors such as renewables and EV's. As the precise targets emerge at the NPC in March of next year, we see the risks skewed towards even more upgrades to demand.

Initial discussions of the National Party Congress' 14th Five-Year plan indicate 5 key areas for copper consumption growth: **1)** continued focus on urbanisation with Western levels still targeted (currently there is a ~60% urbanisation rate in China compared to 80% plus in the West), in turn providing continued support for related property and infrastructure construction; **2)** transportation and infrastructure investment related to rural upgrading, with probable support for rail investment as well as auto/home appliance sales incentives; **3)** new technology and related manufacturing capacity investment, in particular the build out of infrastructure related to 5G and required grid expansions; **4)** green electrification investments to achieve emissions reduction goals, with copper benefiting from higher intensity of use in solar/wind power and electric vehicles and; **5)** diversification in the purchases of key resources and strategic stock building, ultimately providing continued to support for SRB copper inventory builds.

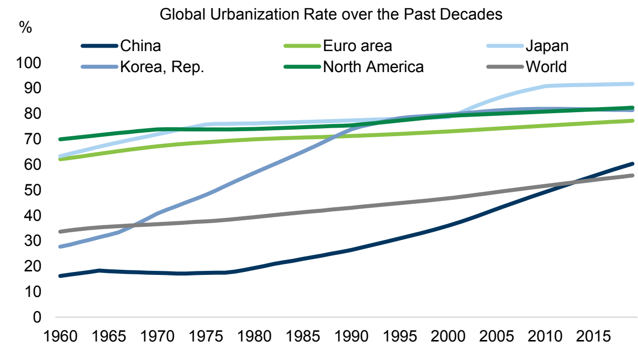
From the above demand drivers, we think the greatest upside risk to our demand forecasts relates to the green electrification agenda. There is still a lack of clarity on the precise levels of renewables investment that will be undertaken over the next 5 years but it is possible there could very sharp increased in related copper use. For example, according to analysis from our equity team, under bull/base/bear case scenarios the annual solar installation needed over 2021E-25E could reach 93GW/60GW/28GW (17%/18%/19% non-fossil fuel energy of primary energy), implying 465GW/300GW/140GW aggregate solar installation. Copper use in solar amounted to 160kt in 2019 and that figure is expected to rise to an average 324kt per year (under our base case for the next 5 years) but could rise to as high as 500kt per year. On new energy vehicles, the NDRC released EV development strategy 2021-2035 on November 2, the target noted that EV sales should account for 20% of total auto sales by 2025 in China. In that context, we expect copper demand in passenger NEVs to reach 520kt in 2025 from around 100kt in 2020, but that could accelerate depending on any potential sales incentives that are introduced.

Exhibit 5: China copper end demand stronger with 5YP policy support
China copper demand, revised growth yoy, GS estimates



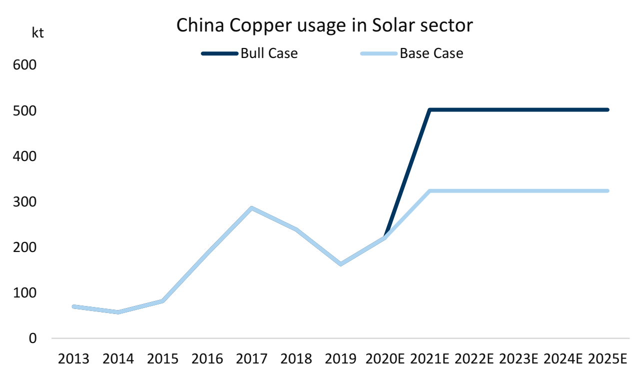
Source: Goldman Sachs Global Investment Research

Exhibit 6: Continued emphasis on urbanisation will be a positive for China copper demand in 2020's
% of population living in an urban area, annual



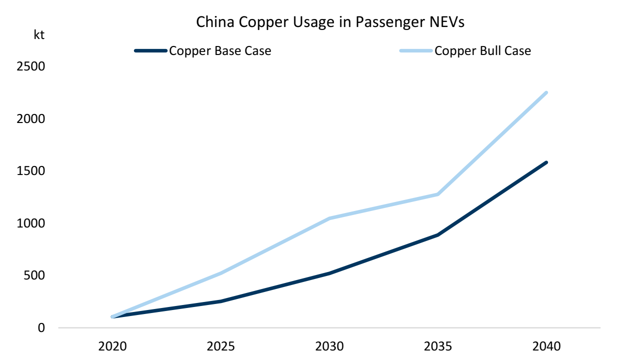
Source: World Bank, Goldman Sachs Global Investment Research

Exhibit 7: Copper use in solar set to trend higher through the 2020's



Source: Goldman Sachs Global Investment Research, Wind

Exhibit 8: EV related copper demand set accelerate over the next 2-3 years



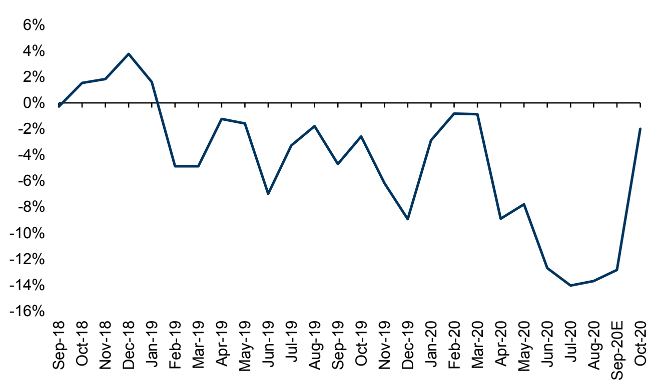
Source: Wind, Goldman Sachs Global Investment Research

Ex-China refined market destocked just as Western demand recovery emerges

In terms of ex-China copper refined market dynamics, there have been two key developments supporting our expectation for a strong Western demand recovery into next year and phases of significant tightness in regional markets. First and foremost, downstream demand has rebound materially from mid-September. Physical traders have noted consumer buying has returned to pre-COVID levels over the subsequent two-month period in the US and Europe. From a low raw material and product inventory starting point, Western consumers have increased metal purchases to align with sustained higher production but also to boost inventory levels. Progress on the vaccine side has clearly supported fabricator confidence on 2021 sales and subsequently raw material requirements. This has been reflected in Western manufacturing PMIs remaining in clear expansionary state over the period but also in sub components pointing to significant further ramps in production in the coming months. We expect developed market copper demand growth to revive from significant y/y contraction during the March-August period (-12% y/y) to close to flat y/y over the September-December period, before strong y/y growth emerges in 1H2021 against a weak base.

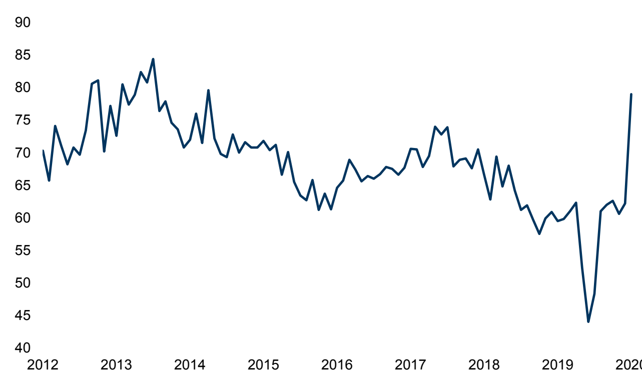
The second key development in the ex-China market has been the destocking impact from the extended phase of record China refined imports. We estimate that China's net refined imports (GSe 4.5Mt 2020) enacting on a pre-trade ex-China refined surplus 3.6Mt will leave the ex-China refined market in a 900kt post trade deficit. This follows a 600kt post trade ex-China refined deficit in 2019. Given that visible inventories in the West are largely unchanged over that two-year period (exchange stocks plus reported producer, consumer), the implication is there has been a large drawdown in non visible stock levels. Trader feedback has suggested that there is still ample cathode availability in the West with depressed premiums reflecting that current state. However, we think that position of relative comfort will change in 2021. The continued revival of Western demand alongside a rebound in China import demand in 1H2021 should generate a strong demand pull on the ex-China refined market. Scrap supply in the US and Europe has been a dampening influence in 2H2021. However, China's scrap import demand increase as well as rising demand from Western semi fabricators should help to limit further softness in the scrap market.

Exhibit 9: DM copper demand recovered sharply in September
DM copper demand growth yoy, an



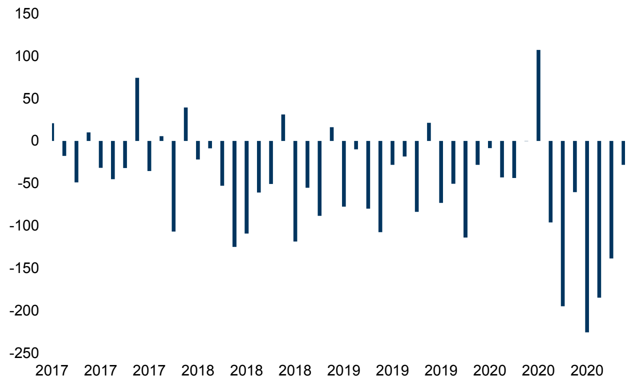
Source: CRU, Goldman Sachs Global Investment Research

Exhibit 10: US manufacturing output surge supporting revival in metals demand
Markit US Manufacturing PMI future output index



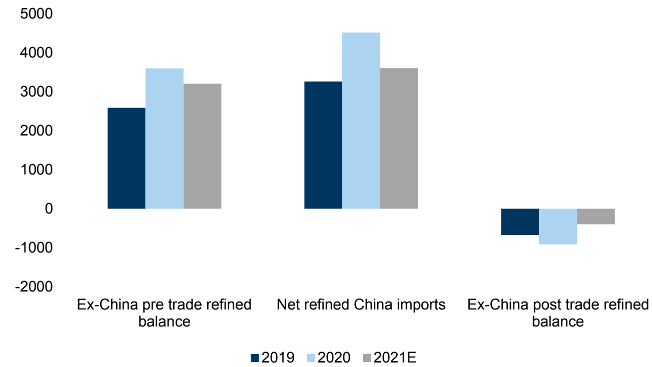
Source: IHS Markit, Goldman Sachs Global Investment Research

Exhibit 11: Ex-China refined deficit expands on record China imports in 2020
Ex-China refined copper balance, post trade, kmt



Source: Goldman Sachs Global Investment Research

Exhibit 12: Ex-China refined market set to remain in a post trade deficit in 2021
kmt



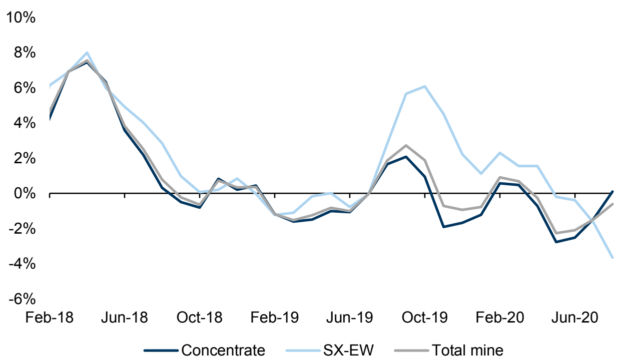
Source: Goldman Sachs Global Investment Research, Wood Mackenzie

Weakest phase in mine supply growth in 15 years set to keep concentrate market tight into 2021

Global copper mine supply is on track to fall just under 2% y/y in 2020 based on the latest production data. This means that over the 3-year period up to and including 2020, global copper mine output has risen on average just 0.7% y/y, the lowest mine supply growth rate on a 3-year rolling basis since 2006-08. Even with our projection for a 3% y/y rebound in global mine supply in 2021 (after applying a 5% disruption allowance), production volumes will only be just over 100kt above 2019 levels and the 3-year growth rate close to 0.5% y/y. In this context, we think it would be wrong to view the copper mine supply dynamic as a softening offset to strong demand next year. Given the starting point and limited growth, mine supply should continue to be a restraining influence on refined production growth via concentrate market tightness. Spot TC/RC's are trading as low as $40/4 currently, which are unprofitable terms for the majority of China's smelters. The benchmark TC/RC for 2021 was agreed in late November at $62/6.2, a rollover of 2020 terms and the lowest terms since 2011. This TC/RC level places margin pressures on the majority of the smelting sector. We believe this means an environment of continued restraint for the higher cost private smelters in China who have struggled with both financing and concentrate sourcing, and limits any growth in primary refined output.

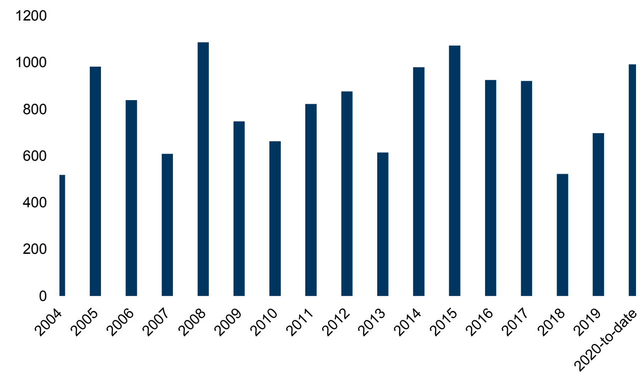
There remains an elevated risk that 2021 mine supply could disappoint, in our view. First, even with the progress on a COVID vaccine, we think it is unlikely that a vaccine will be deployed before 2H next year in some of the key copper mining locations in the Southern Hemisphere particularly in the Latam region. Second, feedback from producers continues to point to a negative production effect in 2021/22 from cuts to maintenance projects and pre-stripping this year as current production was prioritized. So far downgrades to production guidance for 2021 have been limited on this basis. However, we believe there are elevated risks in the full year 2020 results period (in Q1-21) that such adjustments may start to emerge. Third, there remains an elevated risk of labour strikes in Chile with 2.2Mty of mine capacity subject to contract negotiations in 2021. Fourth, there is a significant level of concentration in the production growth forecast for the 2021-22 period. Just 5 projects represent 70% of the total volume growth over the period which means setbacks at one of those operations could have an outsized impact on overall supply trend.

Exhibit 13: Weak global copper mine supply growth trends from late 2019
Copper mine supply growth, yoy an



Source: International Copper Study Group, Goldman Sachs Global Investment Research

Exhibit 14: Copper mine disruptions on track for near record level in 2020
Global copper mine supply disruptions, kt

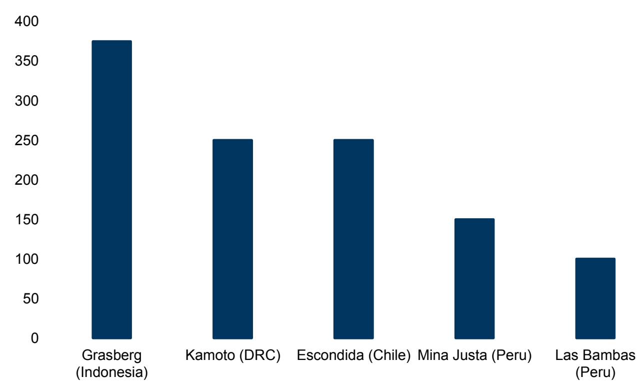


Source: Woodmac, Goldman Sachs Investment Research

Exhibit 15: Benchmark TCRC's for 2021 rolled over at decade lows from last year

Source: Woodmac, Goldman Sach Investment Research

Exhibit 16: Risks from heavily concentrated mine supply growth in 2021-22 (representing 70% volume growth)
Largest copper mine supply growth by project, kmt



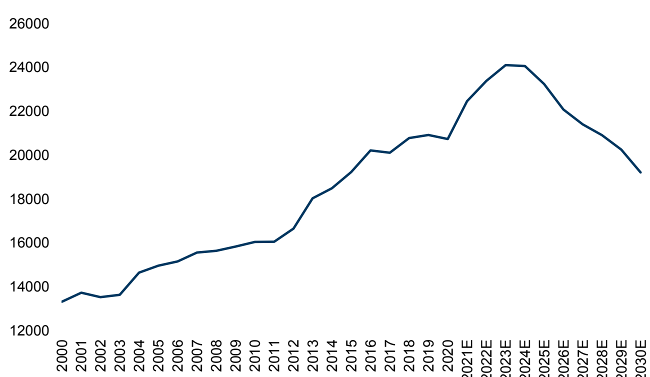
Source: Woodmac, Goldman Sachs Investment Research

Peak mine supply the closest on record, 10 year supply gap the highest ever

The other key supportive aspect to copper mine supply-side dynamics relates to the medium term outlook. Our current forecasts point to the prospect of base case mine supply peaking in 2023 before an open-ended contraction from 2024-25. On these base case numbers global mine supply would rise to 24Mt in 2023 but then fall to 22Mt by 2026 and 19Mt by 2030. To put this in context, we are currently closer to peak mine supply (3 years) than at any point in the previous 20 years. In addition, on our long term forecasts the ten-year supply gap (difference between base case supply and projected demand in 10 years time) is currently at a record 5.6Mt. The only previous point where the supply shortfall rose above 5Mt was back in 2005, which was followed by a two-year uptrend in prices similar to our current expectation for 2021-22. In other words, there has been a significant under-investment in copper supply projects relative to market requirements in the decade ahead.

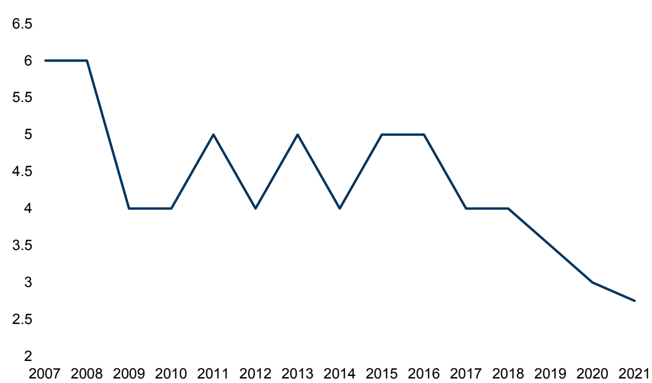
How has the copper market got into this position of facing a near-term supply crunch? There's not an absolute shortage of copper deposits, but rather it is a reflection of the mining sectors focus on deleveraging and balance sheet conservatism after the 2014-15 metals price collapse. This came after a surge in supply investment following the copper price rally in 2010-11. Committed copper related growth capex is on a downward path from 2021. Absent the COVID shock, we believe that upswing in growth capex would have started to play out this year but that has been setback by events this year. How high does copper have to trade to defer peak supply? We think copper prices are essentially past the point of preventing a y/y decline in global mine supply from 2023/24 into 2025 because the lead times on projects are too long – 3-4 years for brownfield additions (at existing mines) and 6-8 years for greenfield projects. Current copper price levels are on paper just about at the incentive price we estimate to get the right volume of supply approved to defer peak supply ($7500-8000/t). However, expanding growth capex is not a significant priority for mining companies at the moment given the ongoing COVID related issues to current production from cuts this year to maintenance capex, project suspensions and reduced labour forces at mine sites.

Exhibit 17: Global copper mine supply set to peak in 2023-24
Global copper base case mine supply, kt



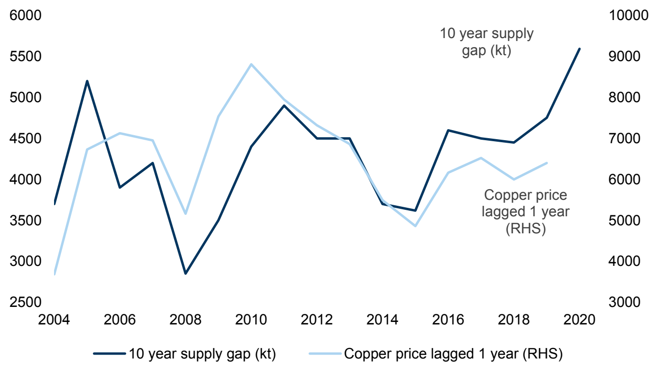
Source: Woodmac, Goldman Sachs Investment Research

Exhibit 18: Time to peak base case copper supply now shortest on record
Time from current year to beak base case global copper mine supply



Source: Woodmac, Goldman Sachs Investment Research

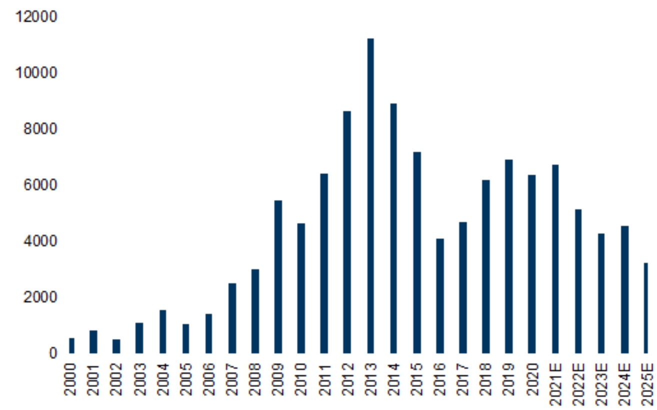
Exhibit 19: Record copper 10 year supply gap points to significant copper price support



Source: Woodmac, Reuters, Goldman Sachs Investment Research

Exhibit 20: Committed copper growth capex trending lower as peak supply approaches

Copper growth in capex, $ mn



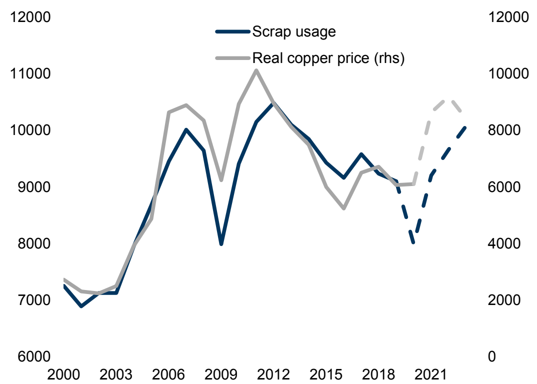
Source: Woodmac, Goldman Sachs Investment Research

Scrap supply set to increase on activity and price, refined deficit conditions to remain

A major headwind to our structurally bullish copper view remains the prospect of rapid scrap supply growth undermining two years of deficits. Initial signs of growing scrap supply are emerging with ex-China scrap discounts trending higher. However, this resurgent source of supply will not be enough to undo the upcoming copper market tightness, in our view. Unlike 2017 where a 400kt increase in global scrap supply prevented a deficit, we see a combination of strong demand and weak mine supply growth overwhelming our projected scrap response, even at our projected higher prices. Indeed, given the risks we have remained conservative about the speed and scale of the scrap supply response. Under our prior $7,500 price target we assumed a 1mn mt increase in scrap supply which now rises to 1.2mn mt in 2021 under our higher price forecast. In contrast, scrap supply after the GFC reached 2007 levels only by 2012 despite record high copper prices, underscoring the conservative nature of our assumptions.

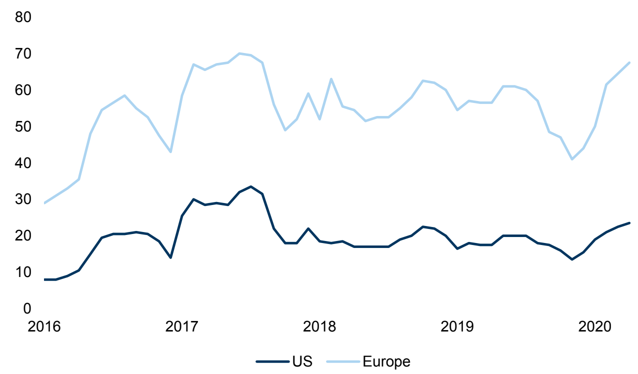
Given this conservative estimate, there remain clear downside risks to our projected scrap supply, and hence upside potential in copper prices. Despite the recent release of HS import codes for copper scrap, trade remains plagued by uncertainty as interpretation and enforcement of the new legislation has not yet occurred. The subsequent uncertainty has restrained western merchant's appetite for sending scrap cargoes to China. This raises the risk of extending the scrap supply disruption into 2021. In addition, it is likely the supply elasticity of scrap has fallen since 2016-17, with lower scrap stocks built up due to depressed economic activity. Finally, as DM economies (producers of scrap) lag China's growth (consumer of scrap) due to second lockdowns, the scrap supply response will remain curtailed into 1Q21. In sum, we have forecast a significant rebound in scrap supply next year but there are factors which may restrain this supply response. Moreover, our global deficit forecasts remain even with the scrap supply upswing assumed.

Exhibit 21: Scrap usage to rise with higher copper price



Source: Haver Analytics, Goldman Sachs Global Investment Research, Bloomberg

Exhibit 22: Scrap copper discount, $/mt



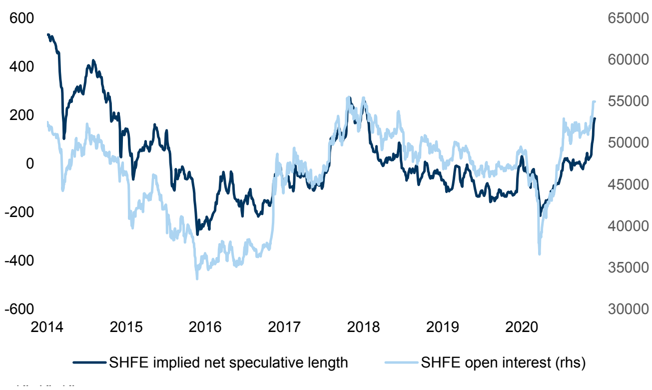
Source: CRU, Goldman Sachs Global Investment Research

Stretched investor positioning a transitory headwind, resultant consolidation phases lie ahead

A large concern among investors over copper's potential upside remains the overextended positioning in both Chinese and Western copper markets. Across the LME and COMEX net length is close to the highs of 2017, while the latest leg higher in copper has been driven in large part by a sharp rise in SHFE copper open interest. Leveraging changes in open interest and on shore flat prices we built an implied estimate of SHFE net length that indicates a similarly stretched positioning albeit still someway below record levels. Together these positioning indicators raise the risk of a near-term technical correction in prices as investors take-profit. However, with such structurally sound fundamentals we expect positioning to remain broadly elevated and trend length to remain positive. When set against global PMI's, copper length remains in line, and we expect further support from the broad macro environment, with our economists expecting a positive global growth outlook over the next few years.

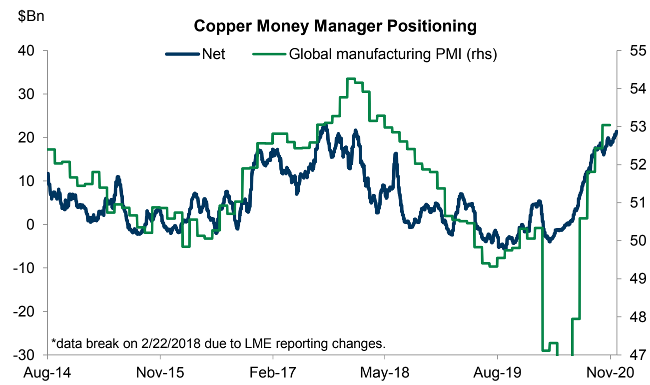
Leveraging the shape of the forward curve, our supply and demand model and speculative positioning analysis, we create a forward-looking copper price model to map the path to $10,000. Underlying this path are our assumptions on falling on-exchange inventories, a period of consolidation in the new year when investors take profit, and our FX strategists' outlook for a falling dollar and strengthening CNY. Tightening on-exchange inventories will also raise timespreads, in our view. As a result we reiterate our Long Copper GSCI ER SubIndex recommendation which will likely benefit from additional carry in the copper curve. The push and pull between these various drivers will likely generate price volatility in the near term, but ultimately draw copper further down the path to $10,000, in our view.

Exhibit 23: Chinese investor interest in copper markets has grown in recent months



Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 24: Copper investor length has extended with better global growth trends



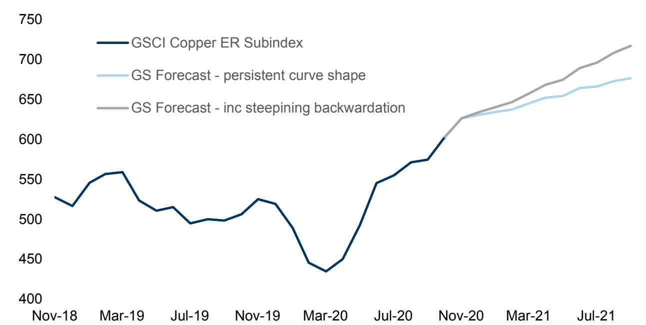
Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 25: An estimate for copper's path to $10,000

Estimate produced by forecasting copper price growth vs independent variables, and rolling forward from current copper prices

Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 26: Steepening backwardation should generate outperformance in our Copper SubIndex trading recommendation



Source: Goldman Sachs Global Investment Research

Copper market balance

Exhibit 27: Goldman Sachs Copper Supply and Demand Model

('000 tonnes)	2012	2013	2014	2015	2016	2017	2018	2019	2020E	2021E	2022E	2023E
Consumption - DM												
US	2081	2117	2102	2104	2107	2113	2127	2155	1983	2102	2217	2317
% change y/y	*-0.3%*	*1.7%*	*-0.7%*	*0.1%*	*0.1%*	*0.3%*	*0.7%*	*1.3%*	*-8.0%*	*6.0%*	*5.5%*	*4.5%*
Europe	5130	5125	5186	5026	5040	5166	5259	5047	4542	4815	5080	5232
% change y/y	*-5.8%*	*-0.1%*	*1.2%*	*-3.1%*	*0.3%*	*2.5%*	*1.8%*	*-4.0%*	*-10.0%*	*6.0%*	*5.5%*	*3.0%*
Japan	1427	1438	1503	1433	1405	1458	1450	1392	1253	1328	1394	1436
% change y/y	*-2.7%*	*0.8%*	*4.5%*	*-4.7%*	*-2.0%*	*3.7%*	*-0.6%*	*-4.0%*	*-10.0%*	*6.0%*	*5.0%*	*3.0%*
Other DM	2339	2361	2313	2252	2279	2328	2234	2089	1880	2012	2113	2166
% change y/y	*-6.2%*	*0.9%*	*-2.0%*	*-2.6%*	*1.2%*	*2.2%*	*-4.1%*	*-6.5%*	*-10.0%*	*7.0%*	*5.0%*	*2.5%*
Sub- DM	10977	11041	11104	10815	10831	11065	11069	10683	9658	10256	10804	11151
% change y/y	*-4.5%*	*0.6%*	*0.6%*	*-2.6%*	*0.1%*	*2.2%*	*0.0%*	*-3.5%*	*-9.6%*	*6.2%*	*5.3%*	*3.2%*
Consumption - EM												
China	10650	11525	12155	12435	12816	13326	13710	13930	14320	14822	15296	15755
% change y/y	*5.8%*	*8.2%*	*5.5%*	*2.3%*	*3.1%*	*4.0%*	*2.9%*	*0.5%*	*2.8%*	*3.5%*	*3.2%*	*3.0%*
Other EM	4329	4366	4522	4620	4691	4769	4883	4963	4466	4801	5065	5268
% change y/y	*1.6%*	*0.8%*	*3.6%*	*2.2%*	*1.5%*	*1.7%*	*2.4%*	*1.6%*	*-10.0%*	*7.5%*	*5.5%*	*4.0%*
Sub- EM	14979	15891	16677	17055	17508	18095	18593	18893	18787	19623	20361	21023
% change y/y	*4.5%*	*6.1%*	*4.9%*	*2.3%*	*2.7%*	*3.4%*	*2.7%*	*1.6%*	*-0.6%*	*4.5%*	*3.8%*	*3.2%*
Global Consumption	25957	26932	27781	27870	28338	29160	29662	29576	28445	29879	31165	32174
Direct Global Scrap Use	6370	6207	6153	5940	5756	6106	6136	6047	5140	6091	6395	6670
Refined Global Consumption	19586	20725	21628	21930	22583	23054	23526	23529	23305	23789	24770	25503
% change y/y	*-0.1%*	*5.8%*	*4.4%*	*1.4%*	*3.0%*	*2.1%*	*2.0%*	*0.0%*	*-1.0%*	*2.1%*	*4.1%*	*3.0%*
Global Production												
Mine Production	16650	18028	18485	19231	20220	20118	20786	20929	20535	21064	22129	22781
% change y/y	*3.7%*	*8.3%*	*2.5%*	*4.0%*	*5.1%*	*-0.5%*	*3.3%*	*0.7%*	*-1.9%*	*2.6%*	*5.1%*	*2.9%*
Refined Copper	20146	20780	21755	22031	22742	22992	23472	23377	23212	23462	24617	25538
% change y/y	*2.0%*	*3.1%*	*4.7%*	*1.3%*	*3.2%*	*1.1%*	*2.1%*	*-0.4%*	*-0.3%*	*1.1%*	*4.9%*	*3.7%*
Global Balance	**560**	**55**	**127**	**101**	**159**	**-62**	**-54**	**-152**	**-93**	**-327**	**-153**	**35**
Cash Prices (annual average)												
Current Dollars ($/t)	7949	7322	6862	5494	4862	6166	6532	6000	6000	8625	9175	8200
Current Dollars (c/lb)	361	332	311	249	221	280	296	272	272	331	340	340

Source: Goldman Sachs Global Investment Research, Wood Mackensie

Disclosure Appendix

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We, Nicholas Snowdon, Jeffrey Currie, Daniel Sharp and Mikhail Sprogis, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

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