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Summary of Platinum Supply & Demand in 2013

**Summary: Platinum**

- The deficit in the platinum market widened to more than 900,000 oz, as South African investors bought 894,000 oz via a new rand-denominated ETF.
- Primary supplies rose moderately to 5.83 million oz, with modest gains in South Africa and Zimbabwe, but this was partly offset by lower recycling.
- Gross demand for platinum rose by 9% to 8.77 million oz on exceptionally strong jewellery, investment and chemical demand.
- Autocatalyst demand weakened slightly, due to lower sales of light duty diesel vehicles in Europe, accompanied by additional thrifting.

In 2013, the platinum market recorded a deficit of more than 900,000 oz, largely as a result of record sales of platinum via ETFs, mainly to South African institutional investors. Excluding investment, combined demand in autocatalyst, industrial and jewellery applications grew by 4.1% to 7.9 million oz, slightly exceeding supplies from primary and secondary sources. This is the first time since 2005 that the platinum market has been in deficit before accounting for investment.

Primary platinum supplies grew by 2.9% to 5.83 million oz in 2013, due to a modest recovery in South African output and some additional production from Zimbabwe and Finland, partly offset by dwindling Russian sales.

Despite a much reduced level of labour disruption, overall sales by South African platinum producers rose by only 105,000 oz, to just over 4.2 million oz. This fragile recovery reflects the continued erosion of the industry’s productive capacity due to shaft closures, delays in the commissioning of replacement capacity, and weak productivity. In addition, most producers chose to withhold some of their output from sale, with more than 170,000 oz being added to inventories of refined platinum last year, ahead of anticipated disruption in 2014.

Following the prolonged illegal strikes seen in 2012, the industrial relations climate remained tense, but for most of the year labour stoppages were limited in scale and sporadic. However, the situation deteriorated in the final quarter: Anglo American Platinum’s western Bushveld operations lost around 44,000 oz of platinum production in October due to industrial action over shaft closures, while Northam’s Zondereinde mine was closed by a wage strike during November and December.

In contrast the incidence of safety stoppages increased, removing approximately 120,000 oz of platinum output. Production was also affected by the mothballing of marginal operations. Shafts at Anglo American’s Rustenburg and Union sections were shuttered in August following the group’s strategic review; operations at Eastplats’ Crocodile...
River mine ceased in July; and Impala Platinum also closed some old shafts at its lease area. Altogether, we estimate that the impact of this new wave of closures was to reduce 2013 platinum production by some 100,000 oz (the full impact will not be felt until 2014 and beyond). In total, some 350,000 oz of platinum were lost to a combination of legal and illegal strikes, safety stoppages and shaft closures, compared to around 750,000 oz in 2012.

The ramp up of Zimplats’ Phase 2 expansion contributed to higher shipments from Zimbabwe, while supplies from other regions were boosted by additional by-product pgm output, including around 30,000 oz of platinum from the Kevitsa nickel mine in Finland. North American platinum production was stable. However, Russian sales continued their gradual downward trend, in line with declining grades at both Norilsk Nickel and the Far Eastern alluvial operations.

Gross demand for platinum rose by 9.1% to 8.77 million oz in 2013. This represents a record level of physical offtake, by a considerable margin, being nearly 700,000 oz higher than the previous high set in 2011. While the unprecedented inflows into ETFs were a major factor in this growth, there was also exceptionally strong demand from the jewellery and petrochemical sectors. In contrast, consumption of platinum in autocatalysts retreated slightly, down 2.2% at 3.12 million oz.

In Europe, which is by far the largest consumer of platinum in automotive emissions control, output of light duty diesel vehicles contracted by 1.5% to 8.4 million units, the weakest performance since the post-financial-crisis low in 2009. However, platinum usage on European diesels shrank by 7%, as a result of continued thrifting on Euro 5 diesel catalysts. Since Euro 5 legislation was first enforced in 2009, we estimate that the average pgm content of a European light duty diesel catalyst has fallen by 3%, but platinum loadings have declined by nearly 20%, primarily as a result of substitution with palladium.

Thrifting and substitution were also evident in North America, where light duty diesel demand decreased by 5% despite growth in vehicle output, while purchases by Indian automakers were hit by a 16% drop in diesel car production. However, these declines were balanced by a strong performance from other Rest of World countries, notably Thailand, where platinum loadings on diesel cars have risen following the introduction of Euro 4 equivalent legislation in January 2013, and Korea, which saw an 18% increase in light duty diesel output last year.

Japanese automakers are the only remaining significant users of platinum in gasoline emissions control, both in their home market and in their transplants in other regions. Thrifting and substitution continue to erode platinum usage on gasoline catalysts generally while, in the Japanese domestic market, demand has also suffered from lacklustre vehicle sales and a shift towards smaller vehicles with lower catalyst volumes.

The use of platinum to control emissions from heavy duty vehicles was unchanged. Although sales to European automakers rose sharply from a low base, as trucks...
began to be fitted with platinum-rich Euro VI emissions control systems, this was offset by a decline in Japanese heavy duty production and significant thrifting by North American manufacturers.

The jewellery industry enjoyed a record year, with gross demand exceeding 3 million oz, buoyed by growth in all major markets except Japan. Purchases by Chinese jewellery makers rose by 7.7% to exceed 2 million oz for the first time since 2009, as the sector benefited from a benign price environment, combined with continued expansion in the number of retail outlets and some stock-building by manufacturers towards the year-end.

Although declines in the gold price resulted in platinum re-establishing a small premium, at the retail level the two metals remained close enough in price to enable some ‘upselling’ by Chinese retailers. In other respects, the lower gold price was generally positive for platinum demand. Firstly, it generated an increased retail footfall from opportunistic customers seeking to take advantage of lower gold prices; this had a knock-on effect on platinum jewellery sales, as some buyers also acquired platinum items. Secondly, gold price weakness has helped contain supply-related price gains for platinum. Stable prices are an important factor in the Chinese jewellery sector because mark-ups are smaller than in Western markets, meaning that metal costs play a bigger role in determining the final retail price of jewellery items.

Jewellery offtake was strong in other regions too. In Europe, demand was boosted by increased use of platinum in luxury watch cases at the expense of yellow and rose gold, while North America saw strong sales of platinum wedding bands, particularly in lower price brackets. In India, fears that the implementation of measures to restrict gold imports would have a knock-on effect on platinum demand proved largely unfounded. Widespread confusion about the application of the new rules triggered some shortages of gold and caused significant uncertainty in the jewellery trade, yet platinum sales to Indian jewellery makers rose by more than 30% to a record 140,000 oz.

Platinum demand from the chemicals sector reached an all-time high in 2013. The ‘shale gas revolution’ in the USA has had a profound impact on the world petrochemical sector, and notably on the ethylene and propylene markets. Many shale gas wells also produce significant quantities of natural gas liquids (NGLs), including ethane; increased availability of NGLs has improved the economics of using ethane in place of heavier products such as naphtha as a feedstock for the production of ethylene. This has had the effect of curtailing output of co-products such as propylene that are generated in the naphtha-cracking process, and has created an incentive for the construction of on-purpose propylene production facilities.

One alternative route for the production of propylene is via propane dehydrogenation (PDH) in the presence of a platinum catalyst. This process is economically attractive at present, due to an abundant supply of propane, another NGL commonly extracted from shale gas wells. As a result, there has been significant investment in new PDH plants using platinum technology in North America and China.
The electrical sector saw a rebound in sales of platinum to hard disk manufacturers, despite weakness in the personal computer market and continued loss of market share to solid state memory devices, which do not use pgm. Hard disk demand was unusually weak in 2012, when manufacturers made a concerted effort to reduce inventories in the wake of the floods which devastated the Thai hard disk sector the previous year. In 2013, purchasing returned to more normal levels.

In contrast, offtake by the glass industry was somewhat disappointing last year: overcapacity in the LCD sector led to some rationalisation and sales of platinum back to the market during the latter part of the year. Overall, demand for platinum in industrial applications rose by 8.2% to 1.76 million oz.

Investment demand was dominated by the purchase of nearly 900,000 oz of physical platinum via a new rand-denominated ETF product launched by Absa in April 2013. This product is designated a ‘domestic’ fund by regulators and has proved attractive to local institutional investors, who are subject to limits on overseas investments. The unleashing of pent-up demand resulted in the new ETF accumulating over 400,000 oz of platinum in its first two months, and inflows continued steadily thereafter, with investors preferring metal to equities in the context of poor profitability and precarious industrial relations at the platinum mines. Many of these buyers saw their investments appreciate over the course of the year: although the dollar-denominated platinum price declined by 8% between the fund’s launch in April and the year-end, the rand price appreciated by 6% over this period.

There were also some net purchases of both ETFs and small platinum bars and coins by North American investors, but this was largely counterbalanced by moderate disinvestment in other regions. Net global investment in 2013 was 871,000 oz, nearly double the previous year’s total.

With gross platinum demand rising at more than four times the rate of primary supply growth, recycling was unable to bridge the gap. While recoveries from spent autocatalysts were up 5.2% in 2013, in line with higher platinum loadings on catalysts fitted to European diesel vehicles built in the early to mid-2000s, there was a sharp decline in jewellery recycling.

In China, which is the largest source of jewellery scrap, a relatively subdued platinum price discouraged consumers from returning old platinum jewellery. In addition, manufacturers were reluctant to expand their recycling business, due to the technical difficulty of achieving the requisite levels of purity when melting down old jewellery of varying alloy composition. Japanese jewellery recycling was flat, even though prices rose in yen terms. Large quantities of old platinum jewellery remain in the hands of consumers, but we believe that significantly higher prices will be required in order to stimulate increased levels of recycling. Overall, we estimate that secondary supplies of platinum derived from autocatalyst, jewellery and electrical scrap fell by 2.1% to 2.01 million oz.
Forecast of Platinum Supply & Demand in 2014

Forecast: Platinum

- The platinum market deficit is forecast to exceed 1 million oz in 2014, with lower supplies and strong demand from all the major consuming sectors.
- Gross demand should approach 9 million oz – a new record – on the back of higher autocatalyst, jewellery and industrial purchasing.
- Primary supplies will be hit by labour disruption at major mining operations in South Africa, but sales from producer stocks will limit the decline.
- Stricter diesel emissions legislation will begin to take effect in Europe this year, but the full impact will not be seen until after 2014.

We expect physical investment to play a smaller role in determining the platinum market balance in 2014, with net inflows into ETFs predicted to fall by 55%. Nevertheless, we forecast that the deficit will exceed 1 million oz, as a result of disrupted South African supplies, an increase in diesel catalyst loadings following the introduction of stricter European emissions standards, and continuing strong demand from the jewellery and chemical sectors.

As of the end of April 2014, the western Bushveld operations of Anglo American Platinum, Impala and Lonmin have been on strike for over three months. Our forecast incorporates the loss of output during this 14-week period, and also includes an allowance for reduced production during the eventual post-strike ramp-up. In total, including ramp-up losses, we estimate that more than 800,000 oz of platinum production has already been foregone. With the strike continuing into May, output will be reduced by approximately 50,000 oz of platinum for every additional week of stoppage. In addition, the longer the strike continues, the more probable it becomes that decisions will be taken to permanently scale-back operations at some of the affected mines.

Nevertheless, our forecast for 2014 envisages a decline of only 250,000 oz in South African platinum supplies, to 3.95 million oz. We allow for substantial destocking by producers, particularly Anglo American Platinum: in its first quarter report, the latter reduced its production estimate to 2.1 million oz, from 2.3–2.4 million oz, but left its sales target unchanged. In addition, approximately 45% of South Africa’s platinum production capacity is unaffected by the current strike, and some of these mines reported strong output in the first quarter. In total, world supplies are expected to fall 5% to 5.56 million oz, with Zimbabwe being the only supplier likely to record an increase in shipments this year.

As previously predicted, there will be an uptick in sales of platinum to European automakers in 2014, due to the enforcement of the next stage of European emissions legislation in both the heavy duty and the light duty sectors. Since January this year, Euro VI regulations have applied to all heavy duty vehicles sold in Europe, and going forward the majority of trucks manufactured in this region will be fitted with platinum-rich catalysts.

The roll-out of Euro 6 emissions limits for diesel passenger cars will begin in September 2014. Although only a minority of light duty diesels sold this year will meet the new standards, this will nevertheless have an appreciable impact on average catalyst loadings. The full effect of the new legislation will not be felt until 2016.

Euro 6 diesel cars will require NOx aftertreatment in order to meet the stricter limits: most smaller cars will use a platinum-rich NOx trap, in addition to a diesel particulate filter (DPF), while larger vehicles will typically use non-pgm...
selective catalytic reduction (SCR) technology downstream of a pgm-containing oxidation catalyst and DPF. This will result not only in higher total pgm loadings, but also a modest reversal of recent trends towards an increased proportion of palladium in the diesel catalyst mix. In order to optimise NOx aftertreatment it is necessary to control the NO to NO\textsubscript{2} ratio in the gas stream, and this favours the use of platinum.

Purchases by chemical companies should remain strong during 2014, reflecting continued investment in new petrochemical plants, while net sales to glass makers are expected to improve now that the industry’s excess metal stocks have been drawn down.

Our forecasts for jewellery and investment are sensitive to price. To date, strike action in South Africa has had only a muted effect on prices: during the first four months of 2014, the platinum price ranged between a low of $1,360 and a high of $1,470, averaging $1,434 (some 4% below 2013’s full-year average of $1,490). This reflects the general market perception that, despite deficits in the last two years, market stocks of platinum remain plentiful.

For the purpose of this forecast, we assume that the average platinum price in 2014 will be similar to that seen last year. Thus, we expect to see continued healthy purchases of platinum by Chinese jewellery makers, supported by underlying growth at the retail and consumer level. However, manufacturers in this region habitually delay purchasing when prices move higher, then buy into price dips, so it is possible that jewellery demand could be curtailed temporarily in the event of a price spike.

Investment demand outside Japan typically shows a positive correlation with price. In the first four months of 2014, global ETF holdings rose by approximately 200,000 oz and we expect some further growth in South Africa, where a second domestic platinum ETF product has recently been launched.

The more mature European and North American markets will see an ebb and flow between new investment and profit-taking, but we think that significant disinvestment is unlikely: the dollar price of platinum is currently below the levels seen between 2010 and mid-2013, during which time the vast majority of net investment occurred. Thus, it is probable that a significant proportion of ETF investment is ‘out of the money’. For as long as the platinum price remains subdued, these holdings are likely to be liquidated only under stressed market conditions. However, we expect some further profit-taking by holders of large bars in Japan.

The recovery of platinum from secondary materials should return to growth this year. Recycling of platinum from European autocatalyst scrap will increase once again, reflecting pgm consumption on vehicles built during 2000 to 2005 when platinum usage on European diesel vehicles more than trebled. During this period, there was not only significant growth in diesel’s share of the passenger car market, but also a steep climb in loadings, due to tightening emissions legislation.

Jewellery recycling is partly a function of underlying demand, so overall market expansion should generate some increased collection of old jewellery items, especially in China. However, overall growth in secondary refining is unlikely to offset the decline in primary supply. With demand expected to remain strong in every sector except investment, we predict another substantial deficit.
In 2013, combined demand in autocatalyst, industrial and jewellery applications exceeded supplies from primary and secondary sources. This was the first time since 2005 that the market has been in deficit before accounting for physical investment. The latter plunged the overall market balance into considerable deficit in 2013, and this is set to continue this year.
Summary: Palladium

- The deficit in the palladium market narrowed to 371,000 oz in 2013, due to weak industrial demand and a significant swing in net ETF investment.
- Primary supplies were little changed, with a modest recovery in South Africa offset by lower Russian shipments, but recycling rose strongly.
- Gross demand for palladium fell 5% to 9.44 million oz, reflecting the steady erosion of dental, jewellery and electrical demand, and lower investment.
- Another year of strong growth in gasoline car sales in China lifted usage of palladium in autocatalysts to a new record of nearly 7 million oz.

Gross demand for palladium retreated by 4.6% to 9.44 million oz in 2013. This decline was almost entirely due to a 475,000 oz swing in investment, from significant net demand in 2012 to modest disinvestment last year. Meanwhile, primary supplies were broadly flat, while recycling of palladium-rich autocatalyst scrap increased, allowing the gap between supply and demand to narrow to 371,000 oz.

South African supplies staged a modest recovery, up 3.9% to 2.44 million oz. The increase was greater than for platinum, primarily because palladium was less affected by changes in producer stocks. Shipments by North American producers also increased, reflecting much higher sales of by-product palladium from Vale’s Canadian mines; ore throughput at the company’s Sudbury operations rose by over 12% last year. However, these gains were more than offset by weak production at Norilsk Nickel, where grades are in long-term decline, and a fall in shipments from Russian state stocks to just 100,000 oz.

The recycling of palladium from auto, electronics and jewellery scrap increased by 9.2% in 2013. Recoveries from spent autocatalysts jumped by 13.8%, reflecting the processing of highly-loaded palladium catalysts from gasoline vehicles manufactured for the European and North American markets during the late 1990s and early 2000s. Palladium loadings during this period were significantly higher than on modern vehicles, even though emissions legislation was less strict. In addition, there was some price-related destocking of spent autocatalysts last year, following hoarding by collectors in 2012. Electronics recycling also continued to rise, but jewellery recoveries declined, mainly due to lower gross demand in China.

In the 1999–2000 period, the auto sector accounted for around 60% of total palladium consumption. Thereafter, thrifting reduced the proportion of total demand reliant on the auto industry, to less than 50% by 2005. However, in the last decade, there has been a recovery in automotive usage (largely driven by the emergence of a significant new...
vehicle market in China), combined with the price-driven erosion of traditional demand sectors such as dental and electronics, resulting in palladium usage again becoming more narrowly based. The auto sector accounted for nearly three quarters of gross consumption in 2013, and sales to automakers now significantly exceed primary mine supplies.

In 2013, major world markets saw no significant changes in emissions legislation for gasoline vehicles, while efforts to substitute palladium for platinum in autocatalysts appear to have reached a plateau. Thus, growth in light duty gasoline vehicle production was the main driver of increased offtake.

This was particularly the case in China, where another year of double-digit expansion in the domestic car market lifted palladium demand by 14.2% to 1.51 million oz. In North America, still the largest automotive consumer of this metal, a modest increase in palladium usage was masked by small swings in automaker inventories. Underlying palladium usage in this region rose by 2%, below the rate of increase in light duty vehicle output, due to engine downsizing in order to meet tighter fuel economy standards. On a global basis, auto demand was up 3.6% at 6.91 million oz.

Demand for palladium in industrial applications fell by 5.9% to 2.18 million oz. This was despite record sales to chemical producers, especially in China and the Rest of World regions, where there was significant investment in new facilities for the production of purified terephthalic acid (PTA), a precursor of polyester.

Dental demand continued its decade-long decline, reflecting improvements in dental health in major markets and some switching to base metal and ceramic products. Electronics demand also contracted. The multi-layer ceramic capacitor (MLCC) sector was once the largest single consumer of palladium, but since the late 1990s high prices have triggered an irreversible shift to base metal pastes as the electrode materials for capacitors. The use of palladium in MLCCs is now largely confined to niche applications such as medical and military electronics.
Indeed, demand for palladium in MLCCs has now been overtaken by the use of the metal in another electronics application: plating. Precious metal coatings, typically palladium or gold, are widely used to enhance the corrosion- and wear-resistance of connectors, lead-frames and printed circuit boards, particularly in applications where components are subject to a large number of connection / disconnection cycles. With gold still trading at a significant premium, the use of palladium remains economically attractive despite price gains in the last two years.

Sales of palladium to jewellery makers fell to a ten-year low of 357,000 oz. Chinese manufacturers are increasingly unwilling to work with this metal, given the lack of effective marketing and negative consumer perceptions regarding the quality of palladium jewellery.

<table>
<thead>
<tr>
<th></th>
<th>Gross '000 oz</th>
<th>Recycling</th>
<th>Net '000 oz</th>
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<tbody>
<tr>
<td>Europe</td>
<td>64</td>
<td>62</td>
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</tr>
<tr>
<td>Japan</td>
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<tr>
<td>China</td>
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</tr>
<tr>
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<td>26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>441</strong></td>
<td><strong>357</strong></td>
<td><strong>312</strong></td>
</tr>
</tbody>
</table>

The palladium ETF sector saw minor disinvestment in 2013. Unlike platinum, no new palladium products were launched, and net investment in existing products was close to zero over the course of the year. Total holdings climbed briefly above 2.25 million oz at the end of May, but there was some profit-taking in the second half, taking the total under management to just over 2 million oz at the end of December.
Forecast of Palladium Supply & Demand in 2014

Forecast: Palladium

- Lower supplies, strong auto demand and the launch of two new palladium ETFs are expected to drive the market to a third consecutive year of deficit.
- Industrial demand will weaken again, but strong sales to automakers and heavy buying by ETF investors will lift gross demand above 10 million oz.
- With primary output from South Africa and Russia likely to fall, and no new sales from Russian state stocks, supplies are predicted to hit a 20-year low.
- Two new rand-denominated ETFs accumulated 470,000 oz of palladium in their first four weeks, and could hold 1 million oz by the year-end.

Primary supplies of palladium are forecast to hit a 20-year low in 2014, as South African shipments fall to the lowest level since 2002 and Russian stock sales dry up. While recycling will grow, the increase is predicted to be more modest than last year, leaving combined primary and secondary supplies down 2%. Gross demand is predicted to rise by 11%, as weakness in industrial demand is offset by further growth in global markets for gasoline vehicles and the launch of two new palladium ETFs. This will leave the market in significant deficit for the third consecutive year.

Both major primary producer nations are forecast to ship less palladium this year. Output at Norilsk Nickel has been on a downward trend for several years, reflecting gradual declines in average grade over the last few years as its richest pgm ore reserves are depleted. Sales from Russian government stocks are likely to be negligible this year, and should not play a significant role in determining the palladium market balance in future. The second largest producer, South Africa, will also ship less metal due to the strike which has paralysed most production from the western Bushveld since late January 2014.

The use of palladium in autocatalysts is forecast to grow in all regions except Japan, reflecting trends in world auto markets. Globally, gasoline vehicle output is expected to rise by 3.7%, slightly lower than last year’s growth rate.

Once again, the gains – both in car production and in palladium consumption – will be concentrated in China. There are no significant changes in gasoline emissions limits slated for this year, and loadings on three-way catalysts will remain broadly stable. However, there will be a decline in palladium’s share of the diesel catalyst mix in Europe, as the new Euro 6 limits tend to favour platinum.

The industrial sector is predicted to see a sharp decline in net sales of palladium to chemical producers, mainly due to plant closures in Europe, where the industry is under pressure from cheap imports from Saudi Arabia and the USA. Manufacturers in these countries benefit from ample and cheap supplies of petrochemical feedstock, derived from local oil and shale gas production, making it difficult for European producers to compete.

We also expect to see further gradual erosion of demand in the electronics, dental and jewellery sectors. Palladium jewellery continues to retreat to its core markets: men’s jewellery, especially in North America, and as an alloying agent in white gold and platinum alloys. Gross jewellery demand this year is expected to total just over 300,000 oz, almost back to the levels seen before the surge in Chinese consumption during the 2004–2008 period.
Palladium investment demand has been galvanised by the launch of two new rand-denominated ETFs in March 2014. The new Absa and Standard Bank products accumulated 470,000 oz in their first four weeks, a faster rate of growth than was seen in the corresponding platinum fund last year. As with previous launches, we expect investment flows to slow after the initial heavy bout of buying, but nevertheless we allow for South African investors to accumulate close to 1 million oz of palladium this year.

Elsewhere, total net investment has been negative so far this year. Given that palladium prices are currently close to their highest level since ETFs were first launched in 2007, we believe that the established funds in Europe and North America may be more susceptible to profit-taking than their platinum counterparts.

The recovery of palladium from autocatalyst, electronics and jewellery scrap is forecast to rise by 6%. Recent trends in autocatalyst recycling are expected to continue, with highly loaded palladium catalysts continuing to flow into collection networks; however, the rate of growth is likely to be lower than in 2013, when the market was boosted by some releases from inventory. The collection of old jewellery scrap in China is predicted to fall again, although as a percentage of gross demand it will rise, leaving net demand from the Chinese jewellery industry close to zero. It should be noted that a significant stock of old palladium jewellery remains in the hands of Chinese consumers, but it may require significantly higher palladium prices to bring this material back to the market.

Combined demand in autocatalyst, industrial and jewellery applications in the palladium market has been greater than supplies from primary and secondary sources since 2012. This position is likely to continue in 2014, but the introduction of two new rand-denominated ETFs is expected to send the overall market balance this year into a deficit of more than 1.6 million oz.
Summary: Rhodium

- The rhodium market was in deficit in 2013 for the first time in six years, due to modest improvements in all major demand areas and weak supply.
- Lower shipments from South Africa depressed primary supplies, but this was balanced by higher recoveries from spent autocatalysts.
- Gross demand for rhodium exceeded 1 million oz, with stronger consumption in the auto, glass and chemical sectors, and some investment buying.
- Rhodium usage in autocatalysts was boosted by strong car sales in China; elsewhere, thrifting continued but at a lower rate than previously.

In 2013, the rhodium market recorded a deficit of 28,000 oz, the first time in six years that demand has exceeded supply. Weak sales by South African producers resulted in global primary supplies contracting by 2.6%, but this was offset by an increase in recoveries from scrapped autocatalysts. Gross demand exceeded 1 million oz for the first time since 2007, lifted by strong sales to Chinese automakers and further significant purchasing by ETF investors.

Excluding investment, combined autocatalyst and industrial demand for rhodium continued to fall slightly short of primary and secondary supplies, reflecting the impact of high prices during the 2006–2008 period, when rhodium peaked at around $10,000 per oz. Between 2006 and 2011, European and North American automakers engaged in aggressive thrifting programmes which resulted in average rhodium loadings on their gasoline catalysts shrinking by around 40% over that period. The scope for further thrifting is now more limited, but there were some modest reductions in loadings in 2013, due partly to engine downsizing to meet fuel economy targets. As a result, increases in gasoline vehicle production in North America and Europe failed to translate into higher rhodium demand.

Only China saw a significant increase in autocatalyst consumption, on the back of a 14% increase in light duty gasoline vehicle production. There is little scope for thrifting in this region, because China 4 (equivalent to Euro 4) emissions limits were not imposed nationwide until 2011, allowing Chinese automakers to adopt the latest catalyst technology with low rhodium loadings.

Other demand was robust in 2013. Sales to glassmakers were buoyed by the continued adoption of platinum-rhodium alloys with a higher rhodium content. The use of such alloys confers some technical benefits, and at current metal prices the economic balance is strongly in favour of alloy switching. In the chemical sector, purchases of rhodium remained at historically high levels, reflecting significant investment in new oxo-alcohol and acetic acid plants. However, the largest gain came from the investment sector. Investors added a further 51,000 oz to their
holdings in the Deutsche Bank rhodium ETF, which was launched in May 2011 and which held 104,400 oz of rhodium at the end of 2013. There was also some fresh demand for small rhodium bars, which are manufactured in Europe for sale in both domestic and North American markets.

The primary supply picture remained weak. Although underlying mine output in South Africa staged a modest recovery following the devastating industrial unrest of 2012, rhodium sales declined, with producers adding to both in-process and refined stocks. However, there were some additional shipments by producers in North America and Zimbabwe. Global primary supplies fell by 19,000 oz to 705,000 oz, but this fall was directly offset by growth in the recycling of rhodium from spent autocatalysts. Most of the cars scrapped in 2013 were constructed in the late 1990s and early 2000s, a period of high rhodium loadings on gasoline vehicles, especially in North America.
Forecast of Rhodium Supply & Demand in 2014

Forecast: Rhodium

- The rhodium market will move deeper into deficit in 2014, on the back of weak primary supplies and firm demand from most major sectors.
- Sales by primary producers will fall again, due to strike losses in South Africa, but higher recoveries from auto scrap will more than compensate.
- Gross demand will rise again, mainly due to strong gasoline car sales in China and North America, and an uptick in purchasing by the glass sector.
- The introduction of Euro 6 emissions limits will trigger the adoption of lean NOx traps containing rhodium on some European diesel cars.

This year will see a continuation of the trends witnessed in 2013. Primary supplies will fall, but strike losses in South Africa will be offset by increased recoveries from auto scrap, while demand for new metal from the auto industry is predicted to reach its highest level since 2007. With consumption in other industrial sectors forecast to remain firm, the rhodium market is set to move further into deficit.

Historically, at least 98% of automotive demand for rhodium has been generated by its use in three-way catalysts for light duty gasoline vehicles and motorcycles (in recent years, minor quantities have been added to some heavy duty systems in Japan). This year will see measurable use of rhodium in light duty diesel systems for the first time, a consequence of the introduction of Euro 6 emissions limits, which require NOx emissions from diesel cars to be reduced by a further 55% compared to Euro 5. While many larger cars and light commercial vehicles will use non-pgm SCR technology to control NOx, smaller cars are more likely to be fitted with lean NOx traps containing rhodium, contributing to a predicted 16% increase in European autocatalyst demand this year.

Elsewhere, rhodium’s fortunes remain closely linked to the gasoline vehicle market. China is expected to see another year of double-digit growth in both car production and metal demand. In North America, thrifting is approaching its technical limits and growth in vehicle output should translate into higher rhodium offtake in 2014. However, these gains will be partly offset by lower demand from Japan, where car production is expected to contract sharply.

Combined demand for rhodium in non-autocatalyst applications is forecast to be unchanged in 2014, as renewed investment in the LCD glass sector is offset by modestly lower investment demand.

This will leave the market in deficit for a second consecutive year. While the deficit that we recorded in 2013 was a function of physical investment demand, this year gross industrial demand excluding investment is expected to exceed combined primary and secondary supplies for the first time since 2007.
The rhodium market moved into a modest deficit in 2013 for the first time in six years. The deficit is expected to deepen this year due to weaker supplies and firm demand from most major sectors.
## PGM Market Report May 2014

### Platinum '000 oz - Supply and Demand

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**Grand Total** | **6,795** | **7,905** | **8,095** | **8,043** | **8,774** | **8,975**
## Platinum Market Report May 2014

### Platinum Tonnes - Supply and Demand

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| **Demand**⁴     |          |       |       |       |       |       |       |
| Autocatalyst⁴    |          | 68.0  | 95.6  | 99.1  | 99.1  | 96.9  | 105.2 |
| Chemical         |          | 9.0   | 13.7  | 14.6  | 14.0  | 17.3  | 20.1  |
| Electrical⁴      |          | 5.9   | 7.2   | 7.2   | 5.5   | 6.7   | 7.4   |
| Glass            |          | 0.3   | 12.0  | 16.0  | 5.2   | 4.0   | 7.7   |
| Investment       |          | 20.5  | 20.4  | 14.3  | 14.0  | 27.1  | 12.0  |
| Jewellery⁴       |          | 87.4  | 75.3  | 77.0  | 86.6  | 94.2  | 99.2  |
| Medical and Biomedical⁵ | 7.8 | 7.2 | 7.2 | 7.3 | 7.1 | 7.1 |
| Petroleum        |          | 6.5   | 5.3   | 6.5   | 6.2   | 6.6   | 7.1   |
| Other            |          | 5.9   | 9.3   | 10.0  | 12.3  | 13.0  | 13.4  |
| **Total Gross Demand** |      | 211.3 | 245.9 | 251.8 | 250.2 | 272.9 | 279.2 |

| **Recycling**⁶   |          |       |       |       |       |       |       |
| Autocatalyst     |          | -25.8 | -33.7 | -38.6 | -35.2 | -37.1 | -42.0 |
| Electrical       |          | -0.3  | -0.3  | -0.3  | -0.7  | -0.7  | -0.8  |
| Jewellery        |          | -17.6 | -22.9 | -25.2 | -27.8 | -24.6 | -25.4 |
| **Total Recycling** |      | -43.7 | -56.9 | -64.1 | -63.7 | -62.4 | -68.3 |
| **Total Net Demand**⁷ |    | 167.6 | 189.0 | 187.7 | 186.4 | 210.5 | 210.9 |
| **Movements in Stocks**⁸ | | 19.8 | -0.8 | 14.0 | -10.2 | -29.2 | -37.9 |
## Platinum Tonnes - Gross Demand by Region

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**Forecast**

- Platinum demand forecast for each region as of May 2014
- Data includes demand for Autocatalyst, Chemical, Electrical, Glass, Investment, Jewellery, Medical and Biomedical, Petroleum, and Other sectors
- Grand Total reflects total platinum demand from all regions combined
# P GM Market Report May 2014

## Palladium '000 oz - Supply and Demand

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# PGM Market Report May 2014

## Palladium '000 oz - Gross Demand by Region

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*Johnson Matthey Precious Metals Management*
# PGM Market Report May 2014

## Palladium Tonnes - Supply and Demand

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**Notes:**

1. **Supply** includes primary production and secondary recovery.
2. **Russia: Primary** includes primary production and secondary recovery.
3. **Russia: Stock Sales** includes secondary recovery from existing stocks.
4. **Demand** includes all end-use categories.
5. **Recycling** includes secondary recovery from end-of-life scrap.
6. **Node** includes all end-use categories.
7. **Total Net Demand** includes movements in stocks.
8. **Movements in Stocks** includes movements in stocks.
## Palladium Tonnes - Gross Demand by Region

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### Ruthenium '000 oz - Demand

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### Ruthenium Tonnes - Demand

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NOTES TO TABLES

1. Supply figures represent estimates of sales by the mines of primary pgm and are allocated to where the initial mining took place rather than the location of refining. Additionally, we continue to report sales of metal which we believe has not previously been priced, principally sales of Russian state stocks, as supplies.

2. Our Russian supply figures represent the total pgm sold in all regions, including Russia and the ex-CIS. Demand in Russia and the ex-CIS states is included in the Rest of the World region. Russian supply figures for palladium have been split into sales from primary mining and sales of stocks.

3. Supplies from Zimbabwe have been split from Others’ supplies. Platinum group metals mined in Zimbabwe are currently refined in South Africa, and our supply figures represent shipments of pgm in concentrate or matte, adjusted for typical refining recoveries.

4. Gross demand figures for any given application represent the sum of manufacturer demand for metal in that application and any changes in unrefined metal stocks in that sector. Increases in unrefined stocks lead to additional demand, reductions in stock lead to a lower demand figure.

5. Our Medical and Biomedical category represents combined metal demand in the medical, biomedical and dental sectors.

6. Recycling figures represent estimates of the quantity of metal recovered from open loop recycling (i.e. where the original purchaser does not retain control of the metal throughout). For instance, autocatalyst recycling represents the weight of metal recovered from end-of-life vehicles and aftermarket scrap in an individual region, allocated to where the car is scrapped rather than where the metal is finally recovered. These figures do not include warranty or production scrap. Where no recycling figures are given, open loop recycling is negligible.

7. Net demand figures are equivalent to the sum of gross demand in an application less any metal recovery from open loop scrap in that application, whether the recycled metal is reused in that industry or sold into another application. Where no recycling figure is given for an application, gross and net demand are identical.

8. Movements in stocks in any given year reflect changes in stocks held by fabricators, dealers, banks and depositories but excluding stocks held by primary refiners and final consumers. A positive figure (sometimes referred to as a ‘surplus’) reflects an increase in market stocks. A negative value (or ‘deficit’) indicates a decrease in market stocks.