



MARKET SPOTLIGHT

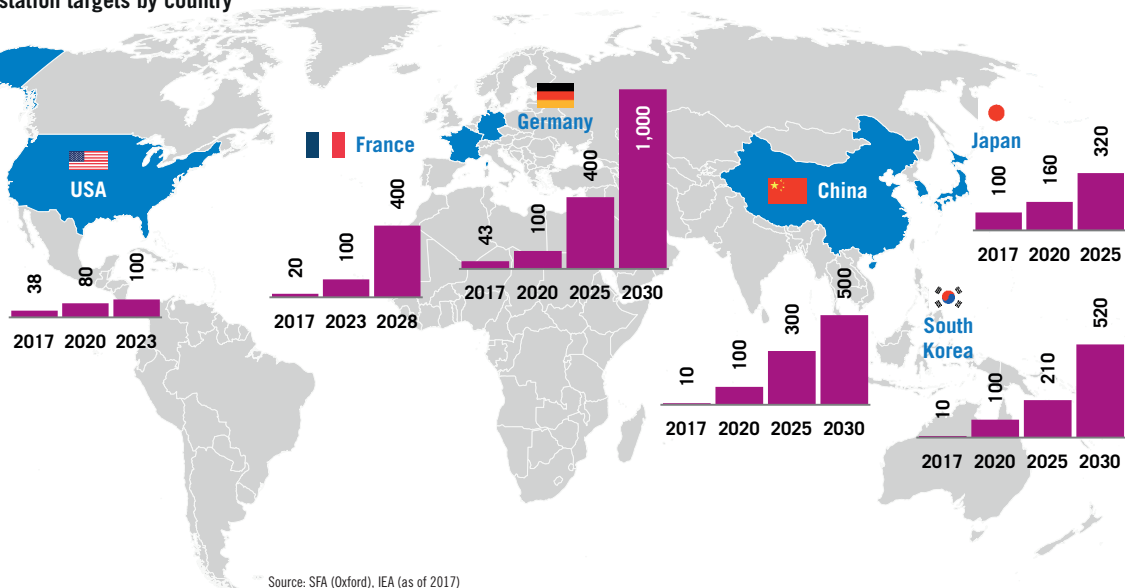
Platinum is gearing up for the hydrogen economy

Technological, legislative and commercial drivers have aligned to make the hydrogen economy viable now. Renewable energy (wind and solar) is ever-more efficient and cost competitive, so 'green' hydrogen can be readily produced. Hydrogen is a flexible store of renewable energy, helping grid balancing and decarbonisation of energy production. Electrolysers produce hydrogen fuel by splitting water into hydrogen and oxygen using electricity, whereas fuel cells reverse the process, generating electricity and water. Electrolysers are scalable and much bigger than the fuel cell in a car.

Proton exchange membrane (PEM) technology uses platinum and iridium catalysts. Several electrolyser technologies with different capital costs, lifetimes and efficiencies compete in this expanding market. PEM is the main technology and is forecast to add much of the new capacity over the next decade. Production scale-up and component standardisation are rapidly bringing PEM electrolyser costs down to commercially competitive levels. Currently, several thousand ounces of platinum are used annually and this will grow as the technology is rolled out, potentially exceeding 100 koz p.a. in the late 2020s. With a surplus market the additional demand can easily be met.

Hydrogen fuelling stations are already operational, with more planned in most major automotive markets. The Hydrogen Council estimates hydrogen fuelling stations worldwide will increase from 375 in 2017 to >1,100 in 2020. The Korean government now plans to have 310 hydrogen stations by 2022. Hyundai is building a new factory to expand annual fuel cell production to 40,000 units also by 2022. Hydrogen fuel costs per mile are somewhat higher than petrol, but as the infrastructure is developed, hydrogen costs will become competitive.

Hydrogen fuelling station targets by country



Heavy commercial and utility vehicles are driving demand for electrolysers and fuel cells in the nearer term using a depot model operating fixed routes. Electrification using hydrogen-powered fuel cells is a highly practical alternative to diesel engines for buses, trains, delivery vans, refuse trucks and ferries, helping to improve air quality and reduce noise in densely populated areas.



PRECIOUS METALS REVIEW

79 Au Gold

	Close	Weekly change	High	Date	Low	Date
\$/oz	1,240	-0.46%	1,250	11/12/2018	1,233	14/12/2018
€/oz	1,098	0.34%	1,100	11/12/2018	1,089	10/12/2018

Gold investors avoid financial market volatility, ETFs give proof. Throughout the recent volatility in the equities and bond markets, the gold price has remained relatively stable. It has steadily climbed by \$19/oz over the last two weeks and its implied volatility, the Gold VIX, is low at 11.1 (10-year average = 18.5). The discord of major market pressures – such as the trade war, a global economic slowdown and Brexit – have made institutional investors very sensitive to new developments. For example, implied volatility for the S&P 500 (VIX) is also

up near the 20 mark and has been since early October. By comparison, gold has been receiving some safe haven demand as ETF holdings have climbed 2.4 moz since October to 69.3 moz, 0.7 moz of that being in the last two weeks. Financial market volatility looks to continue as the current discord between market influences has shown little sign of easing. The gold price looks to continue to rise over the next few months, particularly as we enter a seasonally strong period around the end of the year and into the first quarter.

47 Ag Silver

	Close	Weekly change	High	Date	Low	Date
\$/oz	14.61	0.22%	14.81	13/12/2018	14.48	10/12/2018
€/oz	12.93	1.04%	13.02	13/12/2018	12.70	10/12/2018

India could see solar photovoltaic demand for silver rise 20 moz in three years. Silver loadings vary depending on manufacturer and technology but approximately 1 moz of silver is used for each GW of capacity. ICRA has said India is expected to install 10 GW of solar photovoltaic capacity in FY20 (year ending 31 March 2020). This is an increase from the 9 GW of installations that are estimated to have been completed in FY19. However, India is targeting 100 GW of capacity by 2022, requiring an additional 82 GW compared to the 2017 level of 18 GW. Given these announcements, installations would need to accelerate to ~30 GW per year in 2021 and 2022 to meet the target. Consequently, this represents considerable potential upside for silver demand from the

sub-continent. For comparison, ETFs have only grown 0.4 moz this year. However, this is not to diminish the importance of the installations in 2020 which are likely to account for 10-15% of global installations.

Reduced funding risk to new Japanese solar projects saves 24 moz of silver demand. Japan has mostly rolled back plans to cut subsidies for solar projects granted between 2012 and 2014. The Ministry of Economy, Trade and Industry estimates the subsidy cuts would have put 24 GW of planned capacity at risk. The deadline for the projects to begin operations is September 2020. This means up to 24 moz of silver demand over the next two years has potentially been saved.

78 Pt Platinum

	Close	Weekly change	High	Date	Low	Date
\$/oz	789	-0.32%	808	13/12/2018	778	10/12/2018
€/oz	698	0.46%	710	13/12/2018	686	11/12/2018

Annual auto demand for platinum in India is forecast to grow almost 200 koz by 2025. China's car market attracts a great deal of media attention, but India is also a key region for auto demand growth despite being only 14% of China's market size in sales terms. This is particularly true for automotive platinum demand. Passenger car sales in China are almost exclusively petrol cars, but in India approximately a third of sales are of diesel-powered vehicles. This means India already has greater annual automotive demand for platinum (at ~200 koz) than China, including demand from commercial vehicles. Indian passenger vehicle sales in November

were poor, falling 3.4% year-on-year to 266,000 (source: SIAM). LMC Automotive revised down its 2018 annual Indian sales growth forecast by 1.3 percentage points in November, citing high fuel prices, the weak rupee, low consumer sentiment and tightening credit. However, growth of 10% to 4.07 million light vehicles is still expected this year, rising to 6.45 million in 2025 (CAGR of 7%). Based on this, and increasing loadings to meet tightening emissions standards, annual Indian automotive demand for platinum could grow by almost 200 koz from 2017 to 2025. This should provide important support to global demand levels.



PRECIOUS METALS REVIEW

⁴⁶ Pd Palladium

	Close	Weekly change	High	Date	Low	Date
\$/oz	1,235	0.82%	1,272	13/12/2018	1,212	10/12/2018
€/oz	1,093	1.66%	1,118	13/12/2018	1,066	10/12/2018

Backwardation in palladium futures hit \$74/oz, the highest since the 2001 bull market. The price of the palladium futures contract for March 2019 delivery ended the week \$73/oz lower than the spot price. The futures contract market has now been in backwardation since May 2017. The last time futures contracts were in backwardation for this long (19 months) was in 1997 (see the chart on p.4). However, backwardation continued until the price peaked at \$1,110/oz in 2001, a rally of over 400%. The palladium price was \$800/oz in May 2017 and has risen 58% since then. It is now trading around the same level as gold and is over \$400/oz more valuable than platinum, but could rise further.

China's car sales are expected to fall 3% this year. Automobile sales fell 13.9% year-on-year in November to 2.55 million vehicles. The decline has now been accelerating for the last four months; year-on-year changes in August, September and October were -3.8%, -11.6% and -12.0% respectively. The China Association of Automobile Manufacturers (CAAM) is now expecting an annual decline in sales of 3%. As year-to-date sales are down 1.7%, this implies CAAM is anticipating another 12% decline in December. CAAM originally forecast a 3% rise in sales for 2018 and as recently as October it was expecting sales to avoid a decline. The 6% swing in car sales expectations corresponds to over 100 koz of lost palladium demand. This could potentially help to alleviate, but not eliminate, the tight palladium market which has a large deficit. Despite the potential for some short term corrections the price likely has further upside.

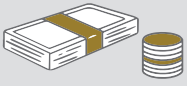
⁴⁵ Rh ⁴⁴ Ru ⁷⁷ Ir Rhodium, Ruthenium, Iridium

	Rhodium	Ruthenium	Iridium
Reporting week	\$2,520/oz	\$280/oz	\$1,470/oz
Previous week	\$2,585/oz	\$285/oz	\$1,480/oz

Prices of all three small PGMs likely to firm in Q1 2019. Rhodium, iridium and ruthenium seasonally have averaged +10%, +10% and +6%, respectively, in Q1 over the last 10 years (see chart on p.4). Iridium has seasonally been the most consistent performer in Q1 over that period, declining only twice and by less than 4% each time. The strong Q1 seasonality is reinforced by the fact that on three occasions the iridium price gained in Q1 but had reversed those gains by the end of the year. Rhodium is more variable, declining in four of the last ten years but exceeding 10% growth in five others. On this basis, a price rise in Q1 2019 is likely.

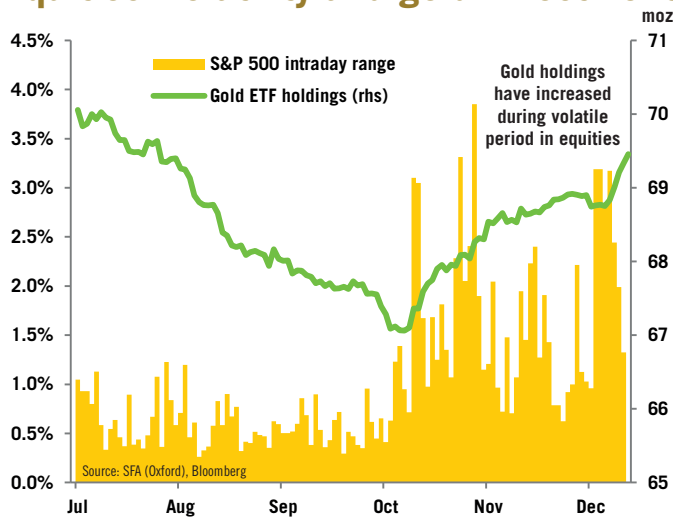
More investment in PGM end uses announced. Mitsubishi is investing in AP Ventures Fund II, adding to the \$200 million initial investment in companies that utilise PGMs. AP Ventures was spun out of Anglo American Platinum with the intention that it could create additional demand for PGMs, including the small PGMs, while providing investors the opportunity for good returns. There is particular focus on the hydrogen economy e.g. fuel cell vehicles, hydrogen plants and energy storage.

All three metals saw a price decline last week. Rhodium, ruthenium and iridium fell 2.5%, 1.8% and 0.7%, respectively.

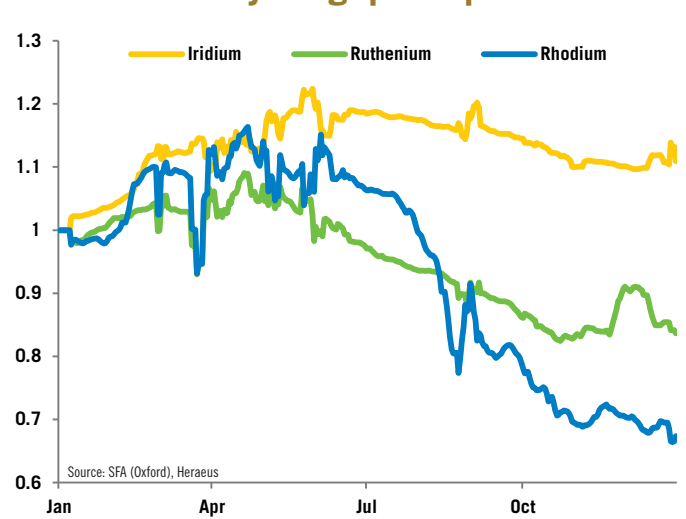


TRENDS AND INVESTMENTS

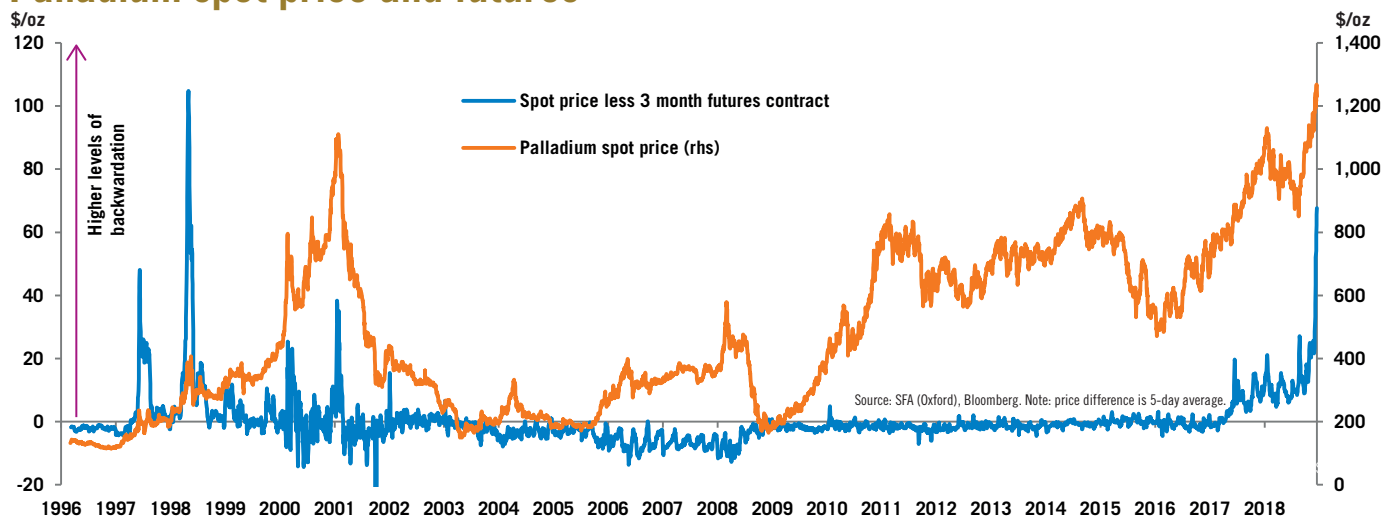
Equities' volatility and gold investment



Small PGM 10-yr avg. price performance



Palladium spot price and futures



Heraeus Precious Metals

Europe, Middle East, Africa & other regions
 Phone: +49 6181 35 2750
 edelmetallhandel@heraeus.com

South East Asia
 Phone: +852 2773 1733
 tradinghk@heraeus.com

www.herae.us/trading-market-report

United States of America
 Phone: +1 212 752 2180
 tradingny@heraeus.com

China
 Phone: +86 21 3357 5658
 tradingsh@heraeus.com

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SFA (Oxford) Ltd
 United Kingdom
 Phone: +44 1865 784366
 www.sfa-oxford.com



The Oxford Science Park, Oxford,
 United Kingdom, OX4 4GA

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