

HERAEUS PRECIOUS APPRAISAL

Heraeus

Ed. 37
5th November 2018



MARKET SPOTLIGHT

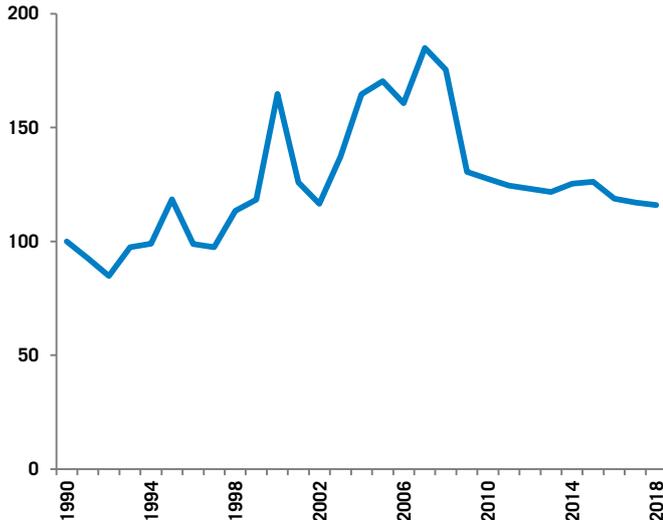
Platinum oversupply set to hoist rhodium price

The intensity of use of rhodium in autocatalysts peaked in 2007 and 2008, when the price spiked to over \$10,000/oz. By 2010, the intensity of use had fallen back to 1999 levels, and it has remained at this lower level since, as catalyst makers cut loadings in three-way catalysts and reduced the need for rhodium-rich lean NOx traps to meet Euro 6 standards. Rhodium prices averaged \$6,550/oz in 2008, and bottomed out at less than \$700/oz in 2016.

Primary rhodium supply is almost entirely reliant on South Africa, with the country accounting for 80% of global mine production in 2017. Rhodium typically comprises 3-5% of 4E output (Pt, Pd, Rh, Au) for the Merensky ore body, but up to 11% of the UG2 ore body. The escalation in rhodium prices during the mid-2000s saw seven UG2 mines commissioned by 2009, adding a little over 100 koz in annual production capacity. This new capacity helped to shift South Africa's supply base from close to 1:1 Merensky:UG2 in the late 1990s to 0.3:1 by the late 2010s.

South African producers have grown increasingly reliant on rhodium revenues as the ore mix of production has evolved. Rhodium contributed over one-third of total (PGM and by-product) revenues at its price peak, but only 7% in 2017. The price collapse led to multiple shaft closures, primarily affecting UG2 operations.

Intensity of use : Rh oz per on-road vehicle
Index 1990=100



Rhodium capacity closed in South Africa



Source: SFA (Oxford), Heraeus

Primary rhodium supply is now on a downward trend. There is significant mothballed and unfinished rhodium-rich capacity on the Western and Eastern Bushveld that could start up and produce more rhodium. However, significantly higher platinum prices, as well as rhodium prices, will be required to incentivise start-up. This is because UG2 ore typically has lower base metal by-products compared to other ore types in Southern Africa to help offset costs. In the meantime, the platinum market surplus is depressing the platinum price, keeping rhodium supply caged and lifting the price.



PRECIOUS METALS REVIEW

79 Au Gold

	Close	Weekly change	High	Date	Low	Date
\$/oz	1,233	-0.61%	1,237	01/11/2018	1,212	31/10/2018
€/oz	1,083	-0.60%	1,083	01/11/2018	1,070	31/10/2018

Gold can benefit from a US political stalemate following the mid-term elections. Equity markets bounced following the worst month for the global stock market since 2012. The S&P500 Index recovered 3% on Tuesday as a number of company reports revealed strong earnings, and safe haven demand eased. The dollar index pushed above the level it reached in August to set a new 16-month high of 97, but weakened on Thursday leading to a partial recovery for gold. Further weakness could result from the US mid-term elections taking place on 6 November. Polling suggests that the Democrats will take control of the House of Representatives but the Republicans will retain the Senate. This would create political gridlock and make it difficult for Trump to continue his pro-business policies. The increased uncertainty could lead to a drop in the dollar and upside for gold.

High local gold prices in India and China are capping demand in the two largest markets. The renminbi has suffered more than most currencies against the dollar, reaching a 10-year low. This has pushed up the local gold price, a headwind for physical demand in the world's largest gold market. In India, the final quarter of the year contributed 36% and 31% of annual demand in 2016 and 2017, according to World Gold Council (WGC) data. Festivals, the wedding season and harvest income all support gold buying in India. Dhanteras, the beginning of Diwali, takes place on 5 November and is an auspicious period for gold purchases. Gold imports are up 6.5% in September year-to-date. However, a weakening rupee has increased the gold price by 10% so far in 2018 to a two-year high of INR90,000/oz. WGC data show that the Indian gold price increase of 10% over the course of 2012 led to a 6.1% drop in demand.

47 Ag Silver

	Close	Weekly change	High	Date	Low	Date
\$/oz	14.79	0.33%	14.91	02/11/2018	14.23	31/10/2018
€/oz	12.99	0.35%	13.06	02/11/2018	12.58	31/10/2018

Increased electrification of cars adds to silver demand. Electric vehicle demand has surged in the US during Q3 2018, escalating by 107% over Q3 2017 to 110,500 cars, according to ev-volumes.com. This is equivalent to a market share of 3.2%, up from an annual average of 1.2% in 2017. These high sales are largely due to the production ramp-up of the Tesla Model 3, which sold 54,000 units in Q3. Automotive silver demand in 2017 was estimated at 50 moz (5% of global demand) in the World Silver Survey 2018. If a 3.2% market share can be sustained, US automotive silver demand could increase by 5% in 2019

despite an expected reduction in car sales. A similar rate of growth is forecast globally and should be sustainable out to 2040 as electrification continues. All cars contain silver in the electrical and electronic systems they contain, e.g. relays, sensors, actuators, rear-window defoggers. Positive global car sales growth forecasts and an increasing number of features per vehicle are likely to benefit silver demand. Electrification and hybridisation of cars should accelerate this growth as there is additional silver in the battery/motor systems. Furthermore, electrified vehicles typically have more features, such as low-level autonomous driving.

78 Pt Platinum

	Close	Weekly change	High	Date	Low	Date
\$/oz	870	4.38%	871	02/11/2018	831	29/10/2018
€/oz	765	4.46%	765	02/11/2018	729	29/10/2018

Platinum substitution into gasoline autocatalysts is not trivial, says automaker. Currently, gasoline autocatalysts are palladium-rich but the high palladium price could lead to greater use of platinum. However, GM has highlighted that to make a substitution requires an 18 to 24-month development cycle. As a result, automakers need to have a high level of confidence that the platinum price discount to palladium is going to last before starting the process. Given that a significant discount has only opened up this

year, substitution would be likely to start only in late 2019 or 2020, assuming a sufficient discount remains. The Bloomberg consensus price forecasts for platinum and palladium indicate a narrowing of the platinum discount to \$32/oz by Q4 2019 (from the current \$249/oz), which might discourage catalyst manufacturers. However, if the current discount persists, a 5% substitution globally of palladium used in gasoline autocatalysts would equate to approximately 300 koz of additional platinum demand.



PRECIOUS METALS REVIEW

⁴⁶ Pd **Palladium**

	Close	Weekly change	High	Date	Low	Date
\$/oz	1,119	2.01%	1,125	02/11/2018	1,069	30/10/2018
€/oz	984	2.00%	987	02/11/2018	941	30/10/2018

China's car tax cuts could lift palladium demand by 150 koz. China's National Development and Reform Commission, the nation's main economic planning body, has proposed halving the sales tax on cars from 10% to 5%. This is an attempt to lift car sales which declined by 7% year-on-year in Q3 2018. There is also pressure to invigorate the Chinese economy as GDP growth has slowed while stock markets and the renminbi have fallen. A similar cut in the car sales tax from 10% to 5% was introduced in September 2015 to boost the market, which had seen no growth year-to-date through to August. In 2016, the year following the tax cut, sales increased by 14% (3.4 million cars). It is unlikely that the upside to sales will be as substantial this time as the market is more developed now and has passed its natural peak in

growth rate. However, an increase in sales of 2 million vehicles would translate into approximately 150 koz of additional palladium demand for 2019.

Nornickel reiterates guidance of 2.7 moz of palladium despite a 14% drop in Q3 2018, quarter-on-quarter. Production in Q2 2018 was elevated as stockpiled material was processed during the quarter. Full-year palladium production guidance is 2,630-2,725 koz, slightly lower than 2017 production of 2,728 koz. North American Palladium increased Q3 palladium production by 7% year-on-year to 57 koz. Guidance for 2018 did not change but output is now expected to come in at the low end of the 230-240 koz range owing to lower than anticipated metal content in the mined ore.

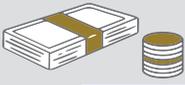
⁴⁵ Rh ⁴⁴ Ru ⁷⁷ Ir **Rhodium, Ruthenium, Iridium**

	Rhodium	Ruthenium	Iridium
Reporting week	\$2,390/oz	\$285/oz	\$1,480/oz
Previous week	\$2,410/oz	\$285/oz	\$1,480/oz

Implats' production cuts may reduce total PGM supply less than initially suggested. Impala, which contributes a sixth of rhodium supply, has reported strong performance in Q3 2018 with rhodium yield increasing by 2% to 47 koz. The company restated its plans to reduce production from 2019 onwards, which is expected to further tighten the market. However, Impala also reported that it was in talks with parties interested in acquiring one of the shafts that are currently slated for closure. If successful, this could result in an upward revision to forecast production

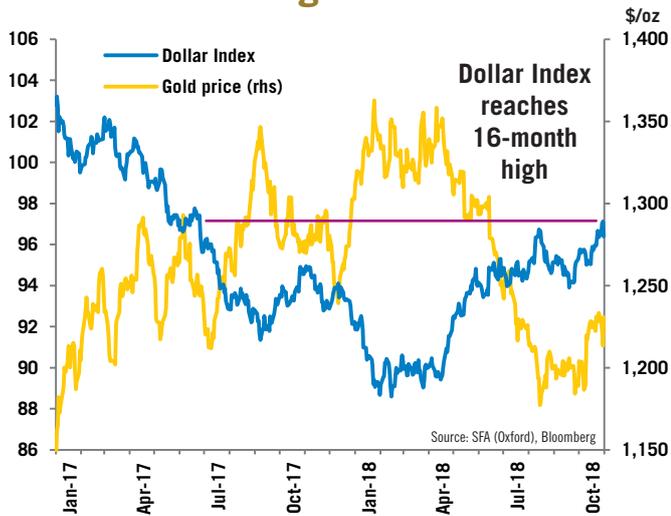
levels for all PGMs – including rhodium, ruthenium and iridium – and lower price forecasts.

Ruthenium and iridium prices remain rangebound but rhodium slipped by \$20/oz, the fourth consecutive weekly decline in the price. However, more interest from buyers is being observed at this price level. Rhodium ETF holdings have declined by a further 8% (3.8 koz) since the price peaked on 1 October and there have been no inflows on the price drop.

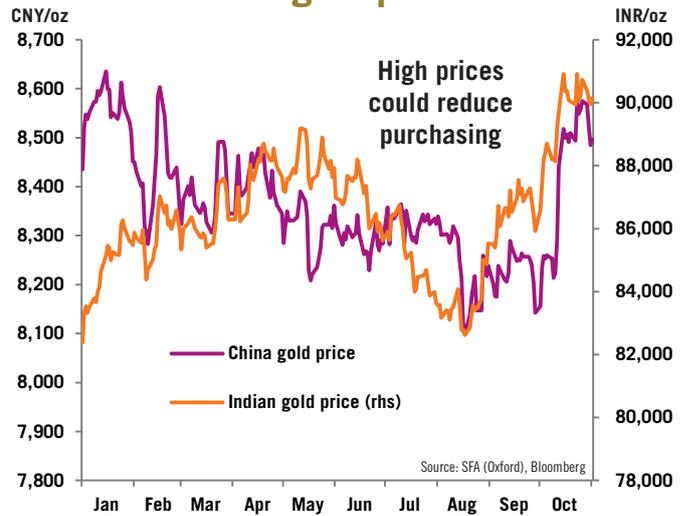


TRENDS AND INVESTMENTS

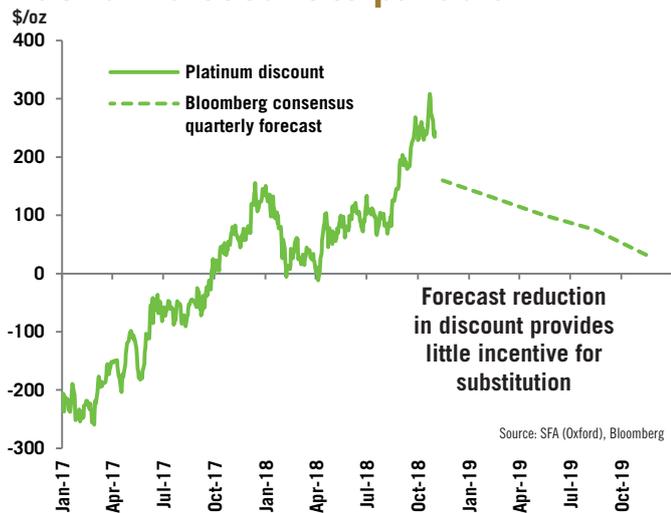
Dollar Index and gold



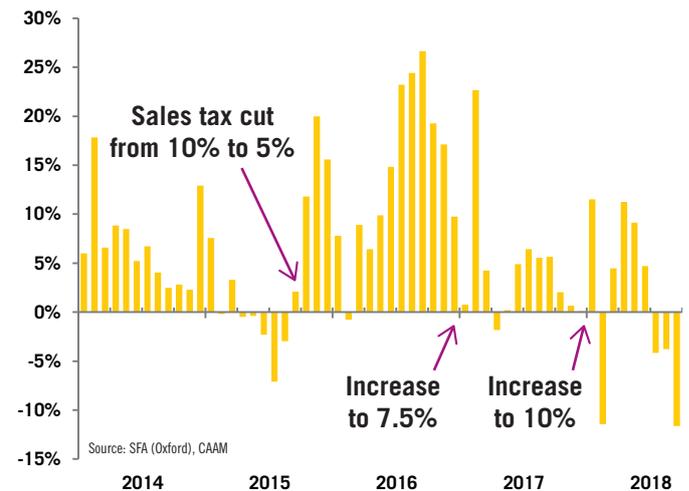
China and India gold prices



Platinum discount to palladium



China car sales year-on-year growth



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