Commodity Watch

Irrational Expectations

- **Irrational expectations make for unsustainable prices.** In economics, price expectations are rational when the agent has the correct model for how prices are set. As a result, the effect of their actions - more or less demand and supply - on prices is consistent with those expectations, forming an equilibrium on average. Yet when the model is incorrect, prices move away from expectations as inconsistent behavior leads to unexpected outcomes. Today, commodity markets appear to hold irrational expectations, as prices and inventories fall together, demand beats expectations and supply disappoints.

- **From hoarding to destocking.** The only rational explanation in our view is destocking as commodity consumers deplete inventories at higher prices, believing they can restock once a broad softening creates excess supply. Yet should this prove incorrect and excess supply does not materialize as we expect, the restocking scramble would exacerbate scarcity, pushing prices substantially higher this autumn potentially forcing central banks to generate a more protracted contraction to balance commodity markets. Instead, markets appear to be pricing a soft landing outcome; minimal further increases in interest rates, dissipating inflation and sufficient economic growth to keep earnings well-supported into 2023. In our view, macro markets are pricing an unsustainable contradiction – it is difficult to square a softening FCI, a more accommodative Fed pivot, falling inflation expectations and drawing commodity inventories.

- **Cross-market curve shapes send warning to investors.** For the majority of the business cycle, physical and monetary futures curves mirror one another. During slowdowns when the yield curve is 'flattening' into backwardation, commodity markets should be softening into contango. Equally, commodity markets tend to tighten most in the expansion phase of the business cycle, turning into backwardation as future rate expectations rise and the yield curve 'steepens' into contango. In those periods where the yield curve flattens and a recession does not materialize (1995, early 2007), oil markets can surge into further backwardation and yield curves steepen, as markets reprice the extent of tightening yet to come. Inversely, when a real fundamental slowdown is occurring commodity markets are generally in contango and physical supply chains are debottlenecking. Today, equity and commodity markets are signaling to investors more persistent demand and higher commodity inflation, while rates

Jeffrey Currie
+44(20)7552-7410 |
jeffrey.currie@gs.com
Goldman Sachs International

Daniel Sharp
+44(20)7774-1875 |
daniel.sharp@gs.com
Goldman Sachs International

Damien Courvalin
+1(212)902-3307 |
damien.courvalin@gs.com
Goldman Sachs & Co. LLC

Samantha Dart
+1(212)357-9428 |
samantha.dart@gs.com
Goldman Sachs & Co. LLC

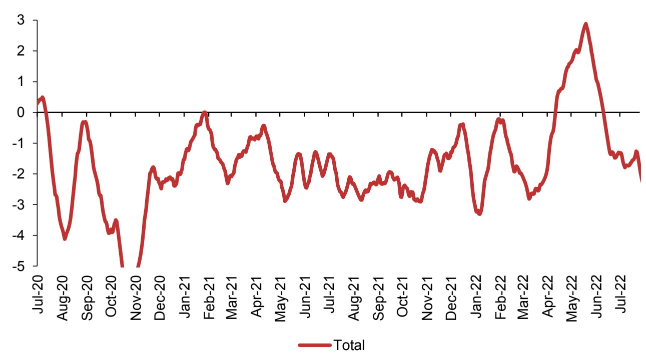
Mikhail Sprogis
+44(20)7774-2535 |
mikhail.sprogis@gs.com
Goldman Sachs International

and inflation curves are signaling an impending slowdown and softening of the economy. Until we see real commodity fundamentals soften, we remain convicted of the former, not the latter. We forecast S&P GSCI to rally 23.4% by year end.

Irrational Expectations

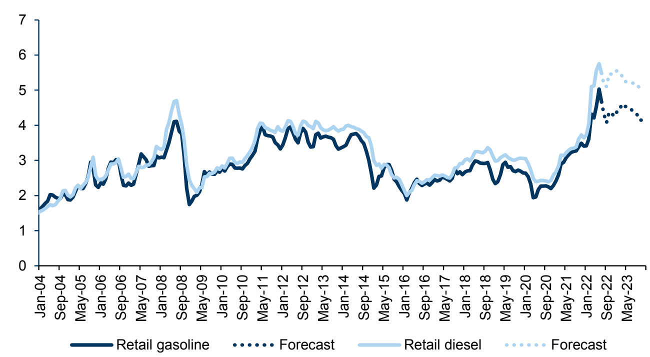
1. Irrational expectations make for unsustainable prices. In economics, price expectations are rational when the agent has the correct model for how prices are set. As a result, the effect of their actions - more or less demand and supply - on prices is consistent with those expectations, forming an equilibrium on average. Yet when the model is incorrect, prices move away from expectations as inconsistent behavior leads to unexpected outcomes. Today, commodity markets appear to hold irrational expectations, as prices and inventories fall together, demand beats expectations and supply disappoints. Such a model of prices is only rational under an assumption of a near-term sharp fall in demand, for which there is scant evidence. The only rational explanation in our view is destocking as commodity consumers deplete inventories at higher prices, believing they can restock once a broad softening creates excess supply, a dynamic apparent in metals and agricultural markets today. Yet should this prove incorrect, and excess supply does not materialize as we expect, the restocking scramble would exacerbate scarcity, pushing prices substantially higher this autumn potentially forcing central banks to generate a more protracted contraction to balance commodity markets.

Exhibit 1: Stock draws (especially including China) remain at or deeper than seasonal levels since June
Rolling 4-week global observable inventory change vs. 2017-19 seasonal (mb/d).



Source: Kpler IEA JODI EIA PJK ARA PAJ IE Singapore Fujairah Oilchem Goldman Sachs Global Investment Research

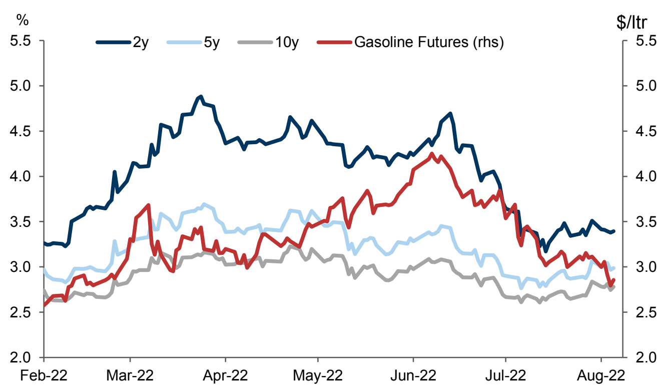
Exhibit 2: We forecast retail gasoline prices rallying into year end, before easing in 2023
US retail gasoline and diesel price forecasts (USD/gal)



Source: EIA, Goldman Sachs Global Investment Research

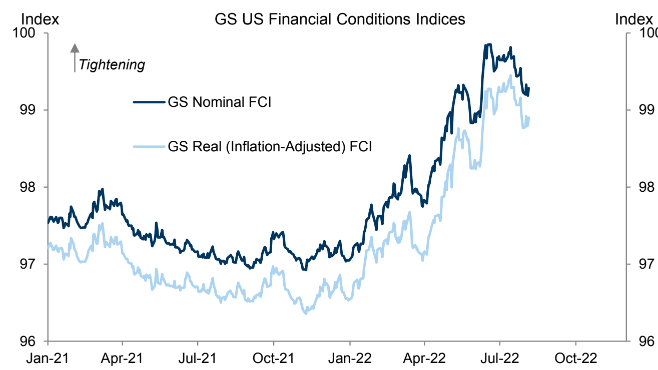
2. Macro markets generate commodity tail risk. Moreover, as our strategists point out, macro markets in general seem inconsistent. Today, markets appear to be pricing a soft landing outcome; minimal further increases in interest rates, dissipating inflation and sufficient economic growth to keep earnings well supported into 2023. In our view, macro markets are pricing an unsustainable contradiction – it is difficult to square a softening FCI, a more accommodative Fed pivot, falling inflation expectations and drawing commodity inventories. Yet equity and bond rallies are fundamentally stimulating to real activity, potentially offsetting the impact of recent Fed rate hikes. In a similar vein, any further decline in commodity prices suppresses demand destruction and disincentivizes additional supply, the opposite of the rational reaction to tightening fundamentals. As a result, we see growing tail risks to commodity prices inherent in the scenario of sustained growth, low unemployment and stabilised household purchasing power. With the Russian oil embargo fast approaching, heat stress on US crops growing and Chilean copper production down 5%, for commodity markets to be rational, we believe demand expectations must be far lower than equities markets suggest. Indeed, we estimate commodities are currently pricing a 3% decline real activity, not yet offsetting our economists expected return in Chinese economic momentum. Unlike in Keynes quote, in the physical world markets cannot stay irrational longer than the consumer has physical inventory, which is nearing critical levels across all markets.

Exhibit 3: Inflation expectations of all maturities are lower than they were in June, driven in part by lower gasoline prices



Source: Bloomberg, Goldman Sachs Global Investment Research

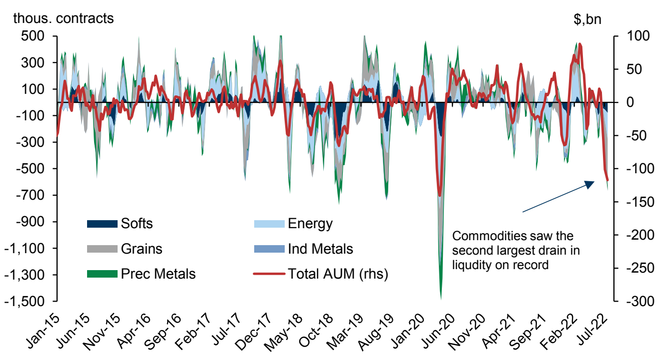
Exhibit 4: FCI has been stimulative in the last four weeks



Source: Goldman Sachs Global Investment Research

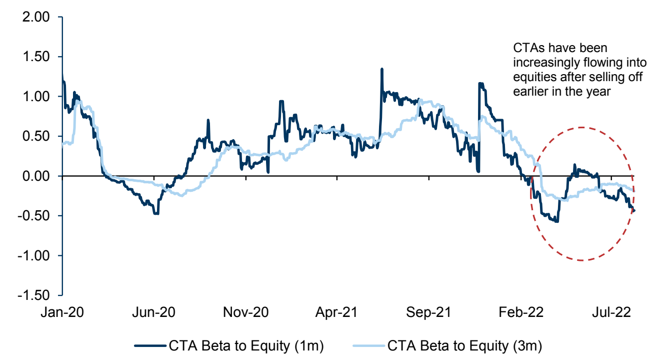
3. Liquidity destocking exacerbates macro mispricing. Recession expectations made June the second worse month (after March 2020) for commodity returns in the last 8 years, with the S&P GSCI TR index falling 10.4%. Since then returns have been relatively fat and flat. Yet as we pointed out at the time, this sell off appeared overdone, driven more by a broader cross-asset risk off amid rapidly rising interest rates than reflective of underlying fundamentals. A similar sell off occurred in equities. Indeed, we view these commodity pricing dynamics of low liquidity, CTA dominated trading as the result of cash hoarding by investors who (rationally) expect a decline in liquidity supply from the Fed to ultimately lower the value of risk assets more broadly. Yet such cash hoarding overweight's the influence of trend-following, particularly in commodities where their weights are larger share of OI, fundamentally agnostic algorithms with ultra-short term expectations of sustained price momentum. Facing an irrational set of price signals, commodity investors remain cautious on where fundamentals are today, let alone where they might go. In our view, one of two paths can occur in commodity markets today; either fundamentals deteriorate sufficiently to match current pricing, or low prices accelerate already tight fundamental trends to force a physical shock on financial commodity markets, driving prices up sharply. Today, commodity markets – oil and copper in particular – are in a race between falling stockpiles and slowing macro activity. With now lower prices helping to drive restocking demand onshore in copper and higher jet and heating demand in oil, we are waiting for a physical recession to solve current tightness without a scarcity price surge.

Exhibit 5: Commodities have faced one of the sharpest liquidity drains on record
6wow change in total (long/short) Managed Money lots traded by comnmodity sector, and 6wow change in total $ AUM (long/short)



Source: CFTC, Goldman Sachs Global Investment Research

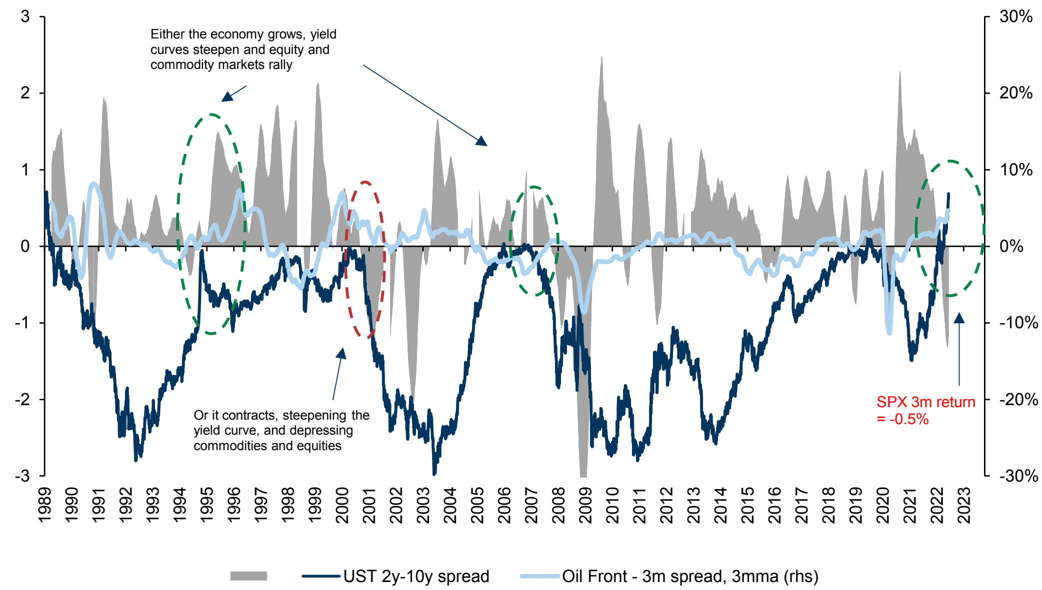
Exhibit 6: CTA activity has been rising in equities suggesting increasing engagement with recent trends
Rolling Beta on multivariate regression of bonds, equities, commodities with Barclays CTA Hedge Index



Source: Datastream, Goldman Sachs Global Investment Research

4. Cross-market curve shapes send warning to investors. Beyond the simple direction of prices remaining inconsistent across macro markets, futures prices - from commodities to the yield curve - indicate a repricing of macro risk remains high. It is important to remember that, for the majority of the business cycle, physical and monetary futures curves mirror one another. During slowdowns when the yield curve is 'flattening' into backwardation, commodity markets should be softening into contango. Equally, commodity markets tend to tighten most in the expansion phase of the business cycle, turning into backwardation as future rate expectations rise and the yield curve 'steepens' into contango. At their inflection points - just before peak tightness in commodity markets and peak rates - they correlate, just as they are today. Yet in those periods where the yield curve flattens and a recession does not materialise (1995, early 2007), oil markets can surge into further backwardation and yield curves steepen, as markets reprice the extent of tightening yet to come. Inversely, when a real fundamental slowdown is occurring commodity markets are generally in contango and physical supply chains are debottlenecking. For more than a year, we have been highlighting the high and persistent level of backwardation in many commodity markets as evidence of scarcity. While this scarcity premium has softened from its most acute in 2Q22, it remains historically elevated, generating 20% annualized returns for passive investors. Yet we believe this scarcity is a function of the under-investment, and will persist without a sharp downturn in real demand levels. Accordingly, equity and commodity markets are signaling to investors more persistent demand and higher physical inflation, while rates and inflation curves are signaling an impending slowdown and softening of the economy. Until we see real commodity fundamentals soften, we remain convicted of the former, not the latter.

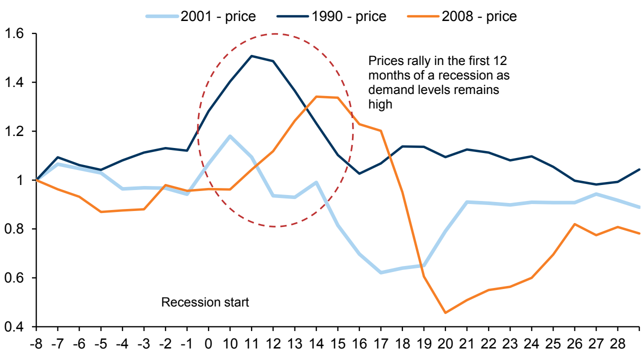
Exhibit 7: It is unlikely an equity rally, flattening yield curve and commodity backwardation can persist



Source: Bloomberg, Goldman Sachs Global Investment Research

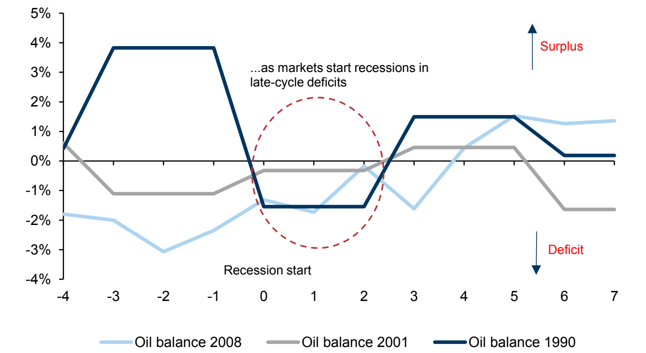
5. No structural shocks keep recession scenario's mild. While recessionary concerns by macro investors are understandable, we believe that investor concerns over the speed and scale of softening commodity markets are overstated. Indeed, outside of the incredibly rapid lockdown hit to demand in March 2020, each prior recession saw rallying commodity prices in its initial months (Exhibit 8) as demand remained above supply (Exhibit 9) until the 9/11 attacks and Lehman Bankruptcy - both exogenous shocks - sharply decelerated demand. In our view, today really is different, at least from the recent past. Outside the emergence of a hitherto unforeseen tail risk – a new virus or a sharp rise in geopolitical risk – it is unlikely we will see a repeat of the sharp – and persistent - shift in commodity fundamentals around 2001s terrorist attacks, 2008s credit crisis, or 2020s pandemic. Moreover, while high commodity prices are constraining overall activity – particularly in Europe and EMs – it is far from clear we are in a commodity-based recession. Oil demand remains healthy – growing yoy at 2.5mnb/d in 2022, while copper (+3.1%) aluminum and soybean (+1.5%) demand are all rising globally. In fact, of the major commodities, only corn and iron ore demand are expected to contract in the near term, as feed demand destruction and a weak Chinese property sector drive micro-related softening.

Exhibit 8: Outside of 2020, the past three recessions saw oil prices rally even as demand declined...



Source: Haver, Goldman Sachs Global Investment Research

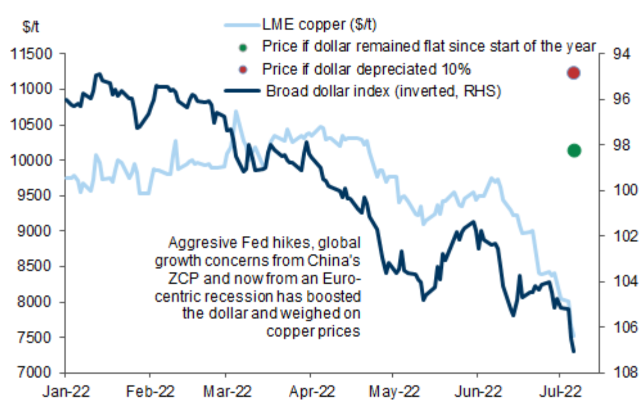
Exhibit 9: ...as commodity markets often start recessions in deficit, requiring outright demand contraction before rebalancing
Oil market balance as a % of demand, quarters before and after recession



Source: IEA, Goldman Sachs Global Investment Research

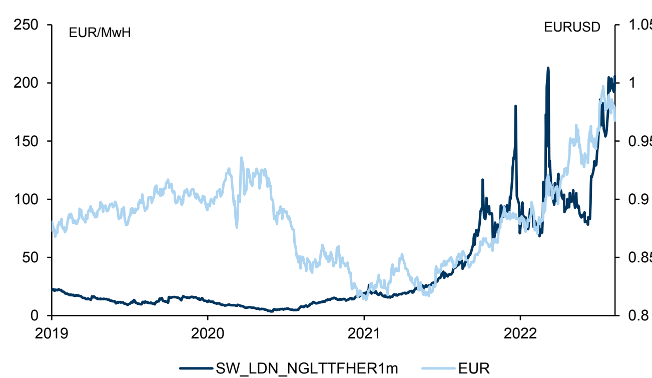
6. Euro-TTF is the new Dollar-Oil. Over the past six weeks, there has been an increasing focus by investors on the role the dollar is playing in commodity markets today, from grains to metals to oil. In prior super-cycles, the relationship between the dollar and commodities has occurred via oil – higher oil prices expanded the US trade deficit, channeling dollars to petro-states and fueling an expansion of the intra-EM credit system. This credit expansion fueled overall growth and hence oil demand. Yet today, the dollar is acting as an indicator of market risk aversion, and relative US outperformance vs a slowing China and gas-constrained EU. Indeed today, while the dollar-oil relationship is negative, we believe it is itself a function of the relationship between TTF and the euro. As NW-European gas markets tighten, recession risks rise, the ECB is increasingly constrained in its rate hiking path and the euro weakens (Exhibit 11), strengthening the trade-weighted dollar and raising risks of a recession that hits oil demand. More broadly, we believe that an effective dollar-commodity framework should center around the function of the dollar at any given time, as the dollar only occasionally impacts the fundamentals of commodities – as in grains today – but more often acts as a bellwether for macro sentiment and hence commodity positioning.

Exhibit 10: While the dollar has been driving copper prices in Q3...



Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 11: The Euro and TTF have moved closer together as tightening gas markets have driven the growth outlook

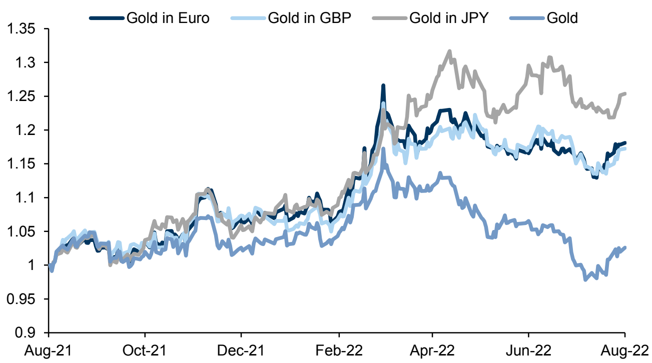


Source: Bloomberg, Goldman Sachs Global Investment Research

7. Russian gas disruptions now, but incentives for oil disruptions growing. The main reason we downgraded our oil price forecast to $110-125/bbl from $140-130/bbl was that Russian gas supplies disappointed while Russian oil supplies surprised to the upside, this created more product oil demand via oil-to-gas substitution which put more upward pressure on product prices and more downward pressure on crude prices as Russian crude exports remained firm. Note that Western reliance on Russian energy exports will wane over the next 6-12 months as alternative supply chains are formed. This provides Russia with a shrinking window to utilize its energy leverage over Europe. Cutting gas first creates more reliance on existing Russian oil exports, which then become disrupted by European sanctions in January, at peak natural gas demand. In addition, European energy policy reinforces our commodity supercycle thesis via the phenomenon we term the political economy of inflation. This is the policy shift from macroeconomic stability to social need during the pandemic that helped drive the rapid rise in physical consumption post-pandemic and the inflationary environment we are in today. While in recent months policymakers are once again discussing the importance of macro-stability in prices, their actions remains firmly anchored in the perspective of social need and solving the cost of living crisis. As a result, fiscal policymakers are looking to redistribute earnings from energy companies via windfall taxes and subsidies household energy consumption. While such policies are necessary to protect households in the short run, in our view, without forcing equivalent demand destruction elsewhere they simply exacerbate long run physical imbalances by dis-incentivising supply and limiting demand destruction.

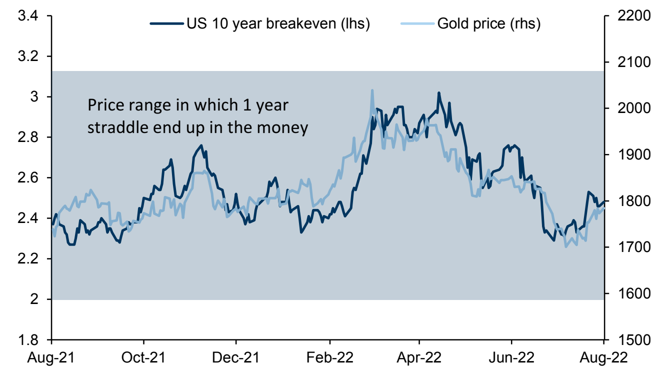
8. Gold balances between growth worries and real rates. Early this year we raised our 12m gold price forecast to $2500/toz on expectations that the US recession fear will boost gold investment demand. We argued that during past periods of Fed rate hikes recession risk was a more important driver of gold than real rates. This was indeed the case over the past 20 years. Part of the reason why recession risk worked so well was that real rates struggled to increase in a weak growth environment because the Fed was very sensitive to growth risks. Yet we underestimated market's willingness to give the Fed credit in its ability to drive inflation back to its target. The fall of inflation expectations back to the Fed's target level led to the most aggressive increase in long term real rates since 2013 and induced a 15% rally in the DXY. As a result, gold ended up roughly flat YoY as the spike in US real rates and recession fears nearly fully offset each other. In the current environment of tightening policy and persistent recession concerns the tactical direction of gold will be determined by shifts in Fed priority function between inflation fighting and growth support. Gold is likely to remain range-bounded as growth and tightening factors continue to offset each other. We, therefore, favor volatility selling strategies and recently opened a short September 2023 ATM straddle trade recommendation and simultaneously closed long Dec 2023 gold futures trade recommendation. Our forecasts are $1850/1950/1950/toz in gold and $21/23/25/toz in silver.

Exhibit 12: Gold was flat in dollars but up in currencies where CBs were not single-handidly focused on inflation risk
Indexed to 08//08/2022



Source: Bloomberg, Goldman Sachs Global Investment Research

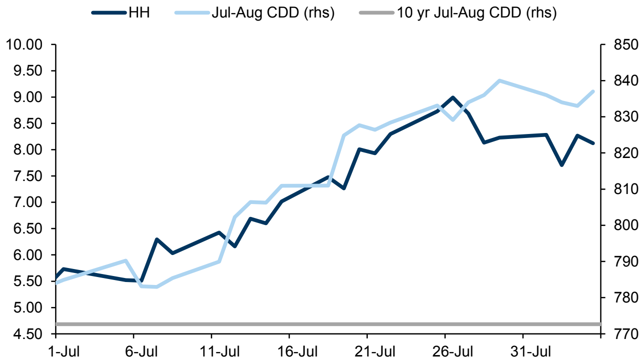
Exhibit 13: With the Fed shifting focus between inflation and growth depending on inflation risks, a rangebound trade in gold looks favourable
% lhs, $ rhs



Source: Bloomberg, Goldman Sachs Global Investment Research

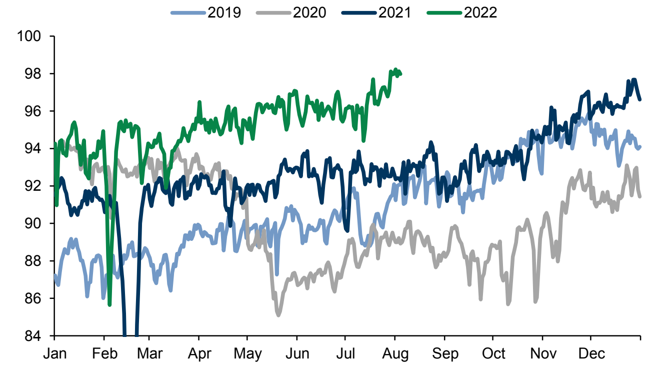
9. US gas enters the volatility trap. Over the last few weeks Henry Hub has endured sustained volatility exacerbated by low liquidity – exemplified by the Freeport announcement that merely confirmed prior information but led to a $0.7/mmBtu intra day move and sharp sell-off. Across July and August, US gas faced a significant $3.50 rally to $9/mmBtu driven by hotter weather forecasts, later reversed by milder weather and a tick up in US gas production. It's currently pricing at $8.19. Despite the enhanced volatility and higher prices, rising US production should offset the risk-premia induced by below average storage (3500Bcf). We maintain our $6.40/mmBtu Winter22/23 US natural gas prices forecast, below our $7.15/mmBtu balance-of-Sum22 forecast. In Europe however, we see additional volatility and the risk to sharply higher prices ahead. JKM has recently moved more consistently above French gas, reflecting the 14 mtpa Jul MoM increase in Asia LNG demand, above the 8 mtpa growth in supply – a move more closely tied to hot weather in South Korea and Japan than a rise in Chinese LNG imports. Throughout the rest of 3Q22 our economists see a sequential rebound in activity onshore, raising competition for molecules and lowering European imports from current levels. As a result, the European race for storage – currently on track to reach 90% capacity by end-Oct – will face further headwinds after a period of falling German re-exports which aided stockpiling in NW Europe ahead of winter months. This will in our view put the burden of European rebalancing back on demand. Yet with European demand elasticity disappointing vs our expectations over the past month, this suggests prices might need to remain higher for longer, posing upside risk to our 171/127 EUR/MWh 3Q/4Q22 TTF price expectations.

Exhibit 14: Hotter than average weather drove a large rally in US natural gas throughout July
HH and Cooling Degree Days, $/mmBtu and CDDs



Source: Bloomberg, Goldman Sachs Global Investment Research

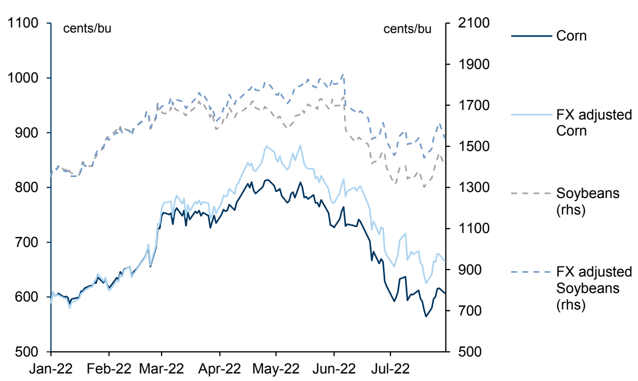
Exhibit 15: Rising US gas production should help offset draws from hotter weather
US dry gas production, Bcf/d



Source: Goldman Sachs Global Investment Research, Bloomberg

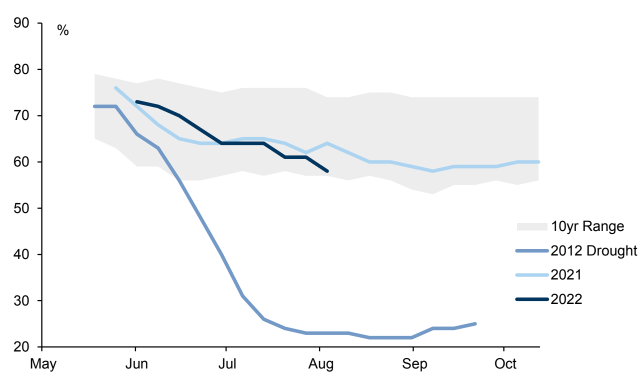
10. Grains caught between drought and the dollar. After a brief respite in late July, weather across the US corn growing region turned hotter and drier in August, shifting peak yield risk from corn into soybeans. With a 2-3% drop in yields enough to push expected corn and soy stocks-use ratios to all-time lows, grain balances are entering their final period of supply volatility for the coming marketing year. With soybean and corn crop conditions coming in below expectations this week (59% and 58% G/E, respectively), the impact of hotter weather is starting to affect expectations for next year's carryout, pulling new-crop prices in line with our forecast, with Sep22 corn up to 618c/bu (from $570/bu vs our $640/bu forecast) and Sep22 soy up to $15.09/bu (from $13.40/bu vs our $14.95/bu forecast). While we are increasingly constructive on the grains complex on the back of hotter weather, we believe the total upside to grains is capped by continued weakness in the export outlook, with US cumulative corn exports on track to finish August 350mn bu below last year. However, should dollar pressure ease and yields be realised below expectations, there remains a tail risk in US grains prices, particularly soybeans. We maintain forecasts of $6.50/bu in corn and $14.95/bu in soybeans for Sep 22, rising to $6.85 and $15.50/bu in Mar23.

Exhibit 16: US corn and soybean prices are closer to $7/bu and $16/bu to foreign buyers
Soybeans and corn adjusted by the broad Dollar Index to give a trade weighted



Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 17: US corn conditions have been falling
NASS Crop Condition survey, percent of crop rated Good or Excellent



Source: USDA, Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Jeffrey Currie, Daniel Sharp, Damien Courvalin, Samantha Dart 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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