



MKS PAMP
GROUP

Precious Metals Outlook

Metals forecasts for 2022

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1.

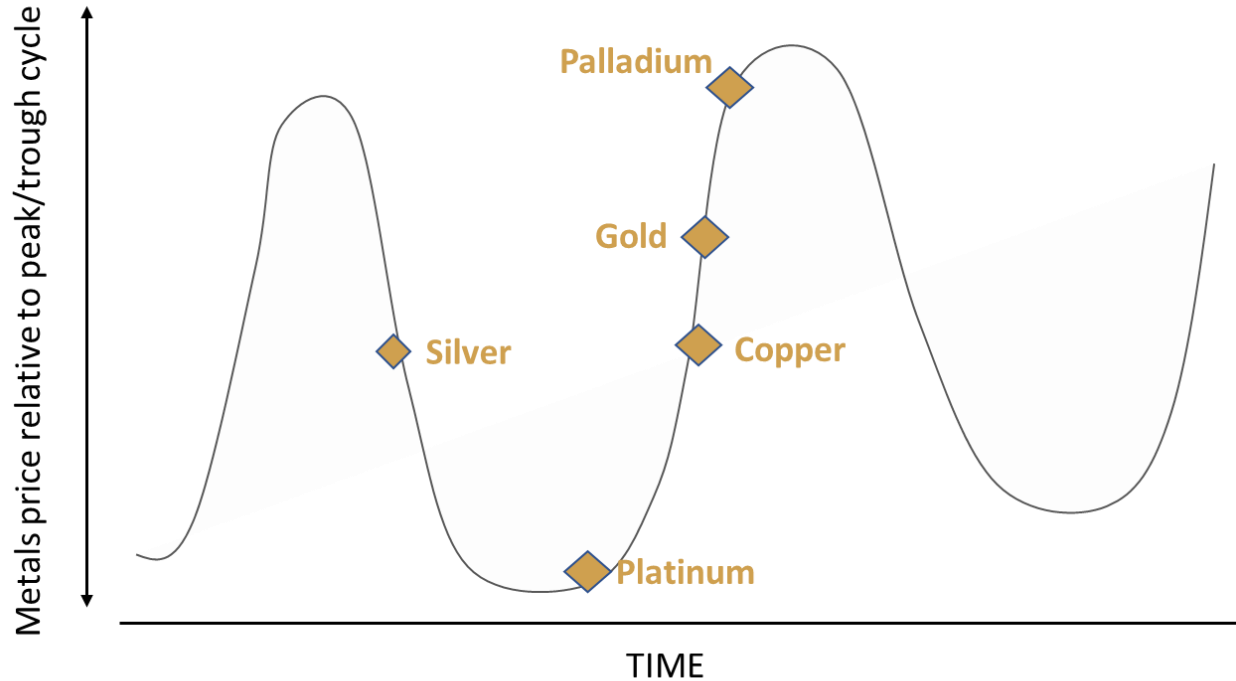
PRECIOUS FORECAST SUMMARY

Precious Metals in 2022: Outlook & Various Risk Profiles

Summary of Precious Metals						
	MKS PAMP Group 2022 Forecasts		Price, availability & volatility risk for consumers			The Streets Average forecasts*
	Average Price forecast	High-Low price range	Price Risk	Availability Risk	Volatility Risk	
Gold	\$ 1,800	\$1675-\$1965	Low but rising	Low	Low	\$ 1,701
Silver	\$ 22	\$18-\$26	Medium	Low	Medium	\$ 21.8
Platinum	\$ 1,100	\$850-\$1,350	Medium but rising	Low but rising	Low	\$ 1,042
Palladium	\$ 1,800	\$1,500-\$2500	High but falling	Historically high but falling	High	\$ 1,952
Rhodium	\$ 13,000	\$10,000-\$20,000	High	Historically high but falling	High	
*Average of several US & European Banks forecasts and forecasts published to the Bloomberg Commodity Forecast page (CPFC)						
Source: MKS PAMP Group						

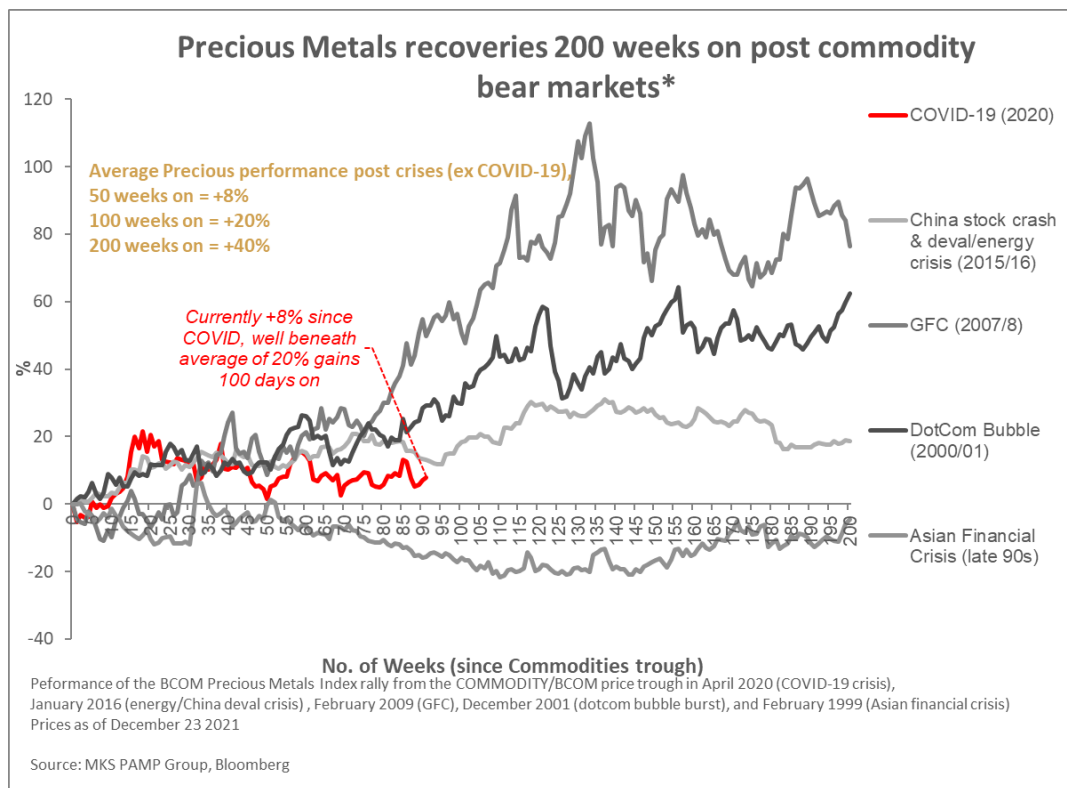
Precious Metals in their fundamental cycle

Estimated Fundamental Commodity Prices Relative to their Cycle Peaks/Troughs



Source: MKS PAMP Group Estimates

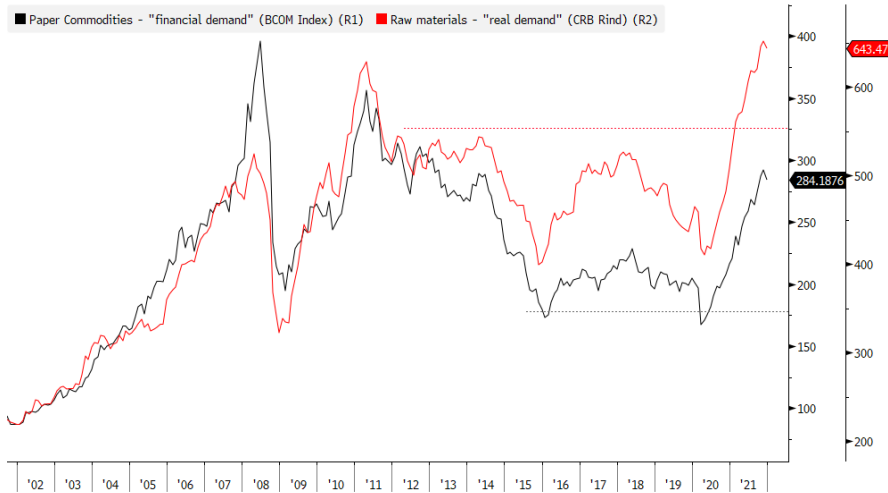
Precious Metals lagging historical commodities recoveries



Commodities Returns Post COVID: most are winners ex Precious

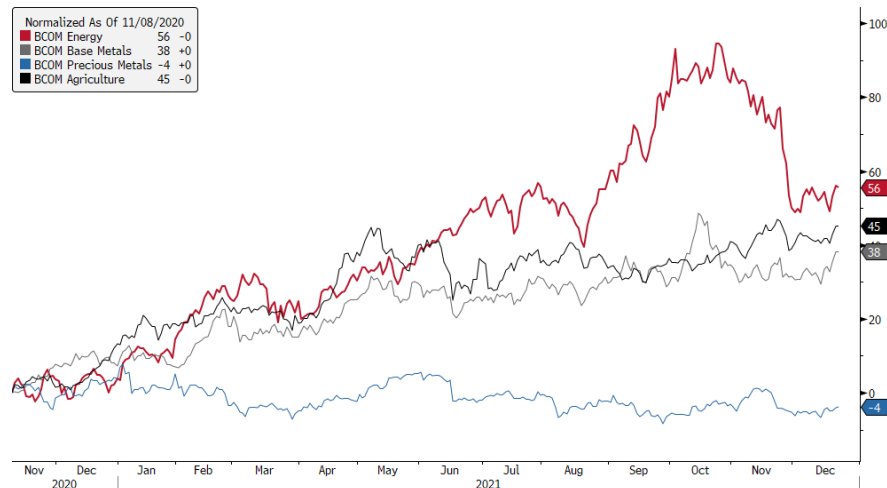
- Strong synchronized rally in Raw Materials and Commodities on vaccination & reopening efforts
- Post COVID recovery and the reflation trade asymmetrically benefits most commodities, excluding the havens like precious metals
- Shift from reflation to stagflation will benefit precious metals over other utility commodities

Real commodities demand vs paper demand synced takeoff - its not all about investor demand



Source: Bloomberg, MKS PAMP Group
BCOMF6 Index (Bloomberg Commodity Index 6 Month Forward) BCOM vs CRB Rind n PM Monthly 19SEP2001-23DEC2021 Copyrights 2021 Bloomberg Finance L.P. 23-Dec-2021 12:47:00

Commodities subsector performances since COVID Vaccination its all about the reflation commodities



Source: Bloomberg, MKS PAMP Group
BCOM Index (Bloomberg Energy Subindex) Commodperf vaccination Daily 06NOV2020-23DEC2021 Copyrights 2021 Bloomberg Finance L.P. 23-Dec-2021 12:48:24

Precious Metals lagging historical commodities recoveries

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	KEY
← Worst Performers / Top performers →	7.0%	86.3%	133.1%	67.6%	82.6%	154.5%	93.0%	5.8%	153.1%	96.6%	10.1%	19.2%	26.2%	11.4%	-2.5%	103.7%	56.3%	18.6%	54.2%	47.9%	80.0%	Palladium
	3.4%	57.3%	75.4%	42.8%	50.8%	126.2%	76.7%	-10.7%	152.4%	83.2%	8.2%	15.2%	7.2%	6.9%	-9.6%	60.6%	32.4%	17.9%	34.5%	26.0%	60.5%	Gold
	2.5%	25.6%	51.1%	41.3%	40.5%	80.9%	57.2%	-23.0%	129.4%	51.8%	5.8%	12.2%	1.7%	3.9%	-10.4%	59.4%	31.2%	6.9%	31.6%	25.9%	38.2%	Silver
	2.4%	24.8%	35.6%	33.6%	39.8%	61.4%	42.7%	-24.7%	118.1%	46.7%	2.8%	12.1%	0.2%	3.8%	-10.7%	45.0%	30.5%	-0.4%	21.5%	25.1%	34.7%	Platinum
	0.4%	21.5%	34.6%	26.0%	36.5%	47.7%	34.3%	-24.9%	77.9%	31.5%	-9.9%	9.9%	-1.0%	-1.7%	-11.8%	21.0%	30.5%	-1.6%	18.3%	24.8%	26.6%	Nat Gas
	-9.8%	12.8%	34.5%	23.5%	29.2%	46.4%	31.0%	-31.0%	58.9%	31.4%	-17.8%	9.0%	-5.4%	-2.2%	-17.8%	17.4%	27.5%	-8.5%	15.2%	19.7%	24.5%	Oil/WTI
	-14.6%	12.5%	29.2%	14.9%	17.9%	37.2%	18.8%	-36.1%	56.8%	30.0%	-18.3%	8.0%	-6.7%	-5.5%	-19.1%	14.9%	24.3%	-14.5%	11.0%	18.7%	23.7%	Coal
	-17.6%	5.1%	24.3%	5.9%	16.2%	31.2%	16.7%	-38.8%	48.2%	29.5%	-19.0%	7.5%	-11.0%	-11.8%	-20.3%	13.6%	13.1%	-16.5%	3.4%	16.0%	19.5%	Copper
	-19.2%	3.5%	19.4%	5.4%	12.7%	24.2%	14.6%	-49.3%	45.7%	20.8%	-20.9%	7.1%	-14.0%	-14.0%	-26.1%	13.5%	12.5%	-17.4%	3.4%	14.6%	19.3%	Aluminum
	-22.0%	0.5%	18.0%	-0.6%	10.3%	23.2%	10.4%	-51.1%	24.4%	15.2%	-21.4%	4.2%	-18.6%	-15.5%	-26.1%	11.3%	6.4%	-17.5%	-4.4%	10.9%	12.3%	Zinc
	-24.8%	-2.4%	16.0%	-3.6%	5.4%	17.1%	6.1%	-53.5%	1.8%	11.3%	-21.6%	2.3%	-22.2%	-16.0%	-26.5%	8.6%	4.7%	-19.2%	-4.7%	10.8%	-3.7%	Nickel
	-26.0%	-12.7%	4.4%	-10.3%	4.2%	0.0%	-16.7%	-55.4%	-0.9%	5.2%	-24.2%	-7.1%	-28.0%	-19.3%	-29.4%	1.2%	3.0%	-22.2%	-9.5%	3.3%	-9.6%	Lead
	-54.1%	-16.4%	4.2%	-17.0%	-7.3%	-25.2%	-23.6%	-56.5%	-11.4%	-5.2%	-25.2%	-9.2%	-35.8%	-31.2%	-30.5%	-1.9%	-0.4%	-24.5%	-18.0%	-1.3%	-11.7%	Corn
	-73.1%	-45.9%	-18.7%	-18.4%	-10.1%	-43.8%	-47.1%	-62.5%	-13.4%	-21.2%	-32.2%	-16.8%	-39.6%	-45.6%	-41.8%	-13.2%	-20.7%	-24.8%	-25.5%	-20.5%	-22.2%	Wheat
AVERAGE	-17.5%	12.3%	32.9%	15.1%	23.5%	41.5%	22.4%	-36.6%	60.1%	30.5%	-13.1%	5.3%	-10.5%	-9.8%	-20.2%	25.3%	17.9%	-8.8%	9.4%	15.8%	20.9%	

Source: MKS PAMP Group, Bloomberg, U.S. Global Investors Research. Returns are based on historical spot prices or most active futures prices (LME or CME)

2.

Gold – stimulus peak in, down (*on a hawkish Fed*), but not out

Gold... stimulus peak in, down (on a hawkish Fed) but not out

Gold prices could become unstuck as 3 important drivers - inflation, the Fed, and expected macro/equity volatility - are on the move this year. We do not hold the view of most analysts (a downward trajectory of gold from here). Gold is a referee on the Fed and a policy mistake (either rampant inflation or an aggressive hiking cycle bringing forward recession risk), who are currently well behind the inflation curve. Gold has one more peak higher as the "inflation" or "Fed policy mistake" peak is not yet in. A short US labor market, future COVID variants and associated zero/low COVID policies create necessary persistent stagflationary forces. As the Fed actionably puts on a series of rate hikes into US midterm elections, downside risks emerge especially if they materially reduce Balance Sheet assets. We have an average price forecast of \$1800/oz with upside risks, as disengaged investor subscription could reengage on equity market volatility and structural bullish drivers (*unsustainable US and global debt path, asset bubbles, messy geopolitics, currency devaluation concerns, and impending sovereign crises*) which usually reemerge on an aggressive Fed hiking cycle. Gold is down but not out, with an innate ability to rally when consensus is bearish. We acknowledge that if \$1675/oz is broken, all hope of pricing in inflation is gone and a new bear market is enacted, where it'll lose appeal as a monetary asset and inflation hedge.

Gold... down from COVID stimulus peak, but not out

- Gold made a statement breakout in summer 2021
- It became sensitive to stimulus risk and the repricing was (smartly) aligned with a shift in Fed policy.
- There are technical similarities between the repricing higher in 2019 on Fed easing cycle (into a bull market) & repricing in 2020 on COVID QE
- There are key differences vs the 2013 taper sell off (into a bear market), which should be respected.
- Gold remains in a mild bull market, technically.**

Respect Golds technical breaks; they're aligned with major Fed pivots

GLD chart with Gold equivalent levels

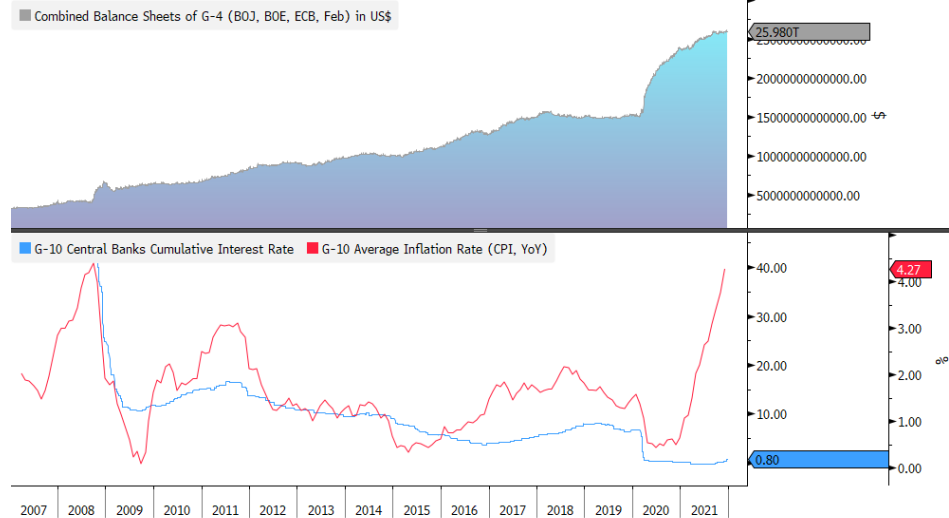


Gold is a liquidity hedge and more – a bet on the Fed's ability to control inflation

- Gold rallies on the *expectation* of additional or reduction in stimulus in the short-term (its sensitive to taper talk); aggregate actual liquidity matters in the longer run
- COVID QE winners include almost all global equity with no pullback from US or World equities into any tapering kickoff
- 2022 to bring more macro / equity volatility as the Fed transitions while inflation remains both sticky and relatively more elevated vs interest rates. Known CB liquidity neuters “macro fear” as indicated by a persistently low VIX; the withdrawal of liquidity will ensure higher volatility floors
- DM inflation has never been this high, with official DM policy rates this low, ever. Cumulative DM interest rates are only at +0.80% with inflation at 4.3%
- **Currently Global developed world Central Banks (G-10, led by the Fed) are behind the inflation curve**

Central Banks' Balance Sheets

dovish interest rates vs inflation AND combined assets remain lofty (in \$terms)



Source: MKS PAMP Group, Bloomberg

.G4BS U Index (BS of ECB BOE BOJ + Fed (in \$)) Fed, ECB, BOJ BS (\$ Int Daily 06JAN2007-23DEC2021

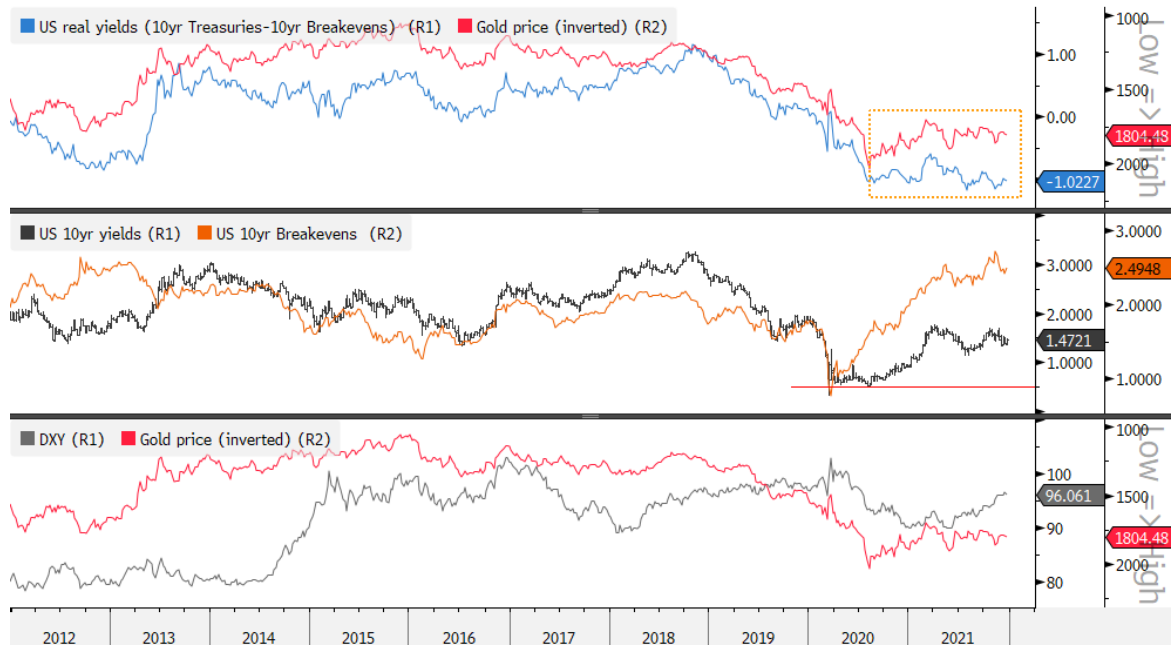
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Gold is a liquidity hedge and more – a bet on the Fed's ability to control inflation

- Gold has a stronger correlation with real US interest rates, than vs the US\$
- **Lower REAL rates for longer will continue to ensure precious metals remain supported.**
- That's our base expectation in the short-term, but the risk of a Fed policy error (hiking too fast) is rising in the medium-long term
- The risk of positive real rates, given the Fed aggressively hiking interest rates, will ensure Gold reprices very quickly toward \$1500

US 10 year real yields, the \$ and Gold core historical drivers of Gold

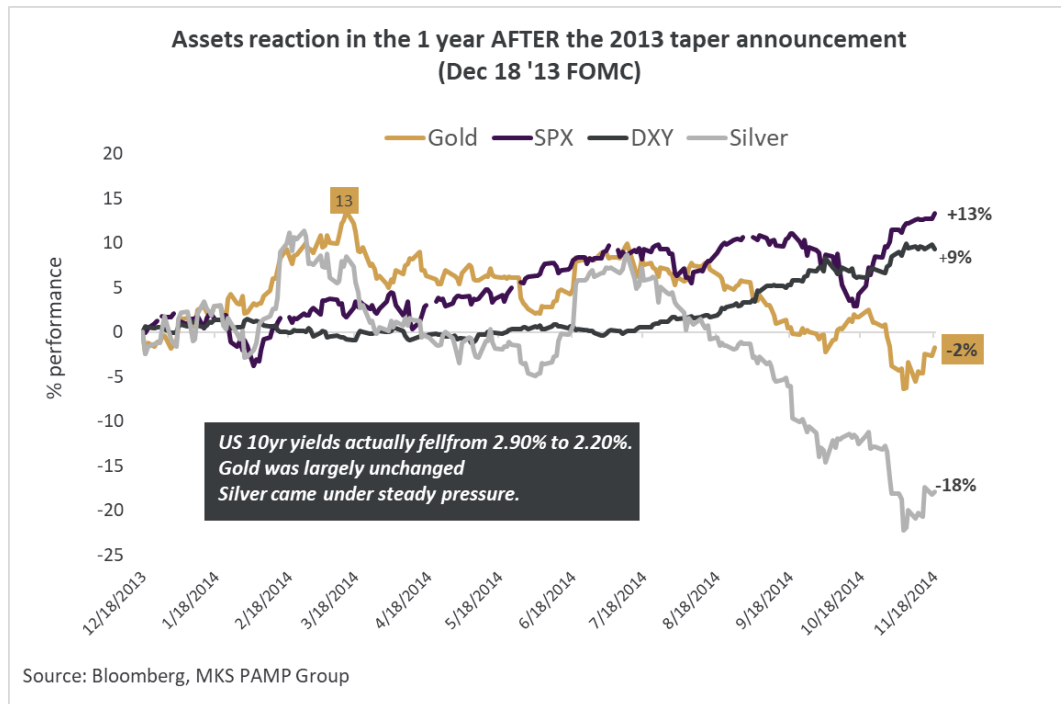


Source: MKS PAMP Group, Bloomberg

USGG10YR Index (US Generic Govt 10 Yr) 10 year real vs Gold 3 Weekly 26DEC2011-23DEC2021 Copyright© 2021 Bloomberg Finance L.P. 23-Dec-2021 13:11:01

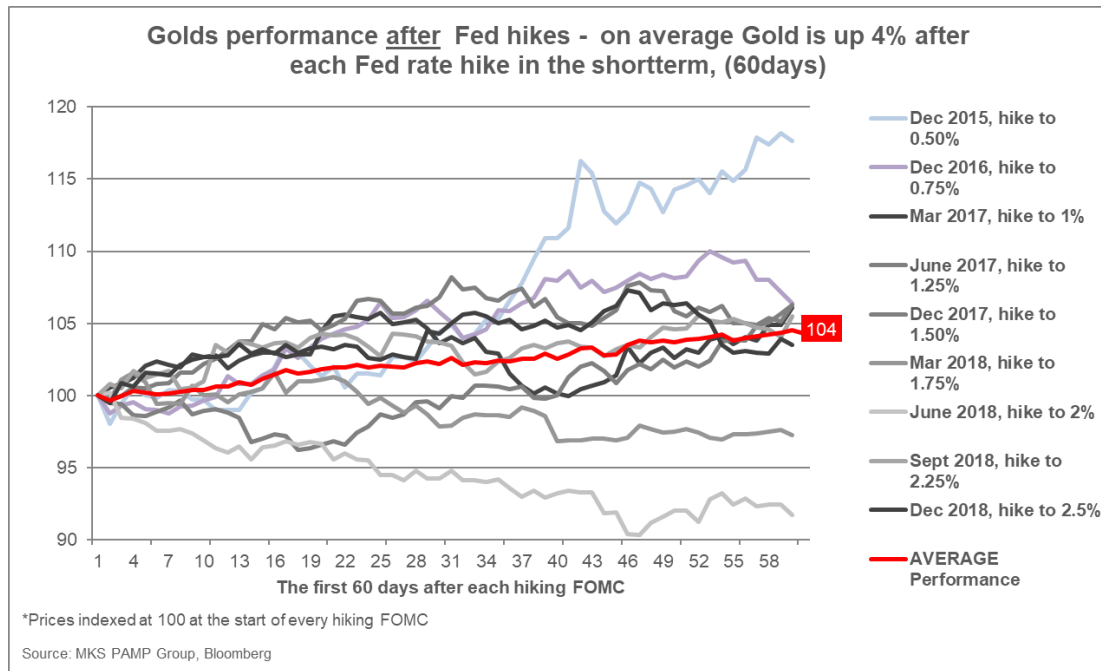
Gold... taper is less of a threat this time around

- Golds has remained relatively more resilient to its performance in 2013 after the initial taper by Bernanke, its also remained resilient to the accelerated taper announcement
- **Gold market attention turns to tightening cycle (3x rate hikes in 2022), the rate hike liftoff, the Feds terminal rate and how effective that will be in taming inflation**



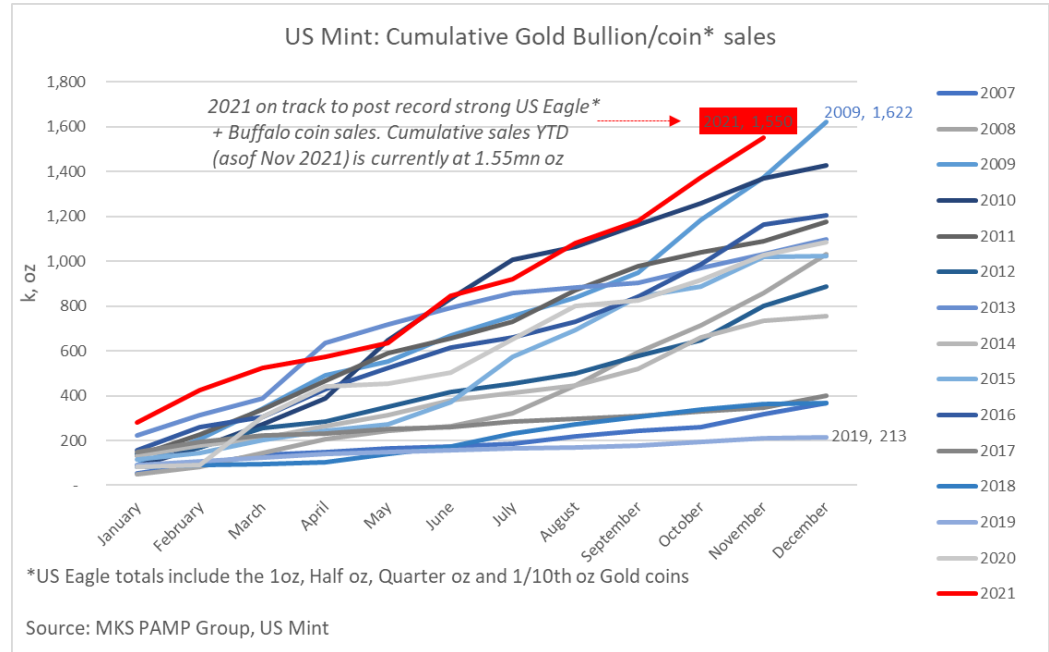
Gold... hiking cycles are less bearish than expected

- The Fed needs to balance its own dual mandate (price stability and max employment) with the unofficial mandate of not triggering a taper tantrum that asymmetrically hurts fragile EM markets
- The quicker the Fed tapers and enters a hiking cycle, the more it will pressure precious metals. However a slower hiking cycle (vs expectations) will be constructive for Gold
- The traditional thinking that Gold can't rally during hikes is incorrect, especially if structural bullish drivers (negative real rates, an imminent growth rollover, structural debt, inflation fears) remain.



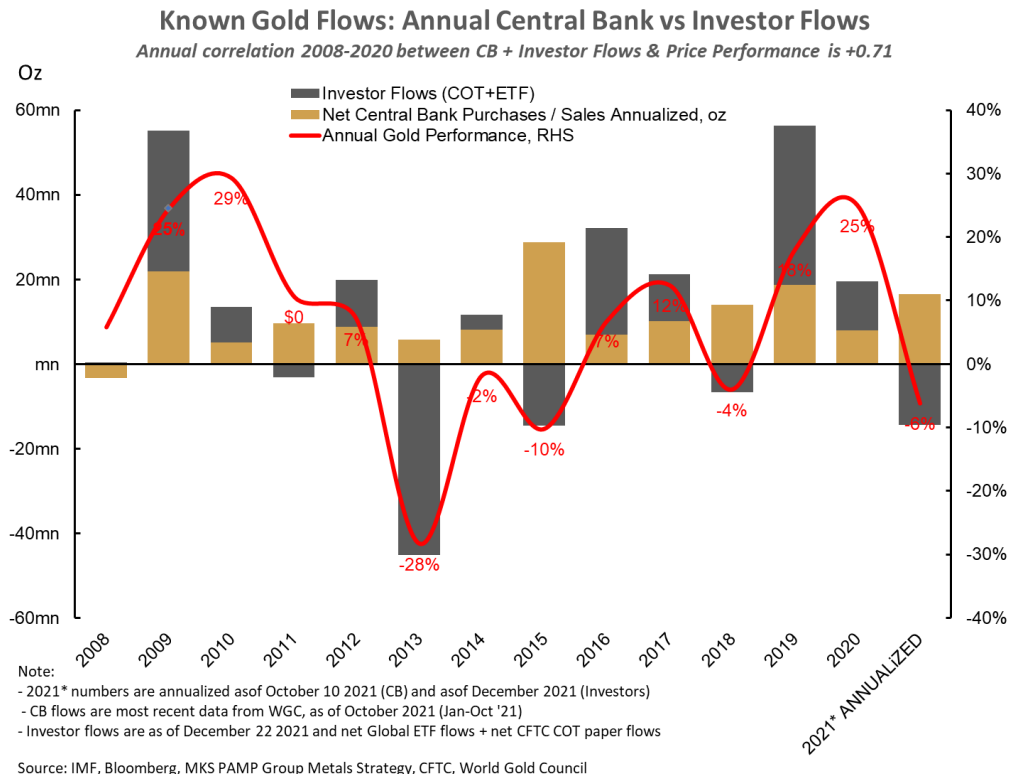
Physical & Bullion demand: recovery strong in 2H expected to last into Q1'21

- The return of some physical support is expected to stay robust into the seasonally strong Q1 period around Chinese New Year
- India, SE Asia & Singapore demand reemerged convincingly in 2H'21 with reopening post Delta lockdowns with pent-up demand and more returning
- The retail coin & bar market in both Silver & Gold boomed in 2021 due either to record setting sales (Gold) or strong premiums (Silver). Retail demand for both should continue to remain robust into 2022, especially into US midterm elections year, given persistent inflation concerns
- Still dishoarding is evident from select traditional physical Gold countries given price surge in local currency terms (e.g.: Turkey)



Official Sector inflows vs investor outflows

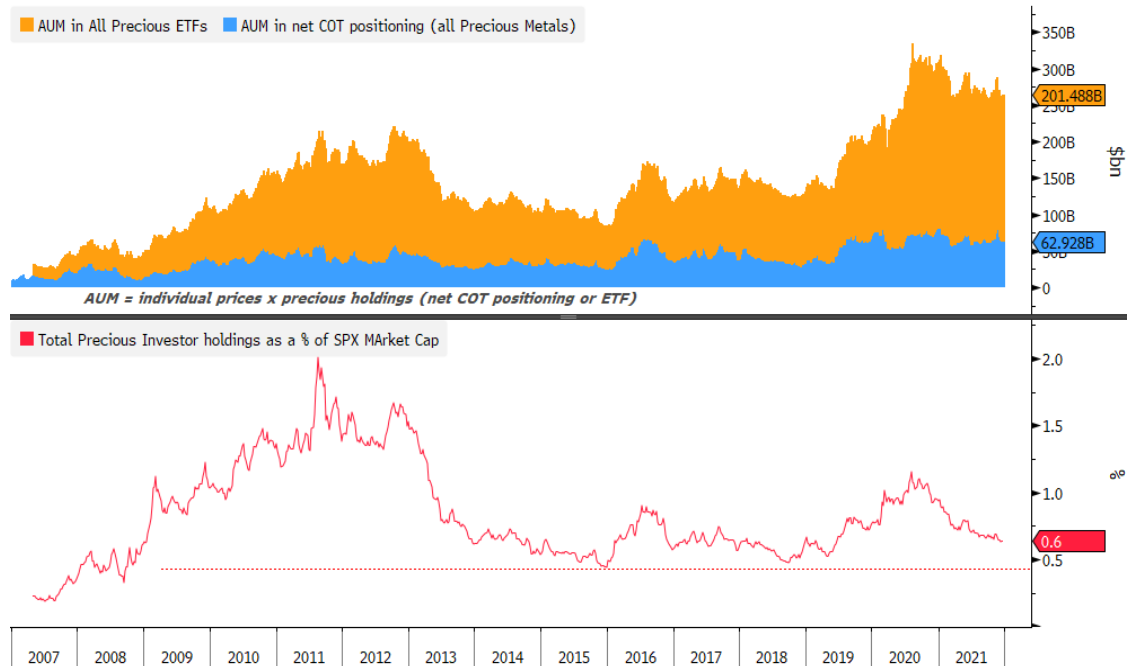
- Central Banks added 13.8mn oz of Gold to holdings in 2021; the ~4th fastest pace of purchases since 2008 (on annualized basis) due to strong 1H purchases
- Surprisingly, investors (ETF + COT) have also sold of 13.8mn oz with investors outflows offsetting CB inflows
- Prices have fallen ~6% in 2021. The model-implied Gold price for combined annualized CB + Investor flows (+2.2mn oz) is +0.7%, higher than actual performances indicating some OTC/physical demand is not enough to offset other unknown/OTC sales.



Investors underweight Gold holdings; a pivotal player in 2022

- Precious Metals Investors own a chunky \$264bn worth of known precious products (ETFs + COT) across Gold, Silver & PGMs
- While these holdings are quite lofty on an historical basis, its is very underweight on an portfolio allocation basis. Precious holdings account for ~0.6% of equity portfolios, much lower than the high (>3x higher) seen in 2011.
- The risk with higher real rates is that much of this AUM will unwind creating a structural headwind.
- On the other hand, if the Fed remains behind the inflation curve with more equity market volatility in 2022 (base case), Precious metals will grow in attractiveness and allocations to the space will increase.

Precious Metals Investor (COT + ETF) AUM



Source: MKS PAMP Group, Bloomberg, CFTC

.PRECAUM U Index (AUM of Precious ETFs) Precious ETF & COT AUM M Weekly 25DEC2006-23DEC2021 Copyright© 2021 Bloomberg Finance L.P. 23-Dec-2021 14:28:34

2022 Gold Outlook: stimulus peak in, down (on hawkish Fed) but not out

Gold: stimulus peak in, down (on hawkish Fed) but not out Drawdowns supported by physical demand); trending sideways awaiting a catalyst



Base case: \$1800/oz Average Price for 2022: prices could become unstuck as 3 important drivers for Gold - inflation, the Fed, and expected macro/equity volatility - are on the move this year. A hawkish Fed creates a structural bearish overhang but Gold will referee whether the Fed is ahead/behind the inflation curve. Disengaged investor subscription could reengage on equity market volatility and structural bullish drivers which reemerge due to an aggressive Fed hiking cycle. Gold is down but is not out; if \$1675 falls, then a new bear market is enacted.

Gold's 2022 high-low range: \$1675/oz (new post COVID cyclical floor) - \$1965/oz (soft ceiling into inflation vs Fed policy overshoots).

(50% probability)

2022 Gold Outlook: stimulus peak in, down (on hawkish Fed) but not out

Alternative scenarios to Golds base case: The bullish (\$2000+) and bearish (\$1400) case for Gold cannot be more distant as it hinges on a very unpredictable Fed hiking cycle

Bullish case (~\$2000/oz): dependent on

- 1) Supply chain bottlenecks or higher energy prices drives sustained inflation risks & fears, triggering renewed investment inflows
- 2) CB / Fed policy mistake (inability to control inflation) leads to acceleration of stagflation narrative and a weaker US\$
- 3) Asian or CB physical demand is stronger than expected
- 4) Equity market volatility, lower global growth and/or much faster cooling of inflation, drives dovish Fed/Central Bank policies
- 5) New “off-calendar” geopolitical risks (e.g.: US /China trade, US politics, Turkey, Russia/Ukraine, Taiwan, etc)

(30% probability)

Bearish case (~\$1400/oz): dependent on

- 1) Fed taper & hiking cycle is aggressive, contains inflation into midcycle, and drives both real and nominal rates much higher, much faster
- 2) Sustained reflation risk – improved global growth data & higher inflation leads to a faster Fed hiking cycle (higher interest rates & US\$, inducing large-scale positioning deleveraging in Gold)
- 3) US growth significantly outperforms ROW driving higher US\$ and leading to largescale ETF/investor selling
- 4) Central Banks turn net sellers as Gold loses its appeal as a monetary asset / inflation hedge.
- 5) Asian physical demand disappoints

(20% probability)

3.

Silver - stimulus peak (2021) and fundamental peak in (2011); downsides risks outweigh upside risks given overhang

Silver: stimulus peak (2021) and fundamental peak in (2011); downsides risks outweigh upside risks given physical overhang

Silver is relatively more sensitive to US\$ upside and thus with a more hawkish Fed priced in for 2022, its downside is accentuated vs Gold downside. That is notwithstanding the fact that fundamentally it remains saturated which is highlighted more so in rising interest rate environments

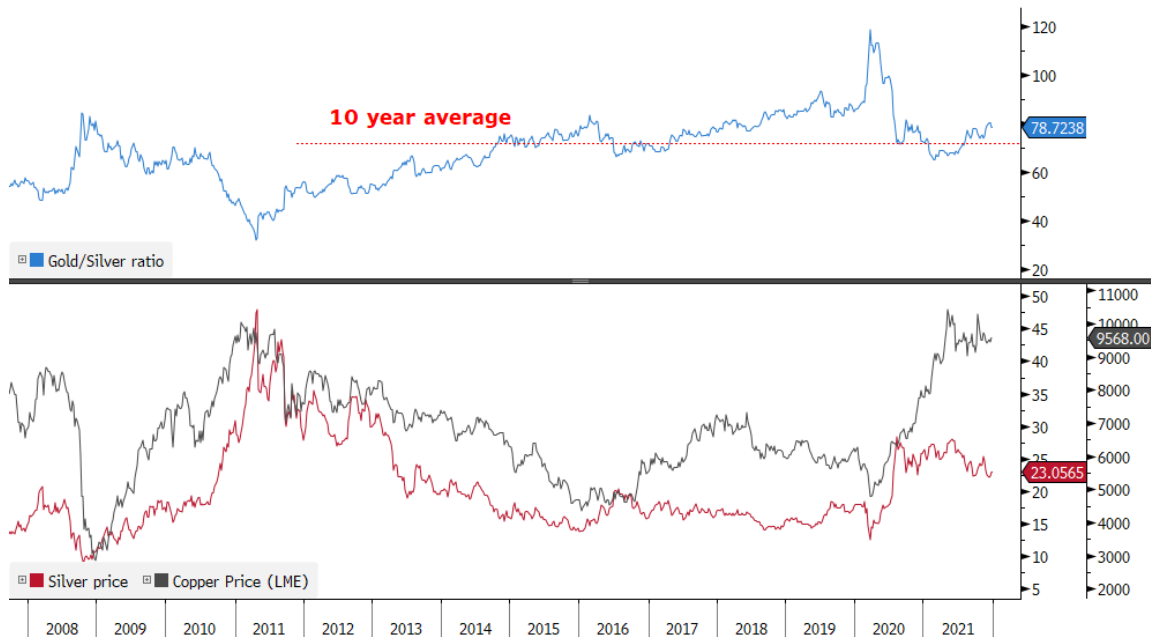
Decent retail demand, rising industrial demand on continued growth expectations and its growing role in the energy transition are bright spots; that has helped drive the supply/demand balance (including investor demand) into a small deficit in 2021, for the first time in six years. These demand pillars are expected to remain strong into 2022, but with the enormous size of both known and unknown above ground stocks, any upside rallies will be short-lived.

Investor – both institutional and retail - demand could reignite, especially as prices fall as the year progresses and into US midterm elections, given perceived inflation and political concerns. Prices should average \$22/oz for 2022, with a low-high range of \$18-26/oz

Fundamentally oversupplied & a lagger to both Gold & Copper

- A notable lagger to Gold in 2H'21; the Gold/Silver ratio shifted up from 67 to through 80.
- Silver missed the reflation trade in 1H'21 and has lagged the strong repricing in base metals/Copper due to physical overhang
- Silver remains 23% below 2021 price peak of \$30/oz and 54% below 2011 peak of \$50/oz
- It remains attractive as a cheap high beta Gold proxy and its role in the energy transition is growing

Gold/Silver ratio sitting comfortably at historical average Silver underperforming Base (Copper) prices



Source: Source: Bloomberg, MKS PAMP Group

.GC SI U Index (gold silver ratio) GC/SI vs Silver 2 Weekly 21SEP2007-28DEC2021

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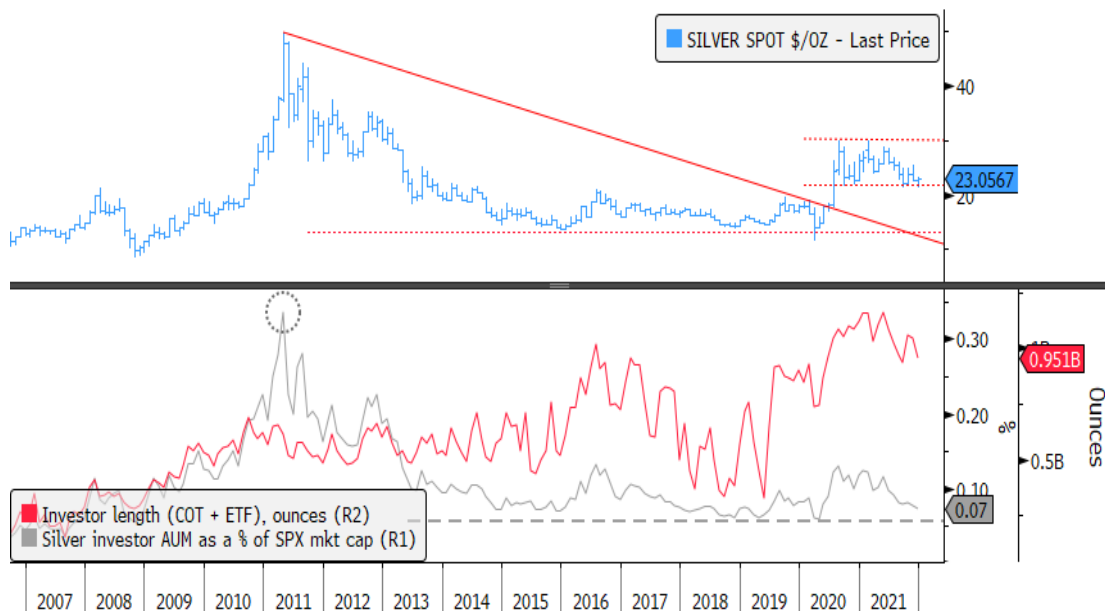
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Investors ETFs and COT remain net sellers adding to price pressure

- Silver investors (ETF + COT) sold of 170mn oz in 2021, but together still own ~950mn oz of Silver
- Prices have fallen ~12% in 2021 indicating OTC/physical demand is not sufficient to process supply overhang and net investor deleveraging
- Investors have room in 2022 to ramp up exposure, owning only 0.07% of Silver in portfolios, and can easily swing the market into a deficit

Investor Positioning & AUM in Silver

..also underweight on historical \$-basis and as % of portfolios



Source: Bloomberg, MKS PAMP Group

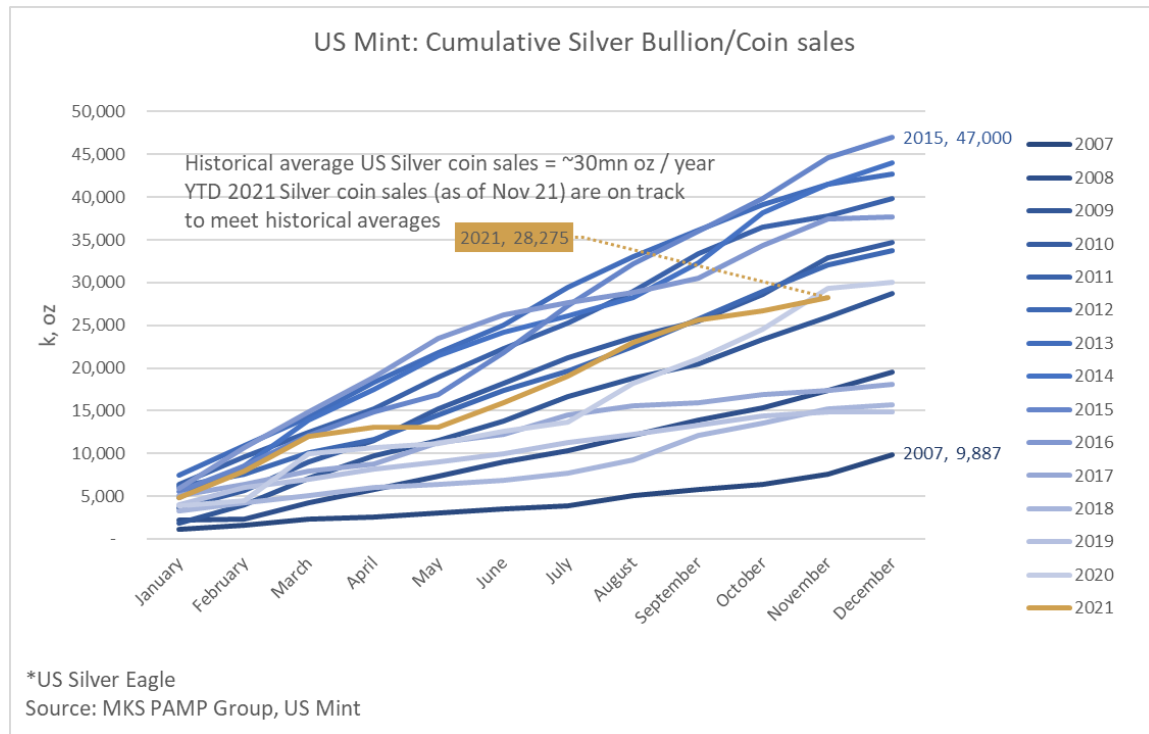
SILV Comdty (SILVER SPOT \$/OZ) ETF COT AUM SILVER2 Monthly 22SEP2006-28DEC2021

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Retail investor demand strong offsetting some ETFs + COT outflows

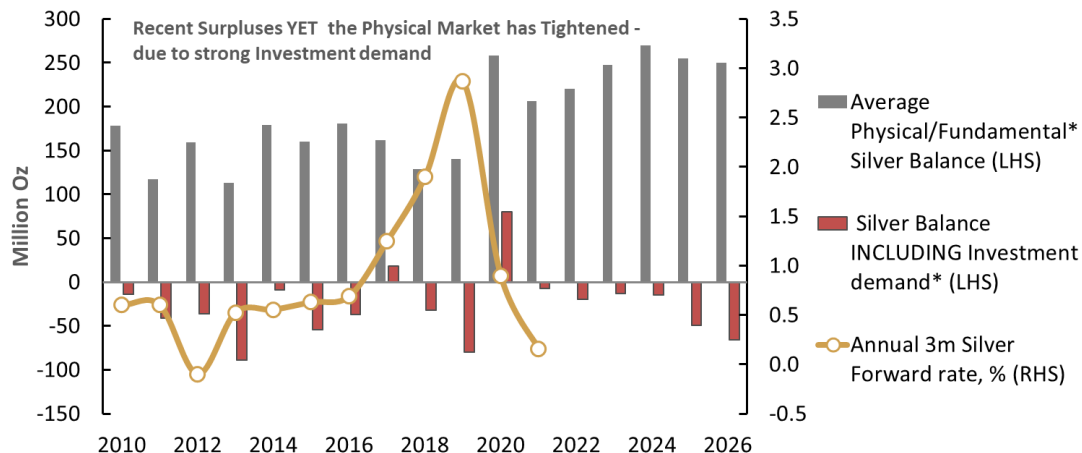
- US Retail coin demand on track to reach 30mn oz/year (historical average) which is also a 5 year high.
- US Silver premiums have surged as strong demand coupled with lack of supply (of blanks) to the US mint, drive the dislocation
- Peak Silver coin sales occurred in 2015, reaching 47mn oz, highlighting the price elasticity of typical silver consumers
- Retail demand for Silver should continue to remain robust, especially into US midterm elections, given persistent inflation concerns



Fundamentally oversupplied but attractive as a cheap high beta Gold proxy

- Structurally, Silver remains oversupplied due both to a mix of primary & by-product production (strong base metals pricing)
- Fundamental surpluses (ex investment demand) have grown since 2018, and are expected to reach ~250mn oz in 2024
- However, investment demand, which can average between 200-300mn oz / year is enough to drive the market into deficit.
- If prices remain low, deficits (including investment demand), albeit small, will grow into 2026

Silvers Fundamental Supply/Demand Balance* vs Forward Curve - investment demand can swing the market into a deficit



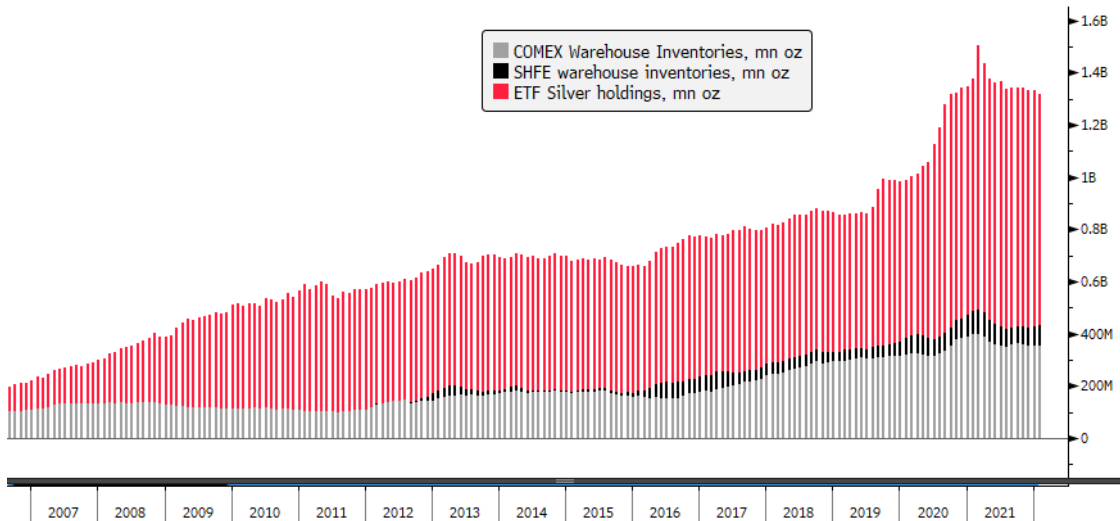
*The average published market surplus/deficit from GFMS, Metals Focus/Silver Institute, adjusting for investment demand (i.e.: excluding physical coin/bar, ETF and COT flows)

Source: Bloomberg, MKS PAMP Group Estimates, Metals Focus/Silver Institute, GFMS

Fundamentally oversupplied with ample above ground stocks

- Fundamental surpluses (ex investment demand) will add to the already high levels of known & unknown inventories.
- Exchange holdings (COMEX + SHFE) and ETFs together house 1.3bn oz, 30% more than current annual total supply and a record high.
- However these inventories tend to remain “sticky”, and with supply chain disruptions & strong regional industrial demand for high grade Silver, physical prices remain elevated

Known on-exchange Silver Inventories extremely well supplied...



Source: MKS PAMP Group, Bloomberg

COMXSILV Index (Comex Silver Stocks) comex shfe silv stocks3 Monthly 21JUL2006-04JAN2022 Copyright© 2022 Bloomberg Finance L.P. 04-Jan-2022 14:38:58

2022 Silver Outlook: stimulus peak (2021) and fundamental peak in (2011); downsides risks outweigh upside risks given overhang

Base case: 2022 average price forecast \$22/oz: despite continued strong industrial and retail demand, limited investor subscription as the Fed convincingly turns more hawkish asymmetrically impacts Silver more so than Gold, given stock availability.

2022 high-low range: \$18/oz (new cyclical floor post COVID QE) - \$26/oz (new lower peak vs WallStr bets peak of \$30/oz).

(50% probability)

Silver stimulus & fundamental peak in Rallies capped & its trending sideways like Gold, awaiting a catalyst



Source: MKS PAMP Group, Bloomberg

XAG Curncy (Silver Spot \$/Oz) Silver 2021/2 forecast Weekly 17SEP2010-073AN2022 Copyright© 2022 Bloomberg Finance L.P. 07-Jan-2022 14:12:59

Alternative scenarios to Silvers base case:

Bullish case (~\$30+/oz): dependent on

1. Gold outperformance (see Gold bulls case on pg. 20)
2. Inflation and reflation risks driving persistent retail/physical demand
3. Accelerated industrial demand drivers (PVs, EVs)
4. Prolonged physical tightness & stockpiling due to persistent supply chain risks

(20% probability)

Bearish case (~\$12/oz): dependent on

1. Faster Fed hiking cycle (higher interest rates & US\$ inducing large-scale positioning deleveraging in precious),
2. Steady emergence of supply (due to higher base metals prices) - Opportunistic hedging and growing fundamental surpluses
3. Slower global growth; stagflation

(30% probability)

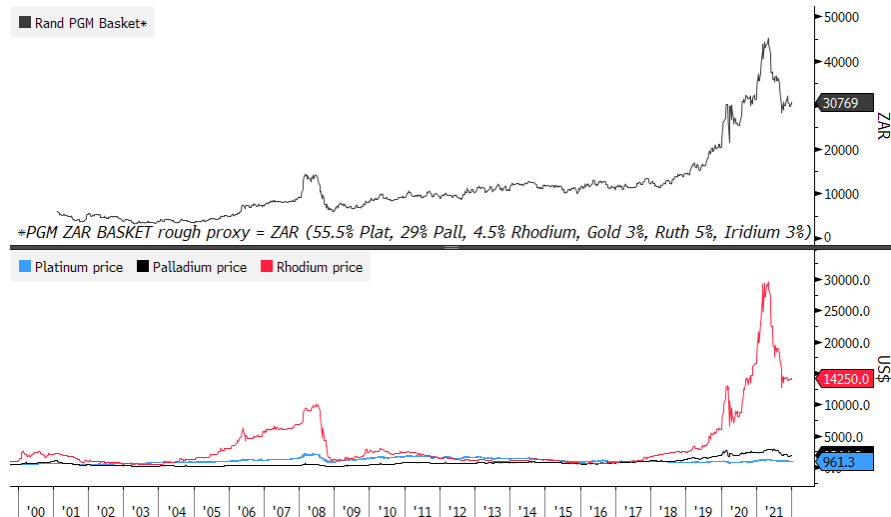
4.

PGM Update & Outlook

PGM Outlook: Statement repricing in the Rand PGM Basket

- A new era had begun in 2018; higher (PGM) price floors but also higher volatility.
- Shifted from consumer-friendly environment (lower prices & ample availability) over the last decade to the current producer friendly environment
- The ZAR SA basket price of PGMs remains high (~3x higher vs 2018). With average cost of production \$980/oz for South African producers, margins (+60%) are strong to incentivize continual growing production

Peak PGM ZAR prices a boon for producers strong Basket prices with good margins spurs consistent supply



Source: Bloomberg, MKS PAMP Group

.PGHBSKT U Index (ZAR PGM basket) PGM ZAR Basket vs plpa Weekly 06OCT1999-04JAN2022

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Physical markets susceptible to major dislocations

- Recent intermittent curve backwardation & tightening fundamentals (rising lease rates) after series of quiet years (2009-2016)
- Indicative that short-term availability & perceived surpluses not as readily available as expected.
- Current and expected PGM metal availability expected to *not* reach past highs, but seasonally dislocations are still possible

PGMs: Outright prices vs 1month lease rates: steadily supplied PGM markets (flat lease rates) but still susceptible to major dislocations



Source: Bloomberg, MKS PAMP Group

PALL Comdty (PALLADIUM SPOT \$/OZ) All PGMs PX + lease Daily 05DEC2010-04JAN2022

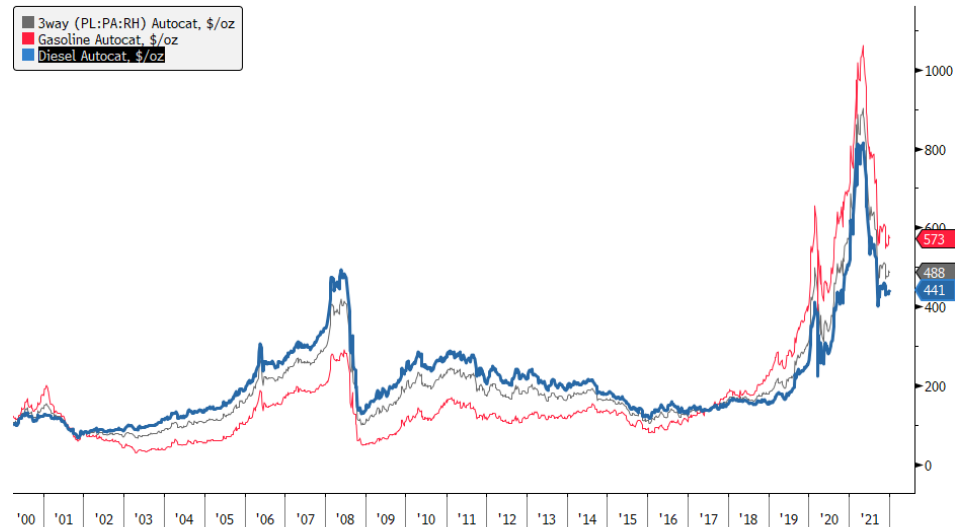
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Platinum vs Palladium: stepsisters with different pasts & futures

- Platinum is near cheapest ever vs Palladium prompting auto reengagement and substitution.
- Evidence of substitution in North America & China: 2021 Chinese PT imports extremely strong
- Driven by rising HD loadings for China VI (loadings 3x higher from July 2021) and US/CARBs LEV III legislation, respectively.
- With Palladium asymmetrically dependent on auto demand, chip shortages (s/t), hybridization (medterm), and threat of EV (long-term) large influencers
- Bearish longterm PA view is consensus & based on, the threat of EVs, few new industrial demand applications and exacerbated by an expected surge in secondary supplies

A VERY rough proxy of the costs of various Autocatalysts
Despite PA & RH fall, the cost of gasoline autocats is still more expensive than diesel & 3-way



Source: Bloomberg, MKS PAMP Group

.3WAYCAT U Index (1.5g Pa, 2.5g Plat 0.7g Rhod) PGM 3way autocats Weekly 26MAR2000-04JAN2022

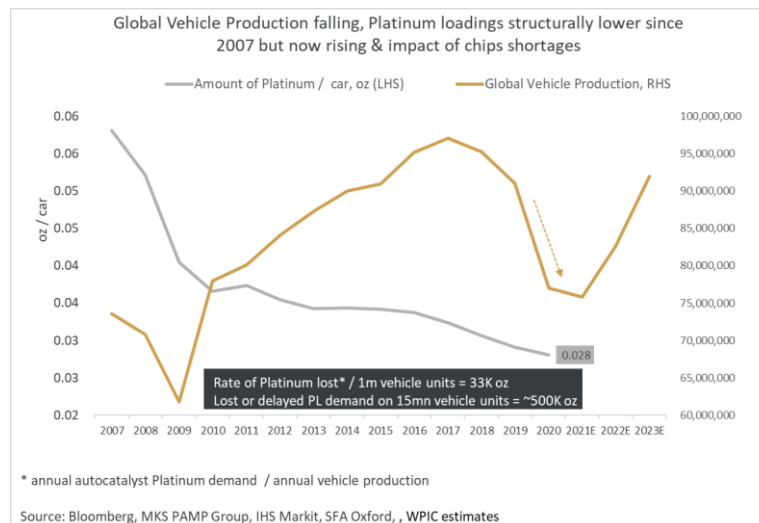
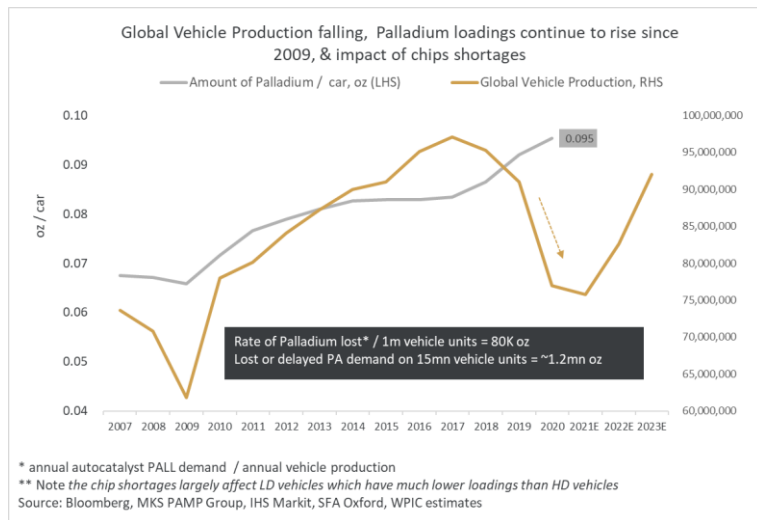
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Chipless cars: resolution only expected in 2H 2022/2023

- Global vehicle production in 2021 + 2022 is likely down ~15mn units but down only 5mn 2023 (IHS MARKIT)
- Total LV production forecast in 2023 = 92mn units, still not above pre-pandemic peak of 95mn units in 2017
- Maximum* lost or delayed auto demand on ~15mn auto units= ~1.2m oz PA, ~500K oz PT, & ~165K Rhodium
- Rate of Palladium lost* / 1m vehicle units = 80K oz. Rate of Platinum lost* / 1m vehicle units = 33K oz
- Rate of Rhodium lost* / 1m vehicle units = 11K oz

*WPIC, SFA, MKSPAMP rough estimates

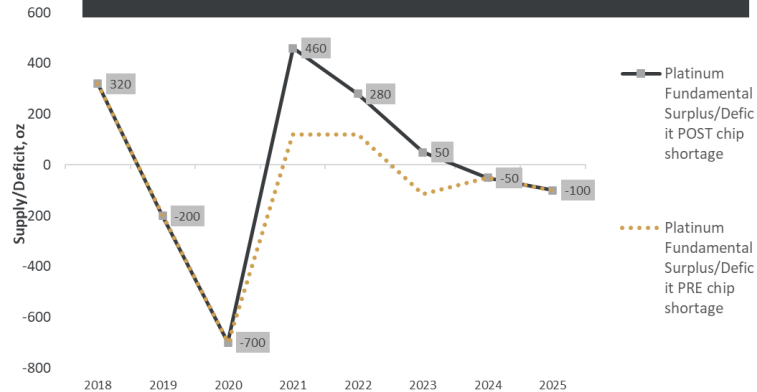


Chipless cars: new surpluses, but pent-up demand to emerge in 2023/4

- Chip shortage to drive larger surpluses in 2021-2023, but Platinum's fundamental surplus (ex investment demand) peaks in 2021 and continues to shrink with flat/deficit fundamental market expected in mid 2020s.
- Any short-term surplus can swing to a deficit driven by investment (ETF, coin/bar, OTC, exchange) demand
- Palladium has smaller deficits in 2021-23 due to chip issue; potential flat/surplus market in 2023+. Rising surpluses into EV inflection year (2025)

Platinum balances: falling Platinum surpluses into 2025

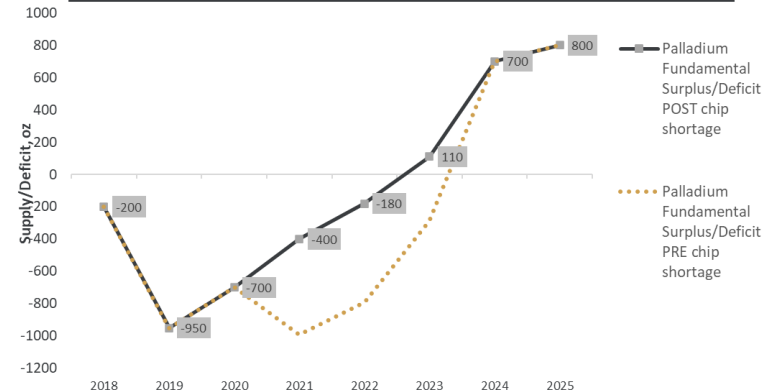
*Global bottlenecks / chip shortages to expand Platinum surplus from 2021-2023
~670k oz of lost or delayed platinum demand on a decrease of 20mn vehicle units 2021-2023
But pent up demand returns in 2023/24 driving tighter markets*



Source: Bloomberg, MKS trading estimates, SFA Oxford, WPIC, Metals Focus, JM & MKS trading estimates

Palladium balances: shrinking deficits into 2025

*Global bottlenecks / chip shortages to drastically reduce PA deficit from 2021-2023
~1.6mn oz of lost or delayed Palladium demand on a decrease of 20mn vehicle units 2021-2023
But pent up demand returns in 2023/24 slowing rate of surplus increase*



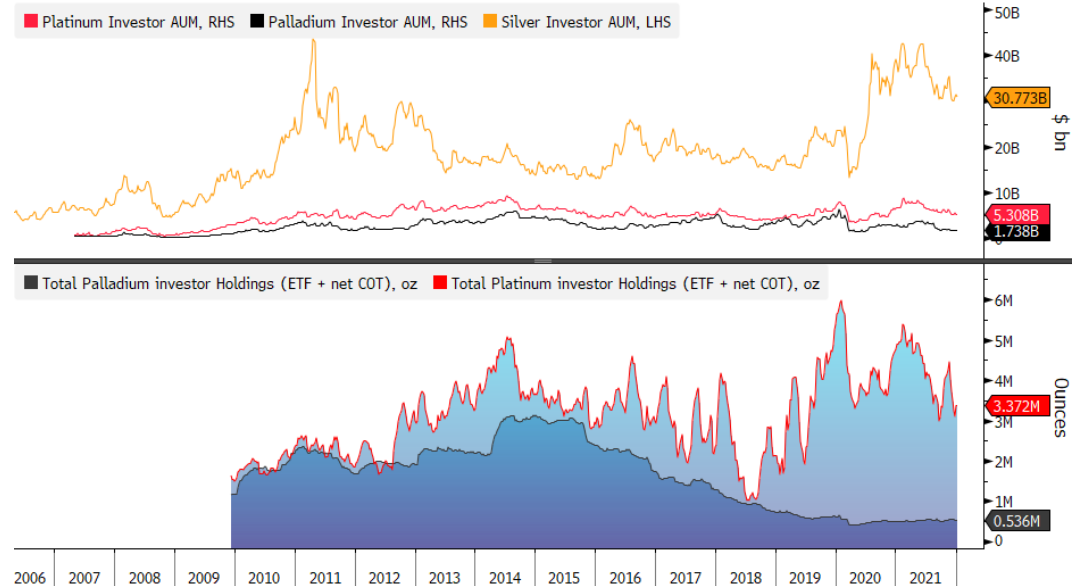
Source: Bloomberg, MKS trading estimates, SFA Oxford, WPIC, Metals Focus, JM & MKS trading estimates

PGM investor participation – Platinum investors engaged, Palladium not so much

- Palladium's CME Aggregate Open Interest is 1/5th of peak positioning; ETFs 1/6th of peak holdings. Total investor (ETF + COT) holdings only ~540k oz
- Palladium derivative market a shadow of its former self due to unpredictable liquidity, wild price swings/volatility, lack of sell-side market coverage, structural warehouse outflows & subsequent exchange limits etc
- By contrast, Platinum, investor interest remains high/engaged with 3.4m oz held in ETFs and net COT. Platinum ETF movement contingent on macro-outlook, the ZAR and PGM producers earnings

Investor Positioning in White Precious metals

*ETFs and gross long COT positions, \$ AUM



Source: MKS PAMP Group, Bloomberg

.PLATAUHZ U Index (ETF + gross longs AUM) Plat n Pall AUM (ETF+lon Weekly 28APR2006-05JAN2022

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Short-term trading developments: key correlations & drivers

- Top short-term price drivers of PGMs – EUR, Gold & ZAR
- Tactical moves increasingly outsized given disconnect between strong investor (in/out) flows vs market size

Correlation Matrix: post COVID recovery (daily correlations)								
	PLAT	GOLDS	PALL	RHODIUM	ZAR	SPX	SHCOMP	EUR
PLAT	1.00	0.54	0.51	0.07	-0.43	0.38	0.34	0.58
GOLDS	0.54	1.00	0.35	-0.22	-0.33	0.22	0.16	0.50
PALL	0.51	0.35	1.00	0.21	-0.45	0.37	0.17	0.40
RHODIUM	0.07	-0.22	0.21	1.00	0.20	-0.16	0.00	-0.08
ZAR	-0.43	-0.33	-0.45	0.20	1.00	-0.44	-0.19	-0.56
SPX	0.38	0.22	0.37	-0.16	-0.44	1.00	0.41	0.44
SHCOMP	0.34	0.16	0.17	0.00	-0.19	0.41	1.00	0.23
EUR	0.58	0.50	0.40	-0.08	-0.56	0.44	0.23	1.00

Source: Bloomberg, MKS PAMP Group

Platinum 2022 Outlook: → fundamentally saturated in the short-term with surpluses & above ground stocks, but surpluses are shrinking

Base case: 2022 average price forecast \$1100/oz

2022 High – low range = \$850 - \$1350/oz

\$1100/oz is contingent on Gold remaining supportive and not rerating into a new bear market, further auto substitution and higher diesel/HDD loadings due to ESG efforts which puts it on a path of shrinking surpluses. Those positive tailwinds offset the headwind from chip shortages (which will ease in 2022 but not alleviate). Its role in the energy transition and in hydrogen applications provides a short-term sentiment kicker and structurally swings Platinum into a deficit by mid-2020. Downside price risks are contingent on faster Fed hikes into weaker global demand which would induce large-scale investor deleveraging at a time of OEM/auto and producer inventory destocking.

(50% probability)

Upside risk \$1350+/oz: dependent on

1. Gold outperformance (PT is cheaper inflation/macro/Fed proxy) driving strong investment inflows
2. Earlier chip shortage 'resolution' injecting pent-up demand on lower stock availability
3. Accelerating/strong HDD demand & substitution
4. Supply disruptions (S.A wage negotiations are mid year for the majors)
5. Hydrogen demand prospects brought forward accelerating (*early*) investor subscription

(30% probability)

Downside risk \$800/oz: dependent on

1. Prolonged chip shortage inducing largescale OEM lending/deleveraging
2. Persistent SA supply/hedging into weak demand
3. Faster Fed hiking cycle (large-scale positioning deleveraging in precious)
4. Weaker Global demand

(20% probability)

Platinum 2022 Outlook: → fundamentally saturated in the short-term with surpluses & above ground stocks, but surpluses are shrinking

Platinum: floors are in

fundamentally saturated in s/t but improving, reflation peak not yet in



Source: MKS PAMP Group, Bloomberg

XPT Curncy (Platinum Spot \$/Oz) Platinu 2022 forecast Weekly 17SEP2010-03DEC2021

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Palladium 2022 Outlook: → fundamentally switching to a surplus in medium-term

2022 Average Price Forecast \$1800/oz: Structural headwinds in the form of ongoing substitution (*Platinum is relatively cheaper, more readily available and less volatile than palladium*) and growing EV penetration, puts palladium on a path of shrinking deficits. An expected stronger auto sales recovery in 2022 (vs 2021, but not as strong as 2019 levels) and a consensual short investor market create tactical bullish opportunities in 2022 while supply risks are also possible.

(50% probability)

Palladium 2022 forecasts

fundamentally switching to a surplus in the medium term

■ Palladium Price 1917.49



Source: MKS PAMP Group, Bloomberg

XPD Curncy (Palladium Spot \$/Oz) Palladi 2022 forecast Weekly 17SEP2011-05JAN2022

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Upside risk (~\$2500+/oz): dependent on

1. Earlier chip shortage 'resolution' injecting pent-up demand on lower stock availability and driving strong auto sales recovery
2. Stricter emission regs (hybridization) + higher loadings offsetting lower production (chip shortage)
3. Investor shortcovering or reengagement (into ETFs, COT)
4. Supply disruptions (S.A wage negotiations are mid year for the majors)

(25% probability)

Downside risk (~\$1500/oz): dependent on

1. Prolonged chip shortage inducing largescale OEM lending/deleveraging
2. Ramp up of Russian supplies
3. Weaker Global demand
4. Accelerating EV forecasts (gasoline "cArmageddon) bring forward price weakness & souring sentiment

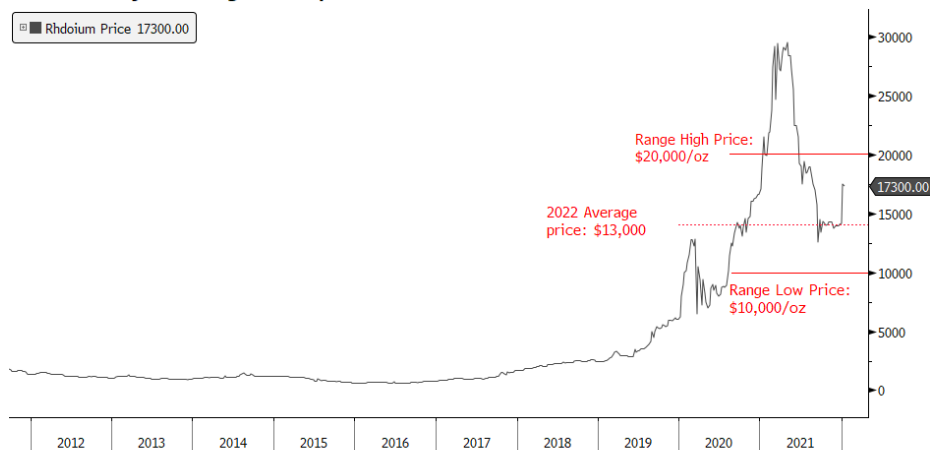
(25% probability)

Rhodium 2022 Outlook: Fundamental peak in; widened surplus for 2022

2022 average price forecast: \$13,000 due to chip shortage and larger surpluses

Rhodium 2022 forecast

fundamentally switching to a surplus in the short-term



Source: MKS PAMP Group, Bloomberg

JHATHRHOD Index (Johnson Matthey Rhodium Spot Price) Rhodium 2022 forecast Weekly 17SEP2011-11JAN2022 Copyright© 2022 Bloomberg Finance L.P. 11-Jan-2022 11:51:02

Upside risk ~\$20,000+/oz: dependent on

1. Earlier chip shortage 'resolution' injecting pent-up demand on lower stock availability,
2. Accelerating/stricter emission regs (hybridization) & higher loadings for Nox emissions offsetting lower production (chip shortage)

(60% probability)

Downside risk (~\$10,000/oz): dependent on

1. Prolonged chip shortage inducing largescale OEM lending/deleveraging
2. Stock accumulation by producers/OEMs larger than expected
3. Accelerating EV forecasts (gasoline "cArmageddon") bring forward price weakness & souring sentiment

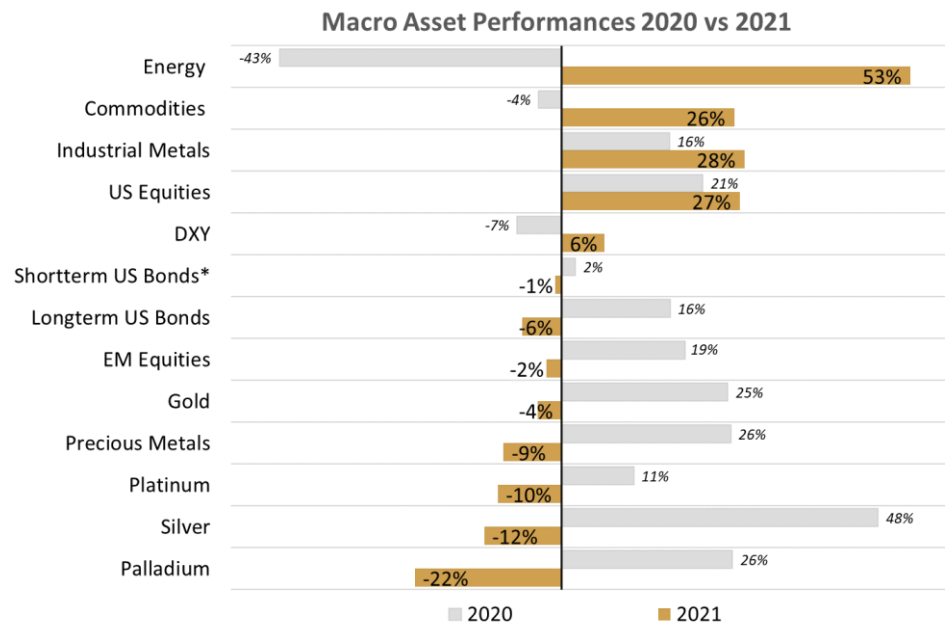
(40% probability)

5.

The macro backdrop & expectations for 2022

COVID macro trends then, now and looking ahead

- **2020 – Fear hedges**
 - High volatility, uncertain regime
 - Precious & safehavens outperforms
 - Reflation trade takes hold 2H '2020
- **2021 – Reflation-on**
 - Outsized repricing in equities
 - Inflation surges to decades+ high
 - Growth-sensitive commodities put in bull mkt returns
- **2022 – Struggle between reflation & stagflation**
 - Shift away from peak growth
 - Peak stimulus behind us with CBs collectively tapering/hiking & fiscal stimulus waning
 - COVID variant risks & Supply chain risks continue (COVID policies, decarbonization & deglobalization)
 - Reflation trades under question if inflation persists transitory, growth rolls over & liquidity withdrawn quickly



MKS PAMP Group, Bloomberg

A summary of 10 macroeconomic expectations for 2022

Cycling through reflation (liquidity-on + growth) and stagflation (liquidity-off + peak growth)

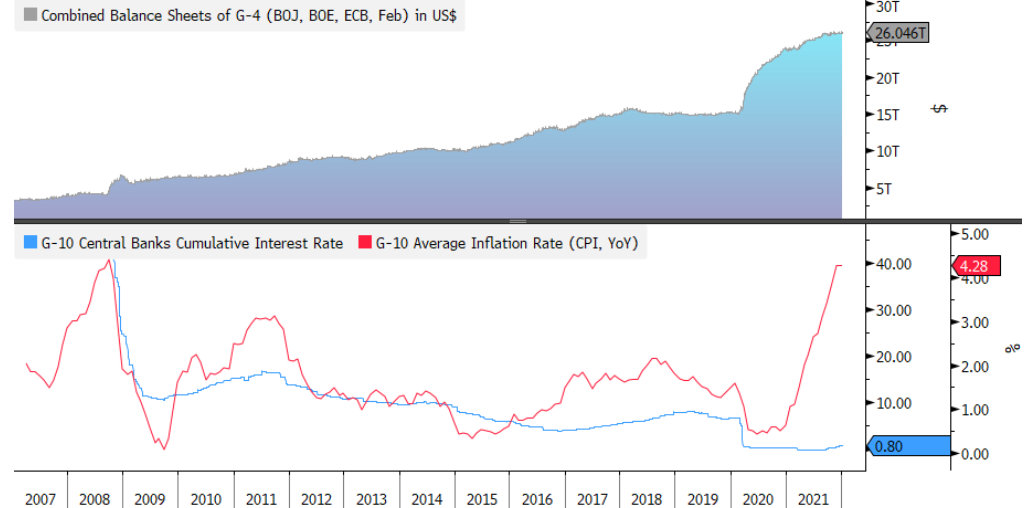
1. **COVID, Variants & Policies – a stagflationary force.** The pandemic becomes endemic for advanced nations, but China & other zero-covid like countries face failed policies that could cause further supply chain disruptions & inflation.
2. **Growth & recession risk:** Slowing of global GDP from 2021 peaks, to more sustainable levels, with recession risk on the rise into a a hawkish Fed hiking cycle.
3. **The Fed & global CBs –** a Fed taper/transition phase is traditionally always tricky. Risk of policy mistake is rising rapidly.
4. **Inflation:** elevated with risks higher
5. **Risk Assets:** enormous amounts of sidelined liquidity still remain despite Fed taper but 2021 equity gains unlikely to be matched
6. **Geopolitics:** messy and underhedged given inward looking governments ('geopolitical recession')
7. **US politics:** more polarized, dysfunctional but a bigger unfavorable government into US midterm elections at a time with deepening economic challenges (inflation)
8. **FX trends:** mixed US\$ outlook with slight bullish bias on the Fed taper
9. **Supply-chain risks:** higher until theres global herd immunity or zero-COVID/similar policies abandoned
10. **Climate change:** large “transition risks” are growing

Global Central Banks & the Fed: liquidity in various forms

- Strong & synchronized lowering of rates and ramping up of Balance Sheets in 2020-2021 marks the peak
- The “Big 4” (Fed, BOJ, ECB + BOE) have ~\$26tn in assets on their Balance Sheet, 4x the post GFC peak
- Recent inflows into Global Equity funds (since vaccination efforts) is ~\$1tn, more the previous 25yrs (COMBINED!). That was driven by retail interest and is unlikely to be repeated in 2022 given impact of inflation, the Fed's liquidity withdrawal and expected equity market volatility
- Top 25 PE firms sitting on ~\$510bn of uninvested cash

Central Banks' Balance Sheets

dovish interest rates vs inflation AND combined assets remain lofty (in \$terms)

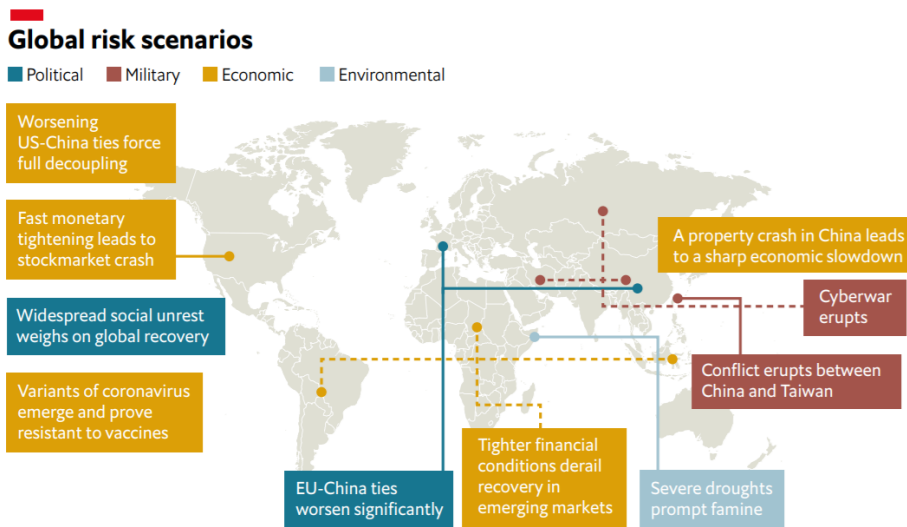


Source: MKS PAMP Group, Bloomberg

.G4BS U Index (BS of ECB BOE BOJ + Fed (in \$)) Fed, ECB, BOJ BS (\$) Int Daily 06JAN2007-10JAN2022 Copyright© 2022 Bloomberg Finance L.P. 10-Jan-2022 10:30:18

Post-COVID recovery running out of steam; slowER not slow global growth

- Growth to slow in 2022 (vs 2021) due to diminishing tailwinds from reopening efforts, reduced fiscal stimulus, higher inflation and continued uncertainty around new COVID variants and subsequent policymaking decisions
- The IMF sees global growth of +4.9% YoY (revised up from 4.4%) in 2022, vs +6% in 2021 and -3.2% (2020) *(as of October 2021)*
- GDP growth estimates for 2022: US 4.9%, Europe 4.3%, UK 4.8%, China 5.7%. All include downside risks
- Global recovery gap will widen on unequal vaccine access, with more upside growth in economies with significant/continued room for reopening.

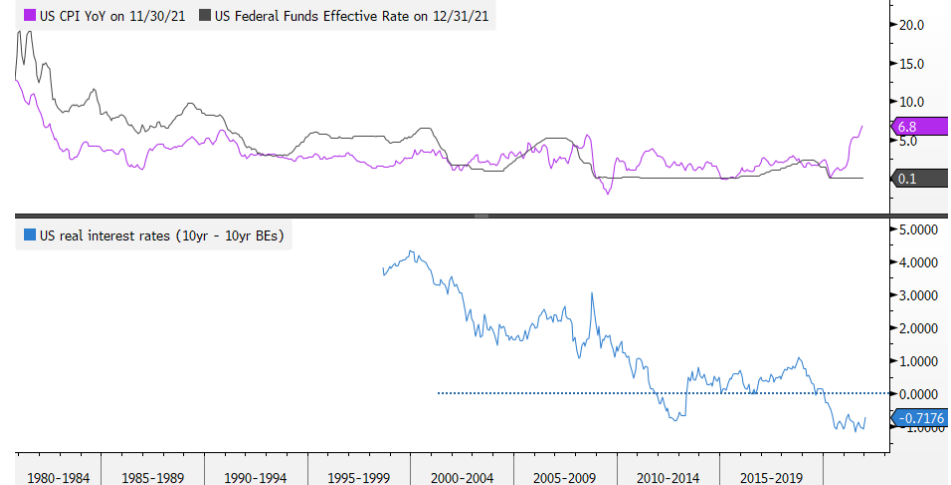


Source: The Economist Intelligence Unit.

Inflation to cool but floors will still be higher

- Base effects and the ability (thus far) of the Fed / Jerome Powell to actively manage inflation expectations is likely to stem aggressive & sustained inflation spikes
- However, supply bottlenecks (contingent on global herd immunity or faster supply-chain adaption), commodity/raw material inflation, wage growth & persistent labor shortages, recently extraordinary policy accommodation, the cost push from ESG/energy transition, protectionist trade policies, and energy crisis, ensures higher inflation floors will be sustained for longer
- Given the current US debt overhang, interest rates are unlikely to rise fast enough to drive very high real positive rates; negative or low real rates to persist throughout the Biden administration, creating a supportive backdrop for Precious Metals.

US CPI outrunning Fed funds target rate Negative real interest rates & looser Fed policy supportive for precious



Source: MKS PAMP Group, Bloomberg

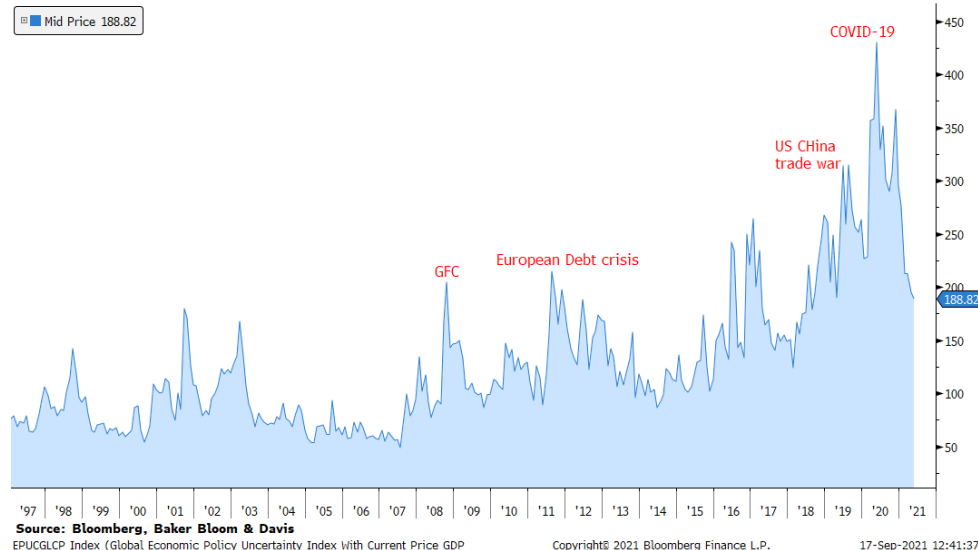
CPI YOY Index (US CPI Urban Consumers YoY NSA) US CPI real rates inf2 Monthly 31OCT1980-10JAN2022 Copyright© 2022 Bloomberg Finance L.P. 10-Jan-2022 10:40:18

Macro uncertainties & event risk to monitor in 2022

Potential macro uncertainties:

- Inflation suddenly accelerates from higher base
- Global growth falls faster than expected
- New COVID variant uncertainties, a government COVID policy failure and/or subsequent stronger restrictions
- A Central Bank policy mistake
- Escalating geopolitical, trade tensions or terrorist attack
- Supply chain risks accelerate
- Commodity shock
- Significant corporate tax policy change
- Social upheaval / protests
- Official currency intervention
- Major spike in interest rates and/or US\$
- China (slowdown, regulatory reform, debt issues, PBOC policies)
- 2022 midterm U.S. election risk
- Threat of a US debt default
- Problems sourcing market liquidity
- DeFi, Crypto reform
- Cybersecurity failure / hack
- Extreme weather event
- Asset bubble burst

Global Economic Policy Uncertainty Index falling from COVID Peak and even underpriced vs US/China trade uncertainty peak





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