



PLATINUM 2013

Interim Review



Johnson Matthey

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Johnson Matthey Public Limited Company.
Precious Metals Marketing, Orchard Road, Royston, Hertfordshire, SG8 5HE, England.
Tel: +44 (0)1763 256315
Email: ptbook@matthey.com
Web: www.platinum.matthey.com

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by **Alison Cowley**

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EXECUTIVE SUMMARY

The deficit in the platinum market is forecast to increase in 2013 to 605,000 oz, from 340,000 oz in 2012. Supplies of platinum will rise by 1.6% to 5.74 million ounces, with higher output from Zimbabwe accounting for most of the gains. Strong offtake by industrial users and investors will lift gross platinum demand by 4.9% to 8.42 million ounces. Recycling of platinum will grow slightly to 2.08 million ounces.



Platinum supplies from South Africa are forecast to rise by less than 1% to reach 4.12 million ounces in 2013. Production losses due to one-off factors such as strikes and safety stoppages totalled around 100,000 oz in the first half. Further strikes or stoppages in the final quarter of the year could eliminate any increase in South African supplies.

Autocatalyst demand will fall by 2.0% to 3.13 million ounces, reflecting weakness in the world's two largest markets for diesel cars, Europe and India. There will also be some additional thrifting by those auto makers still using platinum in gasoline catalysts. However, the use of platinum in heavy duty applications will rise, with a greater number of diesel trucks meeting strict Euro VI limits.



Gross demand for platinum in jewellery will slip by 1.4% to 2.74 million ounces. Purchases by Chinese jewellery makers will ease slightly this year after a very strong 2012, but higher demand is expected in Europe, North America and India. **Unprecedented offtake by ETF investors in the new Absa fund in South Africa is expected to lift investment demand by 68% to a record 765,000 oz.**

Industrial demand will rise by 11.5% to 1.79 million ounces. The construction of new production facilities in Asia and the Middle East is expected to boost purchases of platinum catalysts by the chemical sector. A recovery of demand for platinum in the manufacture of glass and computer hard disks will be partly offset by lower purchases by the petroleum industry.



Recycling of platinum from spent autocatalysts is expected to rise by 12.8% to 1.28 million ounces. Recoveries will benefit from increasing availability of highly-loaded diesel catalyst scrap, improved collection efficiencies, and destocking by collectors. Reprocessing of old platinum jewellery will drop by 12.9% to 775,000 oz, reflecting lower recycling rates in China and Japan.

The rhodium market will record a 14,000 oz deficit in 2013, as demand reaches a six-year high. Gross rhodium purchases will rise by 4.3% to 1.02 million ounces, lifted by double digit growth in the Chinese auto market, buying of rhodium by ETF investors and a recovery in offtake from the glass industry. Primary rhodium supplies will be unchanged from 2012 at 721,000 oz due to lack of growth in production in South Africa. Recycling from scrap autocatalysts is forecast to grow by 11.5% to 281,000 oz.



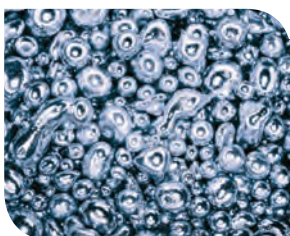
Although the gap between palladium supply and demand will narrow in 2013, the market will be in deficit by 740,000 oz. Primary supplies will decline to 6.43 million ounces, due to lower Russian stock sales, but recycling will grow by 7.4% to 2.46 million ounces. Palladium demand will fall by 3.4% to 9.63 million ounces, with autocatalyst demand strongly up but reduced purchases from other sectors.

World supplies of palladium will decline by 1.5% to 6.43 million ounces in 2013, as sales from Russian government stocks drop to 100,000 oz. There will be a marginal recovery in South African shipments of palladium, while production from Zimbabwe will rise strongly due to another round of mine expansion. North American output of palladium as a by-product of nickel mining will also increase.



A return to boom conditions in the Chinese car market will lift global autocatalyst demand for palladium by 4.0% to 6.97 million ounces. China will become the second largest market for palladium in autocatalysts at 1.51 million ounces. Growth in demand for palladium from the auto industry is expected in all other regions except Japan, but at a modest pace compared with the dramatic gains of recent years.

Industrial demand for palladium will fall by 6.6% to 2.20 million ounces, its lowest level since 2004. Substitution will again be a key feature, with palladium being replaced by base metals as the electrode material for chip capacitors in the electronics industry and by ceramics and non-precious metal alloys in dentistry. Purchases of palladium by the chemical industry remain unusually strong by historical standards.



Palladium jewellery continues to lose market share in China, and has not established a substantial foothold in any other market. Outside China, use of palladium - as an alloying element in white gold and platinum alloys, and for men's wedding bands - will be stable. As a result, demand for palladium in jewellery manufacturing will fall by 12.4% in 2013 to a ten year low of 390,000 oz.

Investors have shown a much reduced appetite for palladium this year. Although there were significant inflows into palladium ETFs in the first two months, there was a prolonged period of disinvestment in mid-year. Net palladium investment demand is forecast to fall to 75,000 oz in 2013, down from 470,000 oz last year.



Despite some recovery in ruthenium and iridium demand, the markets for both metals are in oversupply. The electronics industry has bought more ruthenium this year for hard disk manufacture after running down inventories in 2012, raising total demand by 25.3% to 828,000 oz. Demand for iridium, at 198,000 oz, will remain depressed compared to 2010 and 2011 levels, with the electronics sector currently making no new investment in crystal growing capacity.

SUMMARY

PLATINUM

- The deficit in the platinum market is set to increase to 605,000 oz in 2013, due to strong offtake by ETF investors and industrial users.
- Supplies of platinum will rise marginally to 5.74 million ounces, with hardly any recovery in South African output.
- Autocatalyst demand will fall by 2% to 3.13 million ounces, due to weakness in European diesel car markets.
- Industrial purchases will rebound strongly, up 12% to 1.79 million ounces, on strong chemical offtake and a recovery in the glass and electrical sectors.
- Gross purchases by jewellery makers will ease slightly but at 2.74 million ounces remain at historically high levels.
- Unprecedented offtake by ETF investors in South Africa will lift investment demand to a record 765,000 oz.

Gross demand for platinum is predicted to hit a record 8.42 million ounces in 2013, lifted by a strong recovery in sales to industrial users and unprecedented offtake by investors. This will more than compensate for a slight fall in purchases by the jewellery and autocatalyst sectors. With supplies recovering only very modestly from last year's steep decline, and little overall growth in recycling, the market is set to move further into deficit.

Global platinum supplies are expected to rise by 2% to 5.74 million ounces in 2013, with higher output in Zimbabwe contributing most of the increase. Based on information available to the end of September, our forecast envisages a marginal improvement in South African supplies. This could be jeopardised by strike action in the fourth quarter of 2013, unless producers maintain sales by dipping into inventories.

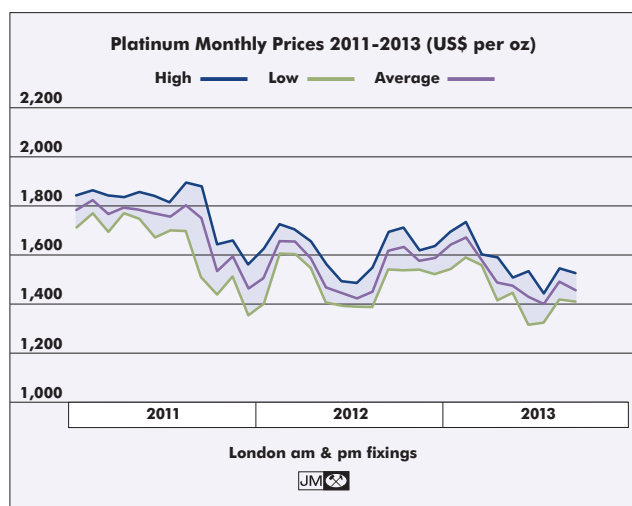
Operating conditions in the South African mining sector remain extremely challenging. Last year, some 750,000 oz of platinum were lost to legal and illegal strikes, safety stoppages and shaft closures. Sporadic industrial action has continued during 2013, but to date has been less extensive than last year.

Based on company data covering the January to June period, we estimate that production losses due to one-off factors such as strikes and safety stoppages totalled around 100,000 oz in the first half. However, disruption could rise in the final quarter: in October, Anglo American Platinum (Amplats) lost 44,000 oz of production during an 11 day strike over job cuts, and there is still a risk of industrial action over wage rises.

Underlying platinum production from South African mines was up an estimated 2% in the first six months of 2013. This gain was mainly due to higher output from Impala's Rustenburg lease area, which lost over six weeks of production to strikes in the January to June 2012 period but suffered no comparable disruption this year. Output at Lonmin declined slightly, but there were marginal gains at Anglo American Platinum (Amplats), due to good performances from joint venture and associate mines such as Modikwa, Kroondal and Bokoni, and at Northam Platinum, whose Booysendal mine began producing in the second quarter.

Eastplats' Crocodile River ceased operations during the first half of 2013, and more mine closures are underway. Following consultations with stake-holders, Amplats' restructuring plan has been amended and will now result in the mothballing of three Rustenburg shafts and an eventual reduction of 350,000 oz in annual platinum production capacity.

Unusually, South Africa has also played an important role in the overall demand picture this year, with a new rand-denominated platinum exchange traded fund (ETF) accumulating 660,000 oz of metal between its launch in April and the end of September. This ETF is the first to be readily accessible to South African institutional investors, who are subject to limits on overseas investments, and it therefore benefited from considerable pent-up demand: over 360,000 oz of platinum were purchased in the first month. Including sales through ETFs in other regions, as well as bars and coins, we predict that total physical investment will reach 765,000 oz this



During 2013 the platinum price became increasingly unresponsive to supply side concerns. After rising above \$1,700 in February, platinum was dragged below \$1,400 following a sharp fall in the gold price.

year, an all-time record.

Autocatalyst demand for platinum is set to decline by 3% to 3.13 million ounces in 2013, on the back of a 2% decline in world production of light duty diesel vehicles. Europe is by far the world's largest market for diesel cars, accounting for over half of global output; here, platinum consumption has been hit by a continued fall in new registrations in France, Germany and Italy, where diesels account for a large proportion of the fleet. However, there will be additional offtake from the European heavy duty segment, with increasing numbers of trucks meeting Euro VI limits being sold this year.

Consumption on gasoline vehicles will fall again, down 6% in response to lower output of light duty gasoline vehicles in Japan – the only region where platinum is still widely employed in three way catalysts (TWCs) – and some additional thrifting and substitution.

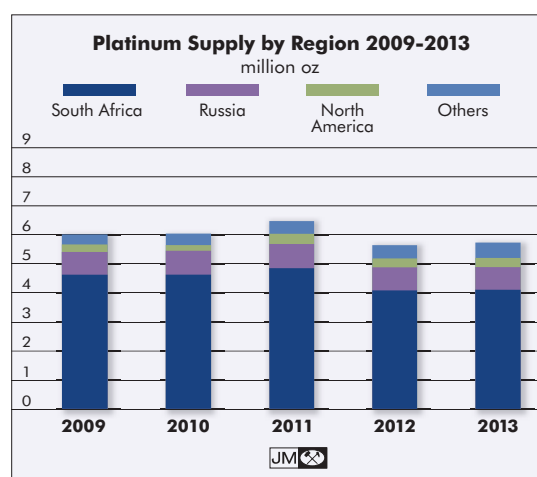
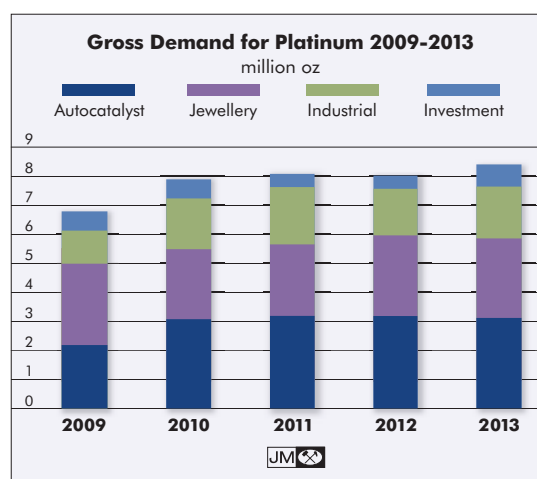
Global demand from the jewellery sector will fall slightly to 2.74 million ounces but remains at historically high levels. In China, sales to jewellery makers have been robust, albeit a little below last year's exceptional level. A sharp decline in the gold price has generated additional retail traffic, and this has supported platinum jewellery sales. The price difference between platinum and gold jewellery remains relatively narrow, enabling retailers to 'up-sell' to platinum.

Industrial demand is forecast to rise by 12% to 1.79 million ounces, with chemical manufacturers buying large quantities of platinum catalysts for polymer intermediates such as paraxylene and propylene, and the glass and electrical sectors recovering from last year's inventory reductions. In 2013, net sales to fibre glass producers will increase five-fold, boosted by some capacity additions in Asia, while purchases by hard disk manufacturers will recover to more normal levels following a period of destocking.

Recycling levels in 2013 will benefit from increasing availability of highly-loaded diesel catalyst scrap, improved collection efficiencies, and some destocking by collectors; we expect recoveries of platinum from end-of-life vehicles to rise by 13%. However, this will be partly offset by lower returns of old platinum jewellery in China and Japan, leaving total secondary supply up only modestly at 2.08 million ounces.

Concerns about labour unrest and capacity rationalisation in South Africa lifted the platinum price above \$1,700 in February. However, in April a sudden drop in the gold price dragged platinum downwards, after which the price became increasingly unresponsive to supply risks, hitting a low of \$1,323 in June. In early October, despite an 11 day strike at Amplats, platinum again slipped below \$1,400.

Platinum Supply and Demand '000 oz			
Supply	2011	2012	2013
South Africa	4,860	4,090	4,120
Russia	835	800	780
Others	790	760	840
Total Supply	6,485	5,650	5,740
Gross Demand			
Autocatalyst	3,185	3,190	3,125
Jewellery	2,475	2,780	2,740
Industrial	1,975	1,605	1,790
Investment	460	455	765
Total Gross Demand	8,095	8,030	8,420
Recycling	(2,060)	(2,040)	(2,075)
Total Net Demand	6,035	5,990	6,345
Movements in Stocks	450	(340)	(605)



PALLADIUM

- The gap between palladium supply and demand will narrow in 2013, but the market will still be in a substantial deficit of 740,000 oz.
- Primary supplies of palladium will decline slightly to 6.43 million ounces, due to lower Russian stock sales, but recycling will grow by 7% to 2.40 million ounces.
- A return to boom conditions in the Chinese car market will lift global palladium usage in autocatalysts by 4% to 6.97 million ounces.
- Total palladium demand will fall by 4% to 9.63 million ounces, as investment contracts sharply and industrial offtake is reduced.

Primary supplies of palladium are forecast to decline slightly to 6.43 million ounces in 2013, mainly due to a drop in sales from Russian government stocks. With a 3% decrease in gross demand to 9.63 million ounces, and a 7% jump in recycling, the gap between supply and demand will narrow somewhat, although the market will remain in significant deficit.

Mine production of palladium in South Africa is expected to rise marginally this year. We expect improved output from Amplats' large Mogalakwena open-cast mine, which exploits the palladium-rich Platreef, and there should be a recovery in output at Atlatsa's Bokoni operation, where the UG2 has a relatively high palladium content. At Nkomati Nickel, a joint venture between Norilsk Nickel and African Rainbow Minerals, an expansion is ramping up and output of by-product palladium was up strongly in the first half of 2013. However, these gains will be mostly offset by the loss of output due to a number of mine and shaft closures since the beginning of 2012, and lower production from large mining complexes on the western Bushveld.

Zimbabwe platinum ores are also comparatively rich in

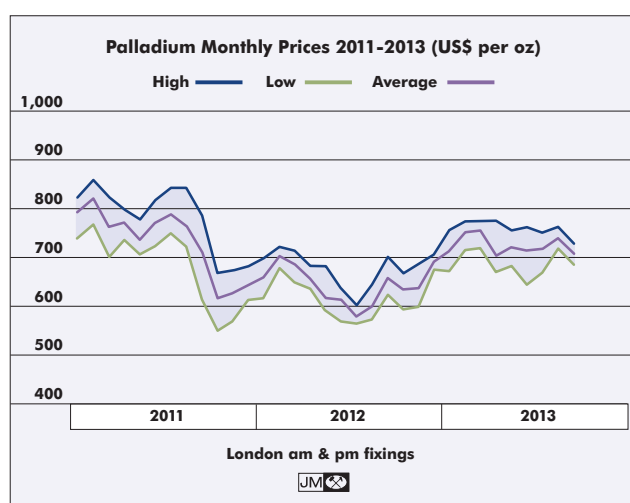
palladium. With Zimplats' Phase 2 expansion beginning to contribute to production this year, Zimbabwean supplies of palladium will rise by 17% to exceed 300,000 oz for the first time. Elsewhere, North American output will be up, reflecting increased recovery of palladium as a by-product of nickel mining, but Russian supplies will drop, due to a combination of lower primary output from Norilsk Nickel, and reduced stock sales. This year, we expect sales from Russian government-controlled inventories to total 100,000 oz.

Gross demand for palladium is set to fall in 2013, as further gains in the autocatalyst sector are offset by lower industrial use and a sharp contraction in investment offtake. With continuing strong growth in the recovery of palladium from autocatalyst scrap, net palladium demand will be down by 7%, but the market will nevertheless remain in significant deficit.

With few legislative changes affecting palladium loadings this year, demand from the automotive industry will broadly follow trends in light duty gasoline vehicle production. Outside Europe, we estimate that over 90% of autocatalyst demand for palladium is derived from its use in three way catalysts for the light duty gasoline sector, where most auto makers favour palladium-rhodium formulations. Thus, palladium consumption will be supported by higher output of gasoline vehicles in China, North America and some Rest of World countries. The biggest gain will be seen in China, where double digit growth in the light duty gasoline sector will lift purchases of palladium by local auto makers above 1.5 million ounces for the first time.

Tighter legislation will play only a minor role in this year's increase in demand, with changes to gasoline emissions limits restricted to the Rest of the World region. In 2013, Euro 4 equivalent legislation has been enforced on all light vehicles in both Thailand and Russia, with a resulting increase in palladium loadings in both countries.

In Europe, palladium enjoys substantial use in the light duty diesel sector – in excess of half a million ounces in each



Palladium traded over \$700 for most of the first nine months of 2013, supported by the prospect of long-term market deficits, and positive economic and auto sales data from the USA and China.

of the last three years, more than a third of total automotive palladium usage in this region. There has been some further substitution of platinum with palladium in this segment, but weakness in European diesel sales has restricted demand growth. However, early sales of Euro VI compliant trucks, ahead of the January 2014 deadline, has boosted the use of palladium in heavy duty applications, albeit off a low base.

In other industries, demand has been lacklustre in 2013. Palladium jewellery has seen further erosion of its market share in China: gross sales to the jewellery trade are set to fall 23% to 185,000 oz and – after taking into account recycling of old stock – net demand will total just 20,000 oz this year. With consumer demand drying up, few retailers are prepared to stock palladium jewellery, and manufacturers are cutting or ceasing production. Outside China, use of palladium – mainly as an alloying element in white gold and platinum alloys, and for men's wedding bands – will be stable.

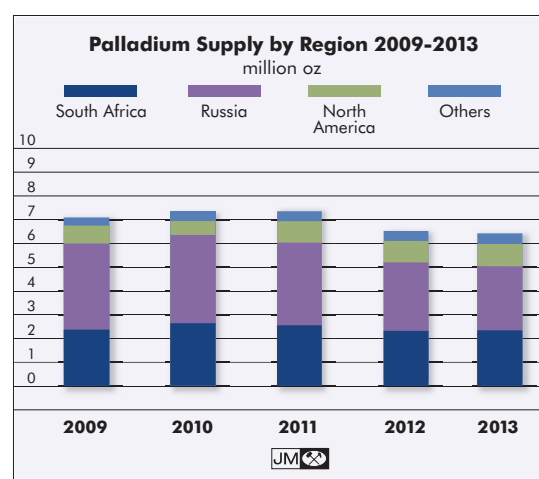
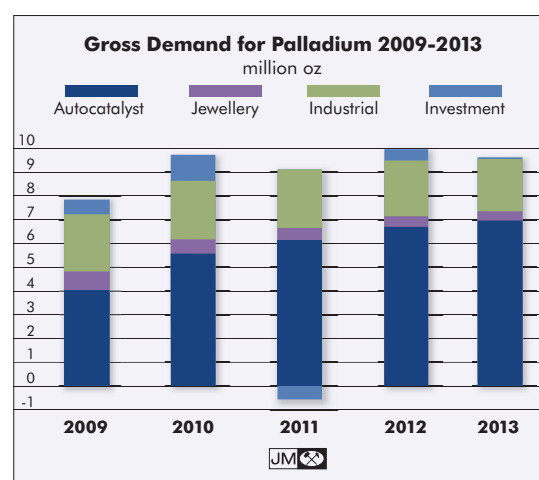
Substitution will again be a key feature of industrial demand, with palladium being replaced by base metals as the electrode material for multi-layer ceramic capacitors (MLCC), and by ceramics and non-precious metal alloys in dentistry. However, purchases of palladium by the chemical industry remain unusually strong by historical standards, reflecting further investment in new capacity for the manufacture of PTA, a precursor of polyester.

Sales of palladium to investors are forecast to contract sharply this year. Although there were significant inflows into palladium ETFs in the first two months of 2013, there was a prolonged period of disinvestment in mid-year, leaving net investment in the nine months to September at just under 50,000 oz. For the full year we forecast that physical investment will total 75,000 oz.

At present, there is no palladium equivalent of the Absa platinum ETF. However, in September 2013, Absa Capital received regulatory approval for a proposed Johannesburg-listed palladium fund, which will be backed by palladium sourced in South Africa. At the time of writing, a launch date had not yet been fixed, and our forecast does not allow for any offtake via the new Absa product this year.

Palladium traded at over \$700 for most of the first nine months of 2013, with strong speculative interest resulting in net longs on NYMEX reaching a series of all-time highs. Speculators were influenced by the belief that the market is in long-term deficit, and by shorter-term considerations including positive economic and auto sales data out of the USA and China. The price averaged \$725 in the first nine months of the year, up 13% on the same period of 2012.

Palladium Supply and Demand '000 oz			
Supply	2011	2012	2013
South Africa	2,560	2,320	2,350
Russia	3,480	2,890	2,700
Others	1,320	1,320	1,380
Total Supply	7,360	6,530	6,430
Gross Demand			
Autocatalyst	6,155	6,705	6,970
Jewellery	505	445	390
Industrial	2,465	2,350	2,195
Investment	(565)	470	75
Total Gross Demand	8,560	9,970	9,630
Recycling	(2,385)	(2,290)	(2,460)
Total Net Demand	6,175	7,680	7,170
Movements in Stocks	1,185	(1,150)	(740)



OTHER PGM

- The rhodium market will record a 14,000 oz deficit in 2013, as demand reaches a six year high.
- Gross rhodium consumption will exceed one million ounces, with auto makers, glass manufacturers and investors all buying more metal.
- Primary rhodium supplies will be flat at 721,000 oz, but recycling will grow at double digit rates.
- Despite some recovery in ruthenium and iridium demand both markets are in oversupply and prices have fallen to multi-year lows.

Rhodium

With mine production flat, recycling will assume greater significance than ever in the rhodium market, accounting for a record 28% of combined primary and secondary production. Nevertheless, supplies of rhodium will fall short of gross demand, which should exceed one million ounces for the first time since 2007.

Output of rhodium in South Africa is expected to decline slightly this year, reflecting sporadic industrial action and the closure of UG2 shafts in the last two years. (UG2 typically has a higher rhodium content than other platinum-bearing reefs mined in South Africa). Sales out of Russia are also expected to be lower in 2013, although the processing of stocks of rhodium-rich pyrrhotite concentrate continues to support production at Norilsk Nickel. These declines will be matched by higher output elsewhere, with an expansion at Zimplats beginning to contribute to supplies.

There is little immediate prospect of a return to growth in primary rhodium supplies, with more shaft closures being implemented in South Africa, and the gradual depletion of stored pyrrhotite concentrate at Norilsk. However, the outlook

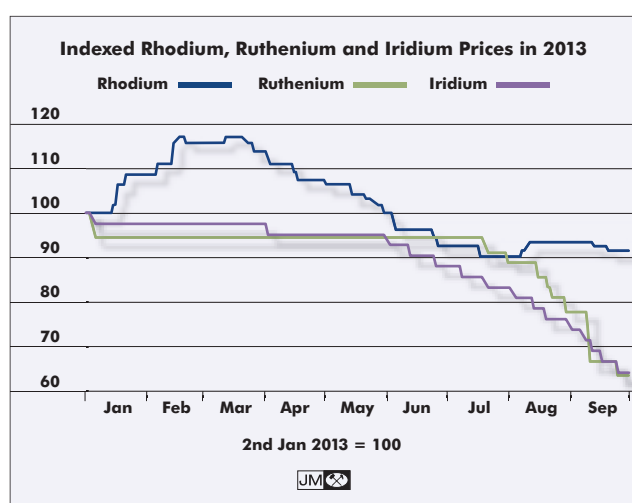
for recycling of rhodium from secondary material is positive. We expect double digit growth in recoveries from spent autocatalysts both this year and next, as collection efficiencies improve in most regions, and as the rhodium content of catalyst scrap increases.

Gross demand for rhodium is forecast to increase by 4% to 1.02 million ounces this year, the highest level since 2007. In the last few years, there has been aggressive thrifting of rhodium by auto makers in North America, Europe and Japan, with the result that auto demand in these regions remains significantly below pre-financial crisis levels. In 2013, combined production of light duty gasoline vehicles in these markets will be about 8% lower than in 2007, but rhodium demand will be 37% below the level seen six years ago. There is now much less potential for thrifting, and total rhodium demand from these regions will stabilise in 2013. Sales to Rest of World auto makers will also stagnate, with lower demand in Korea and India offsetting small growth in other countries.

With consumption elsewhere flat, a return to boom conditions in the Chinese auto market will drive rhodium demand growth this year. Production of light duty gasoline vehicles is forecast to rise at double digit rates, and rhodium usage will expand accordingly.

Historically, the use of rhodium in light duty diesel applications has been almost non-existent. However, the introduction of Euro 6 legislation for new models from September 2014 will generate measurable use of rhodium in diesel catalysts for the first time. The new emissions limits specify a 55% reduction in NOx emissions for diesel-powered cars, and will usually require the addition of NOx aftertreatment to emissions control systems. Smaller vehicles are likely to use lean NOx traps containing rhodium, but many larger cars and light commercial vehicles will use base metal SCR catalysts in conjunction with pgm-containing oxidation catalysts.

In 2012, net demand for rhodium from the glass sector was depressed by sales of metal from obsolete marble melt facilities. This year, purchases by the industry will rise by nearly



Rhodium, ruthenium and iridium prices descended to multi-year lows in 2013, with all three markets suffering from overhangs of surplus metal from previous years.

a third, with the low rhodium price prompting glass fibre manufacturers to adopt platinum alloys with a higher rhodium content. Sales of rhodium to the chemicals sector will remain high, supported by purchases of rhodium process catalysts for use in new oxo-alcohol and acetic acid plants.

With the rhodium price weak, the Deutsche Bank rhodium ETF saw further net inflows during the first nine months of 2012: investors purchased an additional 41,000 oz during this period to lift total holdings to 94,000 oz at the end of September. There was also some fresh demand for small rhodium bars from North American and European investors. We include investment in our estimate of other demand.

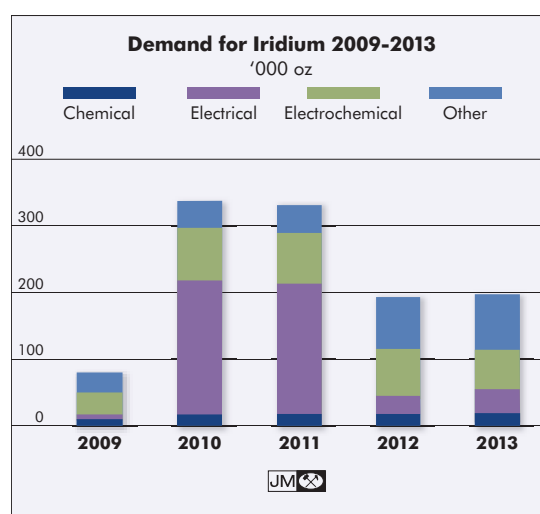
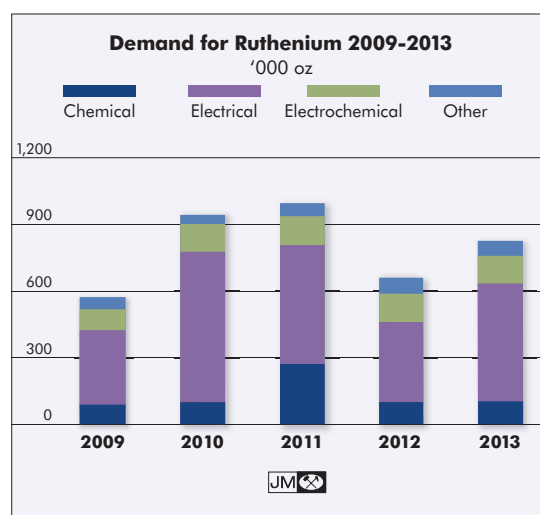
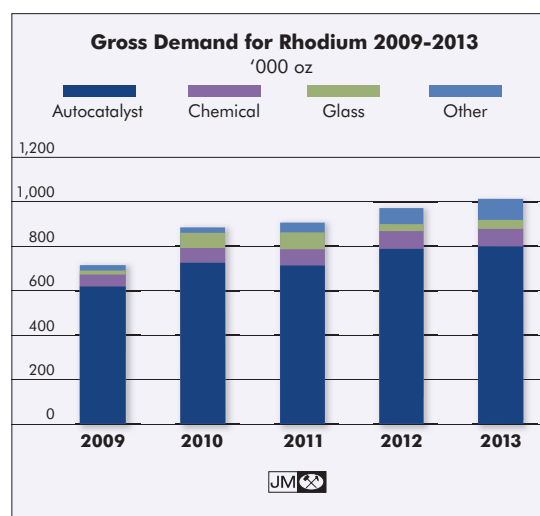
Rhodium fell to a nine year low of \$975 in July 2013 and remained below \$1,000 at the time of writing in October. In a context of stagnating primary supplies and rising demand, the lacklustre price performance may appear surprising, but reflects the large hangover of surplus metal that accumulated between 2008 and 2011. While we are now recording small market deficits, this is entirely due to the movement of market stocks into physically-backed investment products; industrial consumption of rhodium remains below the level of combined primary and secondary supplies.

Other PGM

Despite a strong recovery in demand for ruthenium and a modest improvement in consumption of iridium, the prices of both metals have fallen steeply during 2013 due to a long-term imbalance between primary production and consumer offtake.

For most of the last decade, mine output of ruthenium and iridium has been more than sufficient to meet the needs of industrial consumers. Demand for ruthenium temporarily exceeded mine production when hard disk offtake peaked in 2006 and 2007, while that of iridium was propelled above the level of underlying supplies in 2010 and 2011, due to heavy buying of iridium crucibles. However, in the last two years both metals have been in oversupply despite considerable disruption to mining in South Africa.

This year, there has been some recovery in sales of ruthenium to hard disk manufacturers, while iridium has benefited from good demand in the spark plug sector, but overall demand has been insufficient to soak up offers from producers. This has been reflected in a downward trend in the price of both metals. At the end of September ruthenium stood at an eight year low of \$57, while iridium was at a three year low of \$675.



OUTLOOK

- A reduction of production capacity at Amplats will limit the potential for recovery in South African pgm supplies in 2014, but recycling will rise.
- Sales of pgm to auto makers should increase, lifted by rising output of gasoline cars in China and tighter diesel emissions limits in Europe.
- There is potential for growth in platinum jewellery demand in both China and India, but the outlook for palladium use in jewellery is weak.
- Sales of platinum via ETFs may retreat from 2013's record level, but a rand-denominated palladium fund could generate significant offtake.

PLATINUM

Primary platinum supplies are unlikely to grow significantly in 2014. Industrial offtake will remain strong, while sales to auto makers should be boosted by new diesel emissions limits in Europe, and the outlook for jewellery demand is robust. Even with a further rise in recoveries of platinum from spent autocatalysts, and a drop in investment offtake compared to 2013's exceptional total, a third consecutive year of deficit is likely.

In the last few years, productive capacity in the South African platinum industry has been seriously eroded by mine closures, declining labour efficiencies, falling ore grades, and a failure to ensure the timely commissioning of replacement projects. Next year will see the full impact of a fresh round of shaft closures, this time at Amplats' Rustenburg mines, cutting capacity by 250,000 oz of platinum annually. Thus, even in the absence of further disruption due to industrial action, an early return to growth in platinum output is unlikely.

With both Impala and Lonmin commissioning and ramping up overdue replacement projects at their primary mining sites, and contributions from a handful of new projects such as Booysendal (Northam), Styldrift (Royal Bafokeng Platinum) and Eland Platinum (Glencore Xstrata), there is some prospect of a modest rebound in platinum supply in the 2-4 year time frame. This recovery will be fragile and could be at risk if pgm prices come under renewed pressure.

Elsewhere, only Zimbabwe is likely to produce more platinum in 2014, with the ramp up at Zimplats' Phase 2 expansion ensuring further growth in shipments. This may be the last increase for the time being: given on-going uncertainty over indigenisation and security of tenure, miners may prove reluctant to commit to further investment.

In contrast to the weak outlook for supplies, the prospects for demand are positive, with global industrial production expected to rise strongly in 2014 as the Eurozone begins to emerge from recession and the Chinese, Japanese and US economies enjoy continued growth. However, in the USA, a

gradual reduction in quantitative easing and political gridlock represent downside risks.

A tentative Eurozone recovery should be positive for autocatalyst demand: in 2014, new vehicle registrations in Europe are forecast to rise for the first time in three years. Growth is expected in most of the continent's major diesel car markets, with the notable exception of Spain and Italy. However, of greater significance to demand will be the enforcement of tighter diesel emissions limits in some regions.

The roll-out of Euro 6 emissions limits for passenger cars will begin in September 2014, requiring the addition of NOx aftertreatment on new models. Most smaller cars will use a platinum-containing NOx trap to meet the new regulations, but many larger vehicles will use non-pgm selective catalytic reduction (SCR) technology in addition to a pgm-containing oxidation catalyst.

With Euro VI emissions limits fully applied to European heavy duty vehicles from January 2014, demand from this sector is certain to increase strongly next year. However, the magnitude of the rise will depend on the extent to which this year's additional buying of Euro V-compliant trucks has cannibalised 2014 sales.

We also anticipate an improvement in demand from the Chinese light duty diesel sector in 2014, with China 4 emissions standards being introduced across the country. Use of platinum on diesel catalysts could quadruple from current low levels if the legislation is rolled out as planned. However, implementation has already been postponed once and a further delay cannot be ruled out.

The immediate outlook for platinum usage in the gasoline sector is negative. In Japan, the only region where platinum is still widely employed in TWCs, light duty output is forecast to contract next year. However, beyond 2014, there is potential for growth in global platinum offtake on lean burn gasoline engines, which will employ NOx traps.

Sales of platinum to the jewellery trade could reach new heights in 2014. The conditions are in place for further growth in the Chinese market: manufacturing and retail margins

on platinum jewellery remain high compared with other metals, disposable incomes are increasing, and the process of urbanisation continues. There is also potential for more demand from India in 2014, although recent changes in precious metal import regulations have been disruptive to the jewellery trade and could act as a temporary brake on growth.

Capacity additions in China and other Asian countries will remain the key driver of industrial demand for platinum: we expect further investment in new chemical and glass-making facilities by producers seeking to locate capacity closer to their end markets. Electrical demand is forecast to continue its recovery, supported by strong demand for “enterprise” hard drives used to store commercial data.

Next year, investment will be less critical in determining the overall market balance: combined demand from the autocatalyst, jewellery and industrial sectors alone should be sufficient to absorb primary and secondary supplies of platinum for the first time since 2005. In the absence of large price movements, it is likely that investors will continue to accumulate metal, although at a slower rate than this year.

In 2014, the platinum market is expected to be in significant deficit for a third consecutive year. However, this may not be sufficient to support higher platinum prices as long as the market remains adequately supplied from above-ground stocks. The risk of disruption in South Africa remains high, but investor fatigue appears to have set in, and sporadic strikes in 2013 have had increasingly little influence on the price.

PALLADIUM

Recent trends in palladium supply and demand look set to continue into 2014. Primary supply will fall in the absence of Russian stock sales, but this will be offset by additional recycling. Higher auto demand will be balanced by lower jewellery purchases and further substitution in industrial applications. This leaves investment as the wild card in the overall supply-demand picture: a proposed rand-denominated palladium ETF could generate additional demand from South African investors and push the market further into deficit.

In 2014, primary palladium supplies are likely to fall for the third year running. South African production is expected to be flat; in Russia, output of palladium has been drifting lower over the past several years, due to declining grades at Norilsk Nickel, and we expect this trend to continue. It is not possible to rule out further small sales of palladium from Russian government-controlled inventories, but we do not believe that any further

shipments are planned at present. With stocks now minimal this source of metal will no longer play any significant role in determining the overall market balance.

Excluding investment, gross demand should be little changed next year. The economic outlook is broadly favourable, with forecasters anticipating a tentative recovery in Europe and continued growth in China and the USA. This will be positive for global vehicle output. However, there is little prospect of a revival in palladium usage in the electronics, dental or jewellery sectors.

Gross demand for palladium in autocatalysts is expected to top 7 million ounces next year, mainly due to growth in the Chinese market, where another year of double digit growth in car sales should translate directly into higher palladium demand. China will consolidate its position as the second largest automotive consumer of palladium, ahead of Europe, where demand is expected to be flat, and just behind North America, where higher vehicle output will be offset by a continued trend towards smaller engine sizes.

In the diesel sector, the use of palladium on heavy duty trucks is guaranteed to see growth, albeit from a low base, as Euro VI emissions limits become compulsory from January 2014. However, the roll out of Euro 6 regulations for passenger cars, starting in September 2014, will favour increased use of platinum, halting or even reversing the growth in palladium loadings on light duty diesel catalysts in Europe.

Industrial offtake of palladium is likely to weaken again. There is limited potential for further substitution in MLCC, because the use of palladium has retreated to a core of speciality applications, but 2014 may see a reduction in sales of palladium catalysts to the chemical sector, as a wave of investment in new PTA plants comes to an end.

The downward trend in the Chinese palladium jewellery sector is expected to continue. After allowing for recycling, net jewellery offtake in China is likely to be close to zero, and could even move into negative territory.

The biggest uncertainty facing the palladium market next year is the extent to which Absa's proposed palladium ETF will generate new investment demand. The company's platinum ETF has been a huge success, but it remains to be seen whether a palladium product will enjoy the same degree of interest from South African investors. On the one hand, South Africa is primarily a platinum producer, accounting for over 70% of world platinum output but only 37% of palladium production. However, local institutional investors are keenly aware of the fundamental deficit in the palladium market, and this may encourage significant uptake of a palladium ETF.

SUPPLIES, MINING & EXPLORATION

- Global platinum supplies should increase slightly to 5.74 million ounces in 2013, lifted by higher production in Zimbabwe.
- Platinum supplies from South Africa are forecast to be marginally up on last year, at 4.12 million ounces, despite a strike at Amplats in October.
- World supplies of palladium will decline modestly to 6.43 million ounces, as sales from Russian stocks drop to 100,000 oz.
- Output of pgm in Zimbabwe is forecast to rise by over 15%, reaching an all-time high, as Zimplats' Phase 2 expansion starts to ramp-up.

SOUTH AFRICA

Supplies of platinum from South Africa in 2013 are forecast to be little changed, at 4.12 million ounces. While the first half brought some evidence of a patchy recovery from the events of last year, output from a number of major operations (notably Impala Platinum's lease area and Anglo American Platinum's Amandelbult mines) remains well below pre-2012 levels. In addition, four mines which contributed to platinum supplies last year have been shut down, and more shaft closures are currently being implemented.

After the turmoil of 2012, interruptions to production were comparatively – and perhaps surprisingly – limited during the first half of this year. Northam's Zondereinde mine endured a three-week strike, but elsewhere industrial action was sporadic, while the incidence of safety stoppages has been generally stable (and much lower than in 2011). As a result, production losses in the January to June period were much reduced: an estimated 100,000 oz in total, compared with around 220,000 oz in the first half of 2012.

The final months of 2013 may prove more difficult. In early October, Anglo American Platinum (Amplats) lost some 44,000 oz of platinum production at its western Bushveld mines, the result of a strike in protest at retrenchments during the rationalisation of the company's marginal operations. There is also potential for industrial action over wage negotiations, with significant disparities between pay increases claimed by unions and those offered by producers, most of which are

under severe financial pressure due to the rapid increase in their cost base over the last few years.

Unless further prolonged stoppages take place, there should be no significant impact on our forecast of South African supplies this year. The industry added to refined stocks last year and this metal could be used to supplement sales in 2013.

Anglo American Platinum

Underlying platinum output at Amplats was flat at 1.18 million ounces in the first half of 2013. Intermittent industrial action cost the company some 20,000 oz of production, while the closure in mid 2012 of the Marikana Pool and Share operation reduced output by 26,000 oz. However, this was offset by improved performances at some mines, notably Kroondal and Bokoni, both of which saw production rise by 20% or more.

Refined platinum output was below the level of mine production, at 1.02 million ounces, due to maintenance at processing plants. However, the resulting build-up in stocks of unrefined pgm should be reversed by the year end.

In the year as a whole, Amplats plans to refine and sell 2.3 million ounces of platinum. If this is achieved, refined output will be a little down, but sales will be modestly higher than in 2012, when some 2.17 million ounces of platinum were shipped. (It should be noted that these totals include around 60,000 oz of annual output from Unki, which we report in our estimates of Zimbabwean supplies).

In August, Amplats announced its revised restructuring proposals, under which it aims to reduce baseline production capacity to 2.2–2.4 million ounces of platinum annually. This will involve the consolidation of the five existing Rustenburg mines into three operating units and the closure of three shafts, while the Union North and South mines will be combined into a single operation which will be sold in due course. The overall impact of the rationalisation will be a cut in production capacity of 250,000 oz in the immediate future, and a further 100,000 oz in the medium term. In early October, eleven days

PGM Supplies: South Africa
'000 oz

Supply	2011	2012	2013
Platinum	4,860	4,090	4,120
Palladium	2,560	2,320	2,350
Rhodium	641	577	574

of output were lost due to industrial action over the job cuts, but the company's inventory position enabled deliveries to customers to continue uninterrupted.

Impala Platinum

Impala Platinum was the first company to be hit by an unprotected strike in 2012, when rock drill operators at its Rustenburg lease area downed tools in January of that year. The resulting six week shutdown, followed by a slow post-strike build-up, ultimately resulted in the loss of 150,000 oz of platinum production. With no repeat of last year's events, output in the January to June 2013 period was bound to be higher, and indeed platinum production rose by 31% to 342,000 oz, helped by the refining of some in-process stocks that had accumulated at the end of last year.

However, this gain disguises an underlying downward trend in pgm production at the lease area, where in the five years prior to 2012 platinum output averaged over 950,000 oz annually. The operation is suffering from familiar platinum industry ills: depletion of shallow reserves, delays in the construction and commissioning of new shafts, difficult geology, and reduced productivity. This is being addressed via a focus on development activity at existing operations as well as at the newly commissioned 20 and 16 shaft complexes.

The immediate target is to increase annual mill throughput to 11.4 million tonnes of ore (from 10.9 million tonnes in the year to June 2013), which we estimate would yield up to 700,000 oz of platinum. As replacement shafts are brought on-stream, Impala intends to ramp up production to 850,000 oz of platinum annually by 2018.

The company's two eastern Bushveld assets, the Marula mine and the Two Rivers joint venture (with African Rainbow Minerals), were spared significant disruption last year and both performed well in the first half of 2013. Impala's Zimbabwe operations also had a good first half, with Zimplats reporting a 30% increase in platinum output. This metal is refined in South Africa but categorised as Zimbabwe supplies in our tables.

Lonmin

At Lonmin Platinum, refined platinum output plunged by 20% in the first half of 2013, to 302,000 oz, due to temporary shutdowns at its Number One and Two furnaces. Underlying production also fell, but more modestly. Output was affected by the mothballing of the K4 shaft and by continued safety stoppages and labour disruption, which together cost around

25-30,000 oz of platinum. Including metal from the Pandora joint venture, Lonmin's production of platinum in concentrate totalled 367,000 oz in the January to June period, down 4%.

The company has maintained its production and sales guidance for the twelve months to September 2013, at 700,000 and 660,000 oz of platinum respectively. However, in the calendar year – barring increased disruption in the fourth quarter, or another smelter incident – we expect Lonmin to improve on last year's refined output of 709,000 oz.

Northam Platinum

Output of pgm in concentrate from Northam's Zondereinde mine was stable in the first half of 2013, despite a three week unprotected strike (the only prolonged stoppage at any producer in the first half) that resulted in the loss of around 9,000 oz of platinum. The company's Booysendal mine on the eastern Bushveld is now in production: the permanent power supply to the concentrator was connected in March 2013 and around 15,000 oz of pgm (including an estimated 9,000 oz of platinum) were produced in concentrate form during the second quarter of this year. Production will continue to ramp up into 2014.

Northam has a concentrate offtake agreement with the Pilanesberg mine, owned by Sedibelo Platinum (formerly Platmin), which despatched nearly 28,000 oz of pgm in the first quarter of 2013, up 28% on the same period of last year. However, some of Pilanesberg's output in the second and third quarters was smelted elsewhere, following a four month shutdown at Northam's furnace for a rebuild due to erosion of the refractory lining.



Shaft development at Royal Bafokeng Platinum's new Styldrift mine.

Other Producers

Production of platinum from Eastplats' Crocodile River almost halved to just 13,500 oz in the first half of 2013, in line with an earlier decision to halt stoping activities at one of the mine's two sections. In April, the company announced its decision to suspend mining activities completely, citing low dollar pgm prices and the difficult operating environment in South Africa. Production ceased at the end of July.

Mining operations at the small Smokey Hills operation were terminated in August 2012, and the assets of its former owner, Platinum Australia, are due to be acquired by Jubilee Platinum. The latter plans to use the processing plant to treat tailings from the nearby Dilokong Chrome Mine, before recommencing underground operations. However, we do not expect any production from the mine in 2013.

Following the merger between Glencore and Xstrata, a review of the Eland Platinum project has been undertaken. In view of new drilling results and weak pgm prices, it has been decided to suspend operations at one of the two declines, with the result that the mine's target output has been reduced to 180,000 oz of pgm annually, from 260,000 oz previously. Full production is planned for 2019.

Two new mines are under construction on the western Bushveld, close to Royal Bafokeng Platinum's Bafokeng Rasimone Platinum Mine. The first into production should be the Western Bushveld Joint Venture (WBJV), between the Canadian company Platinum Group Metal Limited and its black economic empowerment partner, Wesizwe Platinum (in which China's Jinchuan group has a 45% stake). The first pgm concentrate from the WBJV could be seen as early as 2015; at full capacity, the mine is planned to extract 275,000 oz of pgm annually. Wesizwe Platinum is developing a neighbouring but significantly deeper project, the Bakubung Platinum Mine, scheduled to begin production in 2018.

RUSSIA

Russian shipments of platinum are expected to decline modestly in 2013, to 780,000 oz, reflecting lower output from Norilsk Nickel's Talnakh operations. Palladium supplies will decline by 190,000 oz to 2.70 million ounces, the lowest level for 11 years, as sales from government stocks fall to minimal levels.

Norilsk Nickel's Russian operations produced 1.3 million ounces of palladium and 315,000 oz of platinum in the first half of 2013, slightly down on the previous year. Production at the

PGM Supplies: Russia
'000 oz

Supply	2011	2012	2013
Platinum	835	800	780
Palladium			
Primary Production	2,705	2,630	2,600
State Sales	775	260	100
Rhodium	70	90	85

Talnakh operations has been affected by unscheduled repair work at both the Oktyabrsky mine and the Nadezhda smelter, which contributed to a decrease in nickel output in the first half and is likely to have impacted pgm output too. For the year as a whole, Norilsk expects to refine around 2.6 million ounces of palladium and 640,000-650,000 oz of platinum, marginally lower than in 2012.

Output from alluvial operations located mainly in the far east of Russia is expected to be stable. The largest of these miners, Kondyor, produced around 120,000 oz of platinum last year, with output being maintained in the face of declining grades thanks to significant increases in the volume of sands removed – up by a factor of five in the last five years. Operations were previously conducted only in the May to November period but now continue year round.

Sales of palladium from Russian state stocks are now an insignificant part of the overall palladium supply picture. We expect supplies of palladium from this source to fall to just 100,000 oz in 2013, down from 250,000 oz last year.

NORTH AMERICA

North American producers should supply a little more palladium in 2013, as lower output from the Lac des Iles mine is more than offset by additional recovery of by-product palladium from nickel ores. Platinum output is forecast to be little changed.

Production from North American Palladium's Lac des Iles (LDI) mine is expected to decrease this year. The mine sold

PGM Supplies: North America
'000 oz

Supply	2011	2012	2013
Platinum	350	310	315
Palladium	900	895	930
Rhodium	23	22	24

72,000 oz of palladium in the first half of 2013, a decline of 11% on the previous year. The fall was primarily due to a reduction in underground mining volumes, accompanied by a fall in grade, as ore reserves accessible via the existing ramp system have been depleted. A new shaft is being developed but is not expected to enter production until late 2013; this will allow LDI to extract deeper ore reserves from a palladium-rich deposit known as the Offset Zone.

Stillwater Mining Company, which operates two pgm mines in Montana, reported a 2% rise in platinum and palladium output in the first half, with a strong increase in mill throughput being partly offset by lower grades. The company expects pgm production to remain flat at around 500,000 oz both this year and in 2014.

PGM are also extracted as by-products from the Canadian nickel operations of Glencore Xstrata and Vale. The former's Integrated Nickel Operations reported a 5% increase in nickel output from its Canadian mines in the first half of 2013, largely due to a 24% improvement in production at its Raglan operation in northern Quebec. Raglan ore typically contains significant quantities of palladium, but only minor amounts of platinum. We would therefore expect the company's palladium output to grow in 2013.

Vale reported a 17% jump in pgm output from its Sudbury mines in the first half of 2013, along with a 14% hike in copper production, probably reflecting an increase in the mining of copper-rich ores which often contain relatively high pgm values. Output this year will also be boosted by the implementation of the CORE (Challenging Ore Recovery) project, involving the construction of a new mill and flotation circuit at the existing Clarabelle plant. The company's new Totten mine is due on stream towards the end of this year, but a lengthy refining pipeline means that it is unlikely to contribute to supplies until 2014.

ZIMBABWE

Zimbabwe's platinum operations are on course to deliver another all-time production record, despite continuing uncertainty over the indigenisation process in the country's mining sector.

In the first half of 2013, total platinum production from the country rose by 15% to nearly 210,000 oz. This figure includes some 18,000 oz of platinum which remained unprocessed at the end of 2012 due to a shutdown at the Zimplats smelter, but which has since been refined. We expect full year supplies from Zimbabwe to reach – and perhaps exceed – 400,000 oz of

PGM Supplies: Zimbabwe '000 oz			
Supply	2011	2012	2013
Platinum	340	340	400
Palladium	265	265	310
Rhodium	29	29	33

platinum for the first time.

This increase reflects the ramp up at Zimplats' Phase 2 expansion. The new concentrator plant was commissioned in the second quarter of 2013, and the build-up of ore reserves at the Mupfuti portal is on target. The project will add 90,000 oz of platinum production capacity, taking Zimplats' annual total to 270,000 oz by 2015.

Platinum is extracted at two other operations in Zimbabwe: the Mimosa mine, a joint venture between Aquarius Platinum and Impala Platinum, and Amplats' Unki project. Both of these are operating at or close to full capacity and we do not expect any significant changes to output levels in 2013.

The indigenisation process continues to create uncertainty for the platinum mining sector, and this is likely to inhibit investment in new expansions. Proposed indigenisation plans submitted by the companies remain under discussion with ministers. In March, Zimplats lodged a formal objection to the expropriation of some of its land holdings by the government.

OTHERS

Other supplies of platinum are forecast to increase this year, to 125,000 oz, largely due to the ramp up at the new Kevitsa mine in Finland, where the extraction of nickel ores yielded 13,000 oz of platinum by-product in the first half.

Kevitsa also produces some palladium, but the additional supply from this source will not be sufficient to offset declining output from Tati Nickel in Botswana, where a sharp fall in grades caused first half palladium production to decline by 30%. We expect other supplies of palladium to decrease to 140,000 oz this year.

PGM Supplies: Others '000 oz			
Supply	2011	2012	2013
Platinum	100	110	125
Palladium	155	160	140
Rhodium	2	3	5

RECYCLING

- **Total recycling of pgm from auto, jewellery and electrical scrap will rise by 5% in 2013, to reach 4.82 million ounces – a record high.**
- **Recovery of pgm from spent autocatalysts will increase by 12%, due to rising scrappage rates, higher loadings, and some destocking by collectors.**
- **Recycling of palladium from electronic scrap will be flat, as higher collection rates are offset by lower average pgm grades.**
- **The reprocessing of old platinum jewellery will drop sharply, reflecting lower recycling rates in both China and Japan.**

AUTOCATALYST

The recovery of pgm from scrapped autocatalysts is forecast to attain record levels in 2013. Last year, some collectors built stocks of scrapped catalysts, but this year inventories have been drawn down. In addition, there has been continued improvement in recycling efficiencies, coupled with a steady increase in the average pgm content on catalysts collected.

The fastest growth rates will be seen in platinum, due to rising quantities of diesel catalyst scrap being collected in Europe; global platinum recoveries will be up 13% to 1.28 million ounces, more than 40% of this year's gross demand for platinum in autocatalysts. Recycling of palladium will climb 11% to 1.86 million ounces, while that of rhodium will be 12% higher, at 281,000 oz.

Catalysts salvaged from vehicles first registered in North America continue to provide the largest share of recovered pgm – over 55% of the total in 2013. US collection rates have picked up this year, in line with the continuing rebound in new vehicle sales, while the pgm content of recovered catalysts is rising, as later models are scrapped. Many of the vehicles being retired now were manufactured in the late 1990s and early 2000s, when palladium loadings were particularly high.

European-registered vehicles provide the second largest source of autocatalyst scrap, accounting for around a quarter of total pgm recoveries. Weak car sales continue to depress vehicle scrappage rates in this region, but the quantity of pgm refined will nevertheless increase, due to improvements in recycling efficiencies and the processing of some stockpiled catalysts. European platinum recoveries will grow much faster than those of palladium and rhodium, due to the rising number of diesel catalysts being processed.

The recovery of pgm from Chinese vehicles currently accounts for less than 3% of the world total, but is increasing rapidly, boosted by new auto scrap regulations which took effect in May 2013. As a predominantly gasoline vehicle market this source of recycled pgm will be rich in palladium.

JEWELLERY

The recycling of platinum by the Chinese jewellery trade is likely to decline by 17% in 2013, to 500,000 oz, representing around 27% of gross jewellery demand in this region. Falls in the local platinum price, particularly during the second and third quarters, have reduced the value of old jewellery, reducing the incentive for consumers to exchange their platinum items for new designs. In addition, manufacturers have shown less inclination to use secondary materials, which are made of platinum alloys of varying composition, due to the difficulty in achieving the requisite purity levels for new jewellery.

Recovery of palladium from Chinese jewellery scrap is forecast to drop by 6% this year, to 165,000 oz. However, the use of recycled metal as a proportion of gross demand is set to rise from 73% in 2012 to an unprecedented 89%, bringing net demand down to a meagre 20,000 oz. Retailers and manufacturers continue to recycle large quantities of unsold stock, while higher palladium prices have encouraged some consumers to return old palladium jewellery items.

Recycling of platinum jewellery in Japan is set to decline by 7% to 265,000 oz in 2013, despite a significant rise in local platinum prices. The gold price is an important driver of jewellery recycling in Japan, and a decline in the yen price has impacted scrappage rates for all jewellery metals. In addition, media attention has moved away from precious metals to focus on the buoyant stock market, resulting in fewer jewellery pieces being returned by consumers.

	Recycling '000 oz					
	Platinum		Palladium		Rhodium	
	2012	2013	2012	2013	2012	2013
Autocatalyst	(1,130)	(1,275)	(1,670)	(1,860)	(252)	(281)
Electrical	(20)	(25)	(430)	(420)	0	0
Jewellery	(890)	(775)	(190)	(180)	0	0
Total	(2,040)	(2,075)	(2,290)	(2,460)	(252)	(281)

PLATINUM

- A recovery in industrial consumption and strong offtake by investors will lift gross platinum demand by 5% to 8.42 million ounces in 2013.
- Sales of platinum to auto makers are expected to moderate slightly, to 3.13 million ounces, reflecting weakness in the European diesel car market.
- Industrial demand will rise by 12% to 1.79 million ounces on the back of strong purchasing by the chemical sector and a recovery in glass and electrical offtake.
- Purchases by jewellery makers will ease slightly, to 2.74 million ounces, but sales to investors are forecast to reach an all-time high of 765,000 oz.

AUTOCATALYST

Demand for platinum in autocatalysts is forecast to decline by 2% to 3.13 million ounces in 2013, reflecting weakness in the world's two largest markets for diesel cars, Europe and India, and some additional thrifting by those auto makers still using platinum in gasoline catalysts. However, consumption of platinum in heavy duty applications will rise, with more trucks meeting strict Euro VI limits.

Europe

Gross platinum consumption in the European auto market is set to fall by 55,000 oz to 1.29 million ounces in 2013, with further declines in demand from the light duty sector only partially offset by strong growth in the heavy duty diesel segment.

European light vehicle sales look set to fall to the lowest level in two decades, and the impact on platinum demand has been compounded by continuing erosion of the market share taken by diesel cars: new registrations in the traditionally strong diesel markets of France, Germany and Italy contracted sharply in the January to August period. Production of light duty diesel vehicles is expected to fall by around 4% this year, but platinum usage will decline at a slightly higher rate, due to some additional substitution with palladium.

In contrast, demand for platinum from the heavy duty sector is set to grow by over 50% this year, ahead of tighter Euro VI emissions legislation which will apply to all heavy duty trucks sold from January 2014. This legislative change has affected the market in two ways. It has generated some pre-buying ahead of the deadline, because of the lower purchase price of Euro V trucks, which often use little or no pgm in their aftertreatment systems. This has brought forward some truck sales into 2013, although it is unlikely to prevent a decline in overall European heavy duty sales this year. At the same time, the improved fuel economy of Euro VI engines has provided fleet operators with an incentive to purchase the new style trucks ahead of

the January 2014 deadline. Only a minority of vehicles sold this year will meet the new limits, but the impact on pgm demand will be significant: we estimate that average platinum loadings on European heavy duty trucks will rise by over 60% in 2013.

Japan

The government's quantitative easing programme, known as "Abenomics", has been unsuccessful in persuading Japanese consumers to purchase additional vehicles or Japanese auto makers to increase local production. Following a recovery in light duty vehicle output last year, in the wake of 2011's earthquake-hit dip, auto production is forecast to slip back below 9 million units in 2013. This reflects weak passenger car sales in the domestic market combined with lower shipments to some major export destinations, particularly Europe. As a result, we expect platinum consumption to slip 3% to 580,000 oz in 2013.

Japan is by far the world's largest user of platinum in three way catalysts: strategic considerations have led Japanese car manufacturers to retain platinum in their gasoline catalyst mix. However, in the absence of any tightening of local emissions limits, auto makers have been able to thrift overall pgm loadings, and in particular those of platinum. As a result, platinum demand in the light duty gasoline sector is forecast to decline by around 10% this year.

	Platinum Demand: Autocatalyst '000 oz					
	Gross		Recycling		Net	
	2012	2013	2012	2013	2012	2013
Europe	1,345	1,290	(370)	(455)	975	835
Japan	600	580	(80)	(90)	520	490
North America	400	375	(580)	(620)	(180)	(245)
China	105	120	(15)	(20)	90	100
Rest of the World	740	760	(85)	(90)	655	670
Total	3,190	3,125	(1,130)	(1,275)	2,060	1,850

In contrast, consumption of platinum in the diesel sector is expected to rise slightly, due to a modest increase in the production of diesel cars, and shifts in market share in the truck sector in favour of smaller vehicles. In Japan, the heaviest vehicles tend to use non-pgm selective catalytic reduction (SCR) technology to control NOx emissions, but lighter trucks are usually fitted with lean NOx traps.

North America

Thrifting and substitution are expected to weigh heavily on North American platinum consumption this year, despite higher vehicle output in both the light and heavy duty sectors. The only market segment showing any growth in platinum demand is non-road, due to the progressive introduction of Tier 4 limits on these engines. Overall, we expect gross platinum demand to decline by 6%, or 25,000 oz, to 375,000 oz.

In the gasoline sector, the few manufacturers still using platinum continue to switch gradually to palladium-based catalysts as new models are introduced. We expect purchases for three way gasoline catalysts to drop below 100,000 oz this year. Indeed, demand for platinum in the gasoline sector is now exceeded by consumption in light duty diesel vehicles, even though the latter account for less than 5% of total light duty vehicle production in North America. In 2013 we expect platinum usage on diesel cars to remain flat, with modest thrifting offsetting growth in vehicle output to over 600,000 units – the highest level ever recorded in this region.

Production of heavy duty vehicles has been hit by a fall in exports of large trucks, but will be supported by strong demand for medium duty trucks from the local construction industry. This change in vehicle mix has caused a downward shift in average engine size, reducing total platinum requirements from the heavy duty sector.

China

Platinum sees little use in the gasoline vehicles which dominate the Chinese auto market, but demand should nevertheless record a healthy increase in 2013, due to higher consumption in the heavy duty and motorcycle sectors. China IV emissions standards have begun to apply to heavy duty vehicles starting in July this year, and will contribute to a modest increase in platinum usage, although most of the heaviest engines will use non-pgm SCR technology to meet the new limits. Further growth in motorcycle output will also lift platinum offtake, which overall is expected to reach 120,000 oz in 2013.

Rest of the World

Although total platinum consumption is expected to rise 3% to 760,000 oz in 2013, this has been a year of contrasting fortunes in the Rest of World region. In India, car sales have been depressed by increasing economic uncertainty and weakening consumer confidence, with the result that light vehicle production is expected to fall by 10% in 2013. The diesel sector has been hit particularly hard, due to the government's policy of reducing the subsidy on diesel fuel over time, which has made consumers wary of future fuel price rises. Output of light duty diesel vehicles will contract by as much as 15% this year, and platinum usage will drop accordingly.

Mexican light vehicle production is booming, but in 2013 the growth has come exclusively from the gasoline sector, where little platinum is employed. Diesel vehicle output is likely to fall, reducing platinum consumption.

In contrast, offtake by Thai auto makers is forecast to rise by more than 30% this year. Vehicle output is rising at double digit rates, while the introduction of Euro 4 equivalent legislation from January 2013 has resulted in a significant increase in platinum loadings on diesel cars. Thailand is a large market, likely to produce in excess of 1.3 million diesel vehicles this year, so the impact on platinum demand will be significant.

Korea should also see strong increases in light duty diesel output in 2013, and platinum consumption will rise accordingly. However, gains in the light duty sector will be partly offset by lower usage of platinum on heavy duty vehicles, due to a decrease in the number of vehicles eligible for retrofitting under a government scheme.

JEWELLERY

Sales of platinum to Chinese jewellery makers will ease slightly this year after a very strong performance in 2012, but this will be partly offset by higher demand in Europe, North America and India. Worldwide, gross jewellery demand is expected to total 2.74 million ounces, down 1%.

China

Gross platinum demand in the Chinese jewellery sector is expected to moderate to 1.85 million ounces, 5% lower than in 2012, but still strong by historical standards. A significantly lower gold price for much of the first nine months of 2013, particularly during the second quarter, resulted in a sharp increase in retail footfall from consumers primarily interested in purchasing

reduced-price gold items. The influx of consumers into retail outlets had a positive spill-over effect on sales of platinum jewellery.

In the past, consumer demand for platinum jewellery has been negatively affected by price volatility. However, since January 2012, the monthly average platinum price in local currency has fluctuated within a relatively narrow +/- 10% range, reassuring consumers that platinum jewellery will retain its value in future. This has tended to support demand.

After spending much of last year at a discount, the local platinum price moved back above that of gold in early 2013, but this has not had a noticeable impact on sales of platinum jewellery in China. At the retail level, platinum has generally been sold at a modest premium to gold regardless of the metals' relative market prices. For the moment, platinum and gold jewellery continue to be closely priced, allowing the "upsale" of consumers to platinum.

Strong retail demand has translated into robust demand for platinum from jewellery manufacturers; platinum sales to the jewellery industry on the Shanghai Gold Exchange (SGE) during the January to August period were only 4% lower year-on-year than the record level of purchasing seen in 2012. However, the industry does face some headwind from a slow-down in economic growth and a deceleration in the pace of retail expansion in the jewellery sector.

Other regions

Outside China, consumption of platinum in jewellery is forecast to rise by 7% to 890,000 oz in 2013. In Europe, demand will recover to 2007 levels, driven by the increased use of platinum in luxury watch cases, at the expense of yellow and rose gold. North America is also witnessing a recovery, although offtake here remains well below pre-crisis levels. In 2013, purchases of platinum by the North American jewellery trade are expected to rise by 11%, driven by rising exports and higher domestic

sales of platinum bridal rings in lower price categories. This is a result of the narrowing of the retail price premium over white gold during the past year: a platinum ring currently sells for only about 20% more than the equivalent product made of 18K white gold.

In Japan, a strong recovery in the stock market has boosted consumer confidence and contributed to a rise in spending on big-ticket platinum jewellery items. However, these gains will be offset by lower platinum consumption in the bridal market, due to a combination of a lower marriage rate and growing competition from imported jewellery.

We expect continued growth in the Indian platinum jewellery market, although at a lower rate than last year, with total purchases forecast to reach 130,000 oz in 2013. There is some uncertainty over immediate prospects for demand, which could be affected by new measures to restrict imports, mostly affecting gold, which were introduced by the government in mid-year and which are designed to reduce the country's current account deficit. The changes have caused significant uncertainty within the jewellery trade, with widespread confusion about the application of the new rules causing temporary shortages of gold. The disruption could have a knock-on impact on platinum, but it remains to be seen whether and to what extent demand will be affected.

INDUSTRIAL

Sales of platinum to industrial consumers will rebound in 2013, led by unusually strong offtake from the chemical sector, and a recovery of demand in glass and hard disk manufacture; this will be partly offset by lower purchases from the petroleum industry. Total industrial consumption is forecast to rise by 12% to 1.79 million ounces.

This has been a good year for platinum demand in the chemical industry, with the construction of new plants in Asia and the Middle East expected to boost offtake. The largest contributor to this growth will be the purchase of platinum catalysts employed in the manufacture of polymer intermediates such as paraxylene and propylene.

In the electrical sector, sales of hard drives in consumer applications are expected to decline at a double digit rate in 2013, as laptop and desktop computers lose share to tablets and smart phones, which generally use solid state drives containing no platinum. However, this will be partly offset by a rise in shipments of large "enterprise" hard disk drives used for commercial data storage applications.

Platinum demand in the hard disk sector was depressed in

Platinum Demand: Jewellery '000 oz						
	Gross ¹		Recycling ²		Net ³	
	2012	2013	2012	2013	2012	2013
Europe	180	210	(5)	(5)	175	205
Japan	310	300	(285)	(265)	25	35
North America	185	205	0	0	185	205
China	1,950	1,850	(600)	(500)	1,350	1,350
Rest of the World	155	175	0	5	155	170
Total	2,780	2,740	(890)	(775)	1,890	1,965

NOTES TO TABLE

¹ Gross demand is equivalent to the sum of platinum jewellery manufacturing volumes and any increases in unfabricated metal stocks within the industry.

² Recycling represents the amount of old stock and old jewellery recycled whether the metal is re-used within the jewellery industry or sold back to the market.

³ Net demand is the sum of these figures and therefore represents the industry's net requirement for new metal.

Platinum Demand: Industrial '000 oz			
	2011	2012	2013
Chemical	470	450	540
Electrical	230	165	205
Glass	515	160	235
Petroleum	210	205	155
Other	550	625	655
Total	1,975	1,605	1,790

2012, largely due to a drawdown of inventory of both platinum metal and finished disks, following disruption to Thai disk production caused by the catastrophic floods of 2011. This year, although the underlying disk market is weak, purchases of platinum are expected to return to more normal levels.

Sales of platinum to the glass industry should stage a recovery this year, although they remain well short of the 2010-2011 peak, which was caused by huge capacity additions by manufacturers of liquid crystal display (LCD) glass. Since then, purchases of platinum for new LCD plants have fallen substantially. Due to a move to thinner glass and an increase in production efficiencies, capacity utilisation in this sector hit an all-time low in early 2013. The Chinese display glass industry is still expected to invest aggressively this year and next as local manufacturers strive to capture market share in the domestic TV industry, but elsewhere we will see some capacity reductions and sales of platinum back to the market.

Demand from the fibre glass sector was depressed in 2011 and 2012 by the return of platinum to the market following the decommissioning of old marble melt facilities. This year, we expect net sales to this segment to increase by a factor of five. Several new projects are planned in China and the Rest of World region, as companies add capacity close to their geographical end markets.

Consumption of platinum in biomedical applications has stagnated in recent years, with the large US market under pressure due to concerns about inappropriate implantation of some cardiac devices. However, lower demand for platinum components in the cardiac rhythm management sector has been offset by growth in some other procedures such as neuromodulation and radio frequency ablation, both of which employ platinum electrodes.

Other applications are forecast to consume more platinum this year: higher global vehicle output will drive demand for platinum in oxygen sensors and premium spark plugs, while growth in new aircraft construction will boost the usage of platinum in turbine blades.

INVESTMENT

Net investment in the physically-backed exchange traded fund (ETF) market is on course to reach an all-time high, with inflows of over 660,000 oz in the first nine months of 2013. We forecast a 68% increase in total platinum investment demand, to 765,000 oz.

Almost all of the net investment is due to rapid growth in a new South Africa based product, launched by Absa in April 2013, which accumulated 660,000 oz of platinum in just over five months, making it the largest single platinum fund on the market. It is the first rand-denominated platinum ETF; its terms stipulate that fund metal should be of South African origin, enabling it to be designated a 'domestic' investment by regulators. This makes it particularly attractive to local institutional investors, who are subject to limits on overseas investments. Its 1/100th ounce minimum investment denomination also makes it appealing to the smallest of domestic retail investors.

Investment behaviour in the other funds has tended to be offsetting. Notably, investors in the ETFS London fund have liquidated positions, while counterparts in the ETFS New York product have exhibited a propensity to invest, in both cases regardless of the prevailing price direction. Excluding the Absa product, net ETF inflows amounted to just 5,000 oz in the first nine months of the year.

Investors in the Japanese large bar market reacted to type during the first eight months of the year, taking profits in a rising market and buying into price dips. A sharply weaker yen has resulted in a significantly higher local platinum price in 2013, incentivising the liquidation of holdings. January 2013 saw the largest single monthly disinvestment since at least 2003, with more than 35,000 oz of platinum returned to the market.

Global demand for small platinum bars and coins is set to decline by nearly a third to 55,000 oz this year, as strong activity in the secondary market limits demand for 2013-issue platinum bullion coins.

Platinum Demand: Investment '000 oz			
	2011	2012	2013
Europe	155	135	(95)
Japan	250	100	(70)
North America	10	190	120
China	0	0	0
Rest of the World	45	30	810
Total	460	455	765

PALLADIUM

- Gross demand for palladium will soften in 2013, dropping 3% to 9.63 million ounces, but the market will remain in significant deficit.
- Growth in auto demand will slow, with the only significant rise in consumption coming from China, where gasoline vehicle output is set to expand at double digit rates.
- Industrial demand will retreat to 2.20 million ounces, its lowest level since 2004, as palladium use in MLCC and dental alloys continues to erode.
- Investors have shown a much reduced appetite for palladium this year, while jewellery demand will drop to a ten year low.

AUTOCATALYST

In the autocatalyst sector, we anticipate further growth in the use of palladium in all regions except Japan, although at a modest pace compared with the dramatic gains of recent years. Only China will record a double digit increase in palladium consumption in 2013, reflecting another year of rapid expansion in domestic vehicle output.

Europe

Against a backdrop of sustained weakness in European vehicle sales, palladium use by the region's auto makers has held up well this year, with modest growth expected in all sectors. Total demand for palladium in light and heavy duty emissions control, including non-road catalysts, is expected to rise by 3% to just under 1.50 million ounces.

Light duty vehicle production in Europe is forecast to fall by over 2% in 2013, but with the diesel sector bearing the brunt of the decline, output of gasoline vehicles should decrease only marginally on last year. Palladium consumption will be boosted by strong growth in shipments of predominantly premium-brand gasoline cars to North America. These exports include growing numbers of vehicles meeting stringent Ultra Low Emission Vehicle (ULEV) and Partial Zero Emission Vehicle (PZEV) standards, which typically contain higher loadings of palladium and rhodium than vehicles certified to European Euro 5 emissions regulations.

Palladium's use in light duty diesel aftertreatment is also set to rise modestly, as it makes further gains at the expense of platinum. European auto makers continue to seek cost savings in their catalyst systems, and where possible they are substituting platinum with palladium.

Like platinum, the use of palladium in heavy duty diesel catalysis will benefit this year from pre-buying of Euro VI trucks ahead of the introduction of the new regulations in January 2014. This will result in much higher pgm loadings on vehicles

meeting the stricter emissions limits. However, palladium takes a much smaller share of the pgm mix on heavy duty diesel catalysts than it does on light duty systems, and the absolute amount of palladium used in this sector remains modest.

Japan

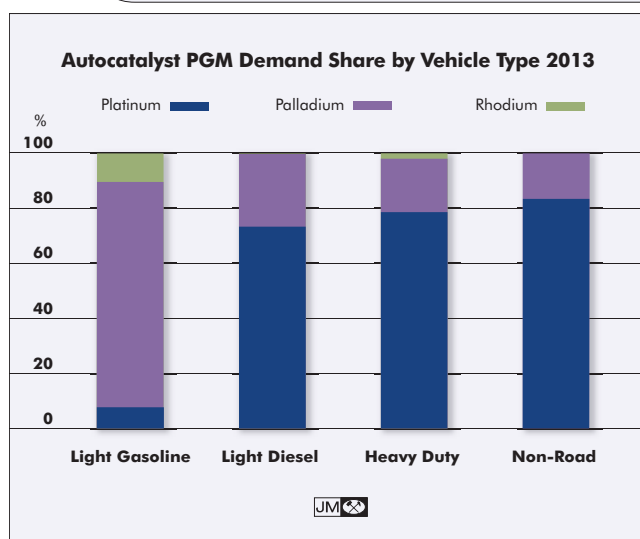
With output of light duty gasoline vehicles expected to drop by over 2%, and no new legislation to drive changes in loadings, demand for palladium from Japanese auto makers is predicted to fall to 765,000 oz in 2013. In this region, the gasoline sector accounts for over 95% of automotive palladium demand; there is some minor use of palladium in heavy duty diesel trucks and non-road engines, both of which segments will see marginal increases in offtake this year.

North America

A combination of factors – improving economic outlook, pent up consumer demand for vehicles and the availability of cheap credit – has stimulated vehicle sales in North America in 2013. Output of light trucks and cars is forecast to reach 13 million in 2013, a 4% increase on last year, and above the pre-crisis 2007 level. Changes in market share in favour of smaller vehicles will restrict the growth in palladium demand, but offtake will nevertheless reach 1.82 million ounces – the

Palladium Demand: Autocatalyst '000 oz						
	Gross		Recycling		Net	
	2012	2013	2012	2013	2012	2013
Europe	1,450	1,495	(305)	(390)	1,145	1,105
Japan	790	765	(105)	(110)	685	655
North America	1,815	1,820	(1,080)	(1,145)	735	675
China	1,330	1,505	(45)	(60)	1,285	1,445
Rest of the World	1,320	1,385	(135)	(155)	1,185	1,230
Total	6,705	6,970	(1,670)	(1,860)	5,035	5,110

Palladium accounts for 82% of pgm demand in gasoline vehicles, but only 25% of total usage on diesel engines (including non-road).



highest level since 2001.

Downsizing has been a feature of the US market this year, with sales of small cars and crossover utility vehicles (CUVs) outpacing growth in the market as a whole. CUVs combine features of a sports utility vehicle (SUV) with those of a passenger car, and tend to be somewhat smaller than a typical American light duty truck. Sales of CUVs are forecast to rise by more than 18% this year, accounting for more than a quarter of total light duty sales. This has caused a slight decline in average engine size across the US market, and has tended to limit growth in palladium demand, since loadings are typically correlated with engine displacement.

China

After two years of slower growth in gasoline car output, China is expected to see a return to double digit growth in the light duty sector in 2013. Palladium consumption will rise accordingly, up 13% to 1.51 million ounces, overtaking European auto demand for the first time. Although there are no changes in emissions limits for gasoline cars this year, some auto makers have started to anticipate the next round of legislation, replacing current engine platforms with China V variants. This has resulted in larger catalyst volumes on some vehicles.

Rest of the World

The rest of the world region will see continued growth in automotive demand for palladium, up 5% to 1.39 million ounces this year on the back of higher output of gasoline vehicles in parts of Asia and South America, and tighter emissions limits

in some markets.

The largest increase will occur in Thailand, where Euro 4 equivalent legislation has applied since January 2013. At the same time, output of light duty gasoline vehicles in this country is expected to surge by a quarter, resulting in palladium consumption more than doubling. Russia will also see a jump in demand, as Euro 4 legislation is applied to all new models, although the impact of higher loadings will be softened by general weakness in the car market.

Elsewhere, trends in light duty output will be the main influence on demand. There will be gains in South America, where gasoline vehicle production is expected to rise by nearly 7% to exceed four million vehicles for the first time, and in Mexico, where output has been boosted by strong sales in the country's major export market, the USA. However, this growth will be partly offset by a dip in purchases of palladium by auto makers in the large South Korean market. The weakness of the Japanese yen has damaged the price competitiveness of Korean models, hitting sales to this major export market.

JEWELLERY

Palladium jewellery continues to lose market share in China, and has yet to establish a substantial foothold in any other market. As a result, the slide in jewellery offtake will continue in 2013, with demand dropping to a ten year low of 390,000 oz.

Gross demand from the Chinese jewellery trade is set to fall to just 185,000 oz in 2013, hit by a continued absence of effective marketing, combined with consumer perceptions that palladium jewellery is of mediocre quality and represents poor value for money. Dwindling consumer demand for the end product has resulted in a steady decline in the number of manufacturers willing to produce and of retailers prepared to stock palladium items.

In other regions, purchases by the jewellery trade will be

Palladium Demand: Jewellery '000 oz						
	Gross ¹		Recycling ²		Net ³	
	2012	2013	2012	2013	2012	2013
Europe	65	65	0	0	65	65
Japan	70	70	(15)	(15)	55	55
North America	45	45	0	0	45	45
China	240	185	(175)	(165)	65	20
Rest of the World	25	25	0	0	25	25
Total	445	390	(190)	(180)	255	210

unchanged. In Japan, palladium is mainly used as an alloying element in platinum and white gold jewellery; both these markets are in decline, while there has been a shift towards alloys with a lower palladium content. This has been offset by some growth in demand for palladium jewellery, albeit from a low level. North America has a more substantial palladium jewellery market, but palladium is positioned against much less costly base metal products, and expanding its share is proving to be a difficult challenge. However, US jewellers are expected to use slightly more palladium in white gold alloys this year. Sales of gold jewellery grew by 5% in the first half of 2013, as a result of a strengthening economy and greater availability of inexpensive gold jewellery in lower purity alloys.

INDUSTRIAL

Consumption of palladium in industrial applications is predicted to decline by nearly 7% to 2.20 million ounces in 2013, reflecting continued substitution with base metals in the electronics sector, and a move away from precious metal alloys in reconstructive dentistry.

By far the largest industrial application for palladium is in electronics, where demand will total 1.06 million ounces this year, down 11%. Over the last two decades, manufacturers of multi-layer ceramic capacitors have progressively replaced palladium with lower cost metals such as nickel and copper. This substitution has affected all but the most conservative end-use markets, where reliability is most critical; as a result, palladium-based MLCC are increasingly restricted to military and medical applications.

In contrast, the use of palladium to plate electronic components such as leadframes and connectors is expected to remain robust in 2013, supported by its technical qualities – notably its oxidation resistance, even at high temperatures – and its cheaper cost relative to gold.

In the chemical sector, Chinese investment in new capacity for the manufacture of PTA (purified terephthalic acid, a precursor of polyester) appears to have passed its peak, but

the baton has been handed to India, which is still seeing strong growth in the polyester clothing market. Sales of palladium to the chemical industry will remain unusually strong by historical standards, at 530,000 oz.

Demand for palladium in dental applications will see further erosion in 2013, reflecting improved dental care and the increasing use of non-precious materials, including ceramic treatments, in all markets.

INVESTMENT

With no equivalent to the new Absa platinum fund, investment in palladium ETFs has been muted during the first nine months of 2013. Net palladium investment demand is forecast to fall to 75,000 oz in 2013, down from 470,000 oz last year.

The first two months of this year saw significant investment in ETFs, as the price recovered strongly, rising from a low of \$669 in early January to a high of \$775 in mid February. Funds in Europe and North America reported 195,000 oz of net inflows during that period, with February recording the fifth largest monthly total since palladium ETFs were first launched in 2007. However, the majority of these gains were relinquished during the three months to August, in the heaviest prolonged period of disinvestment since 2011, leaving total net investment for the first nine months at just under 50,000 oz.

In September 2013 it was announced that Absa Capital had received regulatory approval for a new Johannesburg-listed palladium ETF. Like its platinum counterpart, this new fund will be backed exclusively by metal of South African origin and it will therefore qualify as a domestic investment vehicle. This will allow local institutional investors greater access to a palladium ETF for the first time, and is likely to generate additional investment inflows. However, the launch date for this new product has not yet been confirmed, and we have not made any allowance for it in our forecast of palladium investment this year.

Palladium Demand: Industrial '000 oz			
	2011	2012	2013
Chemical	440	530	530
Dental	540	530	510
Electrical	1,375	1,190	1,055
Other	110	100	100
Total	2,465	2,350	2,195

Palladium Demand: Investment '000 oz			
	2011	2012	2013
Europe	(35)	165	30
Japan	5	0	(5)
North America	(535)	305	50
China	0	0	0
Rest of the World	0	0	0
Total	(565)	470	75

OTHER PLATINUM GROUP METALS

- Global rhodium demand will rise by 4% to top one million ounces, with higher offtake from the auto, glass and investment sectors.
- Combined primary and secondary supplies of rhodium will expand modestly, due to increased recoveries from autocatalyst scrap.
- Ruthenium demand will rebound strongly, reflecting a recovery in sales to the hard disk industry, but the market will remain adequately supplied.
- Consumption of iridium will remain depressed, with the electronics sector making no new investment in crystal-growing capacity this year.

RHODIUM

This year should see gross demand for rhodium exceed one million ounces for the first time since 2007, lifted by double digit growth in the Chinese auto market, strong sales of rhodium to ETF investors, and a recovery in offtake from the glass industry.

Autocatalyst

World demand for rhodium in autocatalysts is forecast to rise modestly to 801,000 oz in 2013, driven by sharply higher vehicle output in China. Rhodium usage in the other major regions will be broadly flat, but we expect a slight drop in consumption in some smaller markets such as India and South Korea, where gasoline car production is set to decline this year.

Over 95% of auto demand for rhodium is derived from its use in three way catalysts (TWCs) for light duty gasoline applications. China is by far the world's largest producer of gasoline vehicles, and the vast majority of these use palladium-rhodium catalysts to meet local emissions limits. In 2013, we anticipate no significant changes in pgm loadings used by Chinese auto makers, and rhodium demand will therefore rise at a double digit rate, in line with auto production.

Although Japan's gasoline vehicle output is modest in comparison with China's, the two countries use similar amounts of rhodium, each accounting for roughly a quarter of total world demand. Average rhodium loadings on Japanese-built cars are much higher than similar vehicles manufactured in most other locations, reflecting tight local emissions standards and the conservative approach of Japanese auto makers to the pgm mix in their catalyst systems. After some thrifting in the last two to three years, average rhodium loadings in Japan appear to have stabilised.

North America has seen aggressive rhodium thrifting in recent years, but there is now little scope to further reduce loadings. This year, demand will be supported by overall growth of around 3% in light duty gasoline output, although a

shift towards smaller average engine size will limit the potential for a rise in rhodium offtake.

In Europe, the diesel sector has borne the brunt of recent declines in vehicle output, and gasoline car production will fall only modestly this year, leaving rhodium use little changed.

Other Demand

Net sales of pgm to the glass sector contracted sharply in 2012, as metal was returned to the market following the closure of obsolete marble melt facilities in China. This year, we expect demand to bounce back, as Chinese glass makers purchase metal for new glass fibre and display glass plants. This will more than offset some returns of pgm from shuttered LCD plants outside China. Rhodium in particular will benefit from a continued shift by glass fibre manufacturers towards alloys with a higher rhodium content, which provide significant technical benefits. At current rhodium prices there is a strong financial incentive in favour of alloy switching.

The use of rhodium in chemical applications is forecast to remain at historically high levels this year, supported by further purchasing of rhodium process catalysts for use in new oxo-alcohol and acetic acid plants.

Demand in other applications will also be unusually strong, mainly thanks to fresh investment in the Deutsche Bank rhodium ETF which was launched in May 2011. This

Rhodium Demand by Application '000 oz			
	2011	2012	2013
Autocatalyst	715	790	801
Chemical	72	81	79
Electrical	6	6	7
Glass	77	31	40
Other	38	66	89
Total Gross Demand	908	974	1,016
Autocatalyst Recycling	(277)	(252)	(281)
Total Net Demand	631	722	735

fund saw steady demand during the first nine months of 2013, with investors purchasing 41,000 oz over this period; total holdings exceeded 94,000 oz at the end of September. Including some additional demand for small rhodium bars, which are manufactured in Europe for the North American and European markets, we expect net rhodium investment to total approximately 65,000 oz in 2013.

Supplies

Production of rhodium in South Africa should be broadly flat in 2013; although the industry has suffered less disruption from strikes than last year, a series of shaft closures, lack of investment and poor productivity have all had a negative impact on the industry's capacity. In the last two years, four mines have been mothballed, all of which exploited primarily or exclusively the UG2 reef, which typically contains more rhodium than Merensky or Platreef. As a result, the impact of these closures on rhodium output has been relatively greater than on platinum or palladium.

OTHER PGM

After a weak performance last year, ruthenium demand should rebound strongly in 2013, although offtake – at 828,000 oz – will remain well short of the 2006-2007 peak, when demand exceeded one million ounces annually. Iridium purchases will be little changed, at 198,000 oz, but still significantly lower than the levels seen 2-3 years ago.

The hard disk industry is by far the largest single user of ruthenium, currently accounting for over 35% of total consumption. Last year, the sector struggled to recover from the catastrophic floods which disrupted Thai disk production in 2011, at a time when sales of hard disk drives were starting to falter under pressure from the increased popularity of tablets and smart phones. Manufacturers drew on ruthenium inventories to meet their production needs, causing a sharp drop-off in net sales to the industry. In 2013, the hard disk sector remains under pressure, with strong demand for 'enterprise' hard disk drives failing to compensate for lower PC sales to consumers. Nevertheless, with industry stocks now depleted, we expect ruthenium sales to hard disk producers to more than double.

In the chemical sector, there has been no repeat of the exceptional ruthenium demand seen in 2011, when large quantities of metal were bought by ammonia producers. Purchases of a ruthenium-iridium catalyst used in acetic

Ruthenium Demand by Application '000 oz			
	2011	2012	2013
Chemical	273	101	104
Electrical	536	361	531
Electrochemical	130	127	125
Other	58	72	68
Total Demand	997	661	828

acid production have also been limited, although a fresh round of capacity expansion in China looks set to generate some additional demand in the near future. Overall chemical industry demand for both metals will be little changed in 2013.

In recent years, the electronics industry has purchased large quantities of iridium in the form of crucibles, in order to meet demand for single crystal sapphire used in light-emitting diodes (LEDs) for backlit LED TVs. Sufficient capacity is in place for the time being, and iridium demand has stabilised at the level required to replace process losses from existing installations. However, the use of iridium salts to make blue phosphors for organic light-emitting diodes (OLEDs) is now starting to show growth, albeit from a low base.

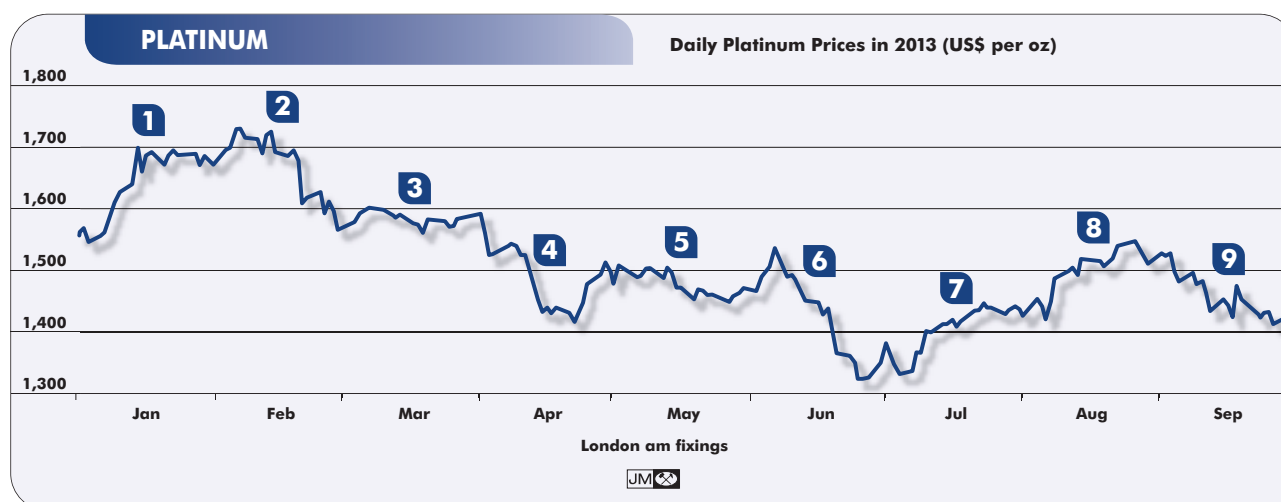
We have revised our 2012 estimate of iridium consumption in other applications, to account for strong growth in the use of this metal in automotive spark plugs. Demand has been lifted by rising gasoline vehicle output, and wider adoption of premium spark plugs in general and plugs with iridium electrodes in particular.

Supplies

On-going difficulties in the South African platinum mining sector will restrict output of ruthenium and iridium this year. Like rhodium, these metals are disproportionately affected by the shutdown of UG2 shafts, because UG2 tends to be comparatively rich in minor pgm. However, demand for both metals remains well below recent peaks, and these markets should be adequately supplied from primary mine production.

Iridium Demand by Application '000 oz			
	2011	2012	2013
Chemical	19	19	20
Electrical	195	27	36
Electrochemical	76	70	59
Other	42	78	83
Total Demand	332	194	198

PRICES



In early 2013, speculator interest in platinum was boosted by supply concerns in South Africa, lifting the price to a peak of \$1,730 in February. Net long positions reached a record 3.4 million ounces, but speculative buying then waned as expectations of disruption began to dim. In early April, the gold price suddenly dropped over \$200 on reports of central bank selling and rumours of the end of quantitative easing (QE). This dragged platinum downwards, with the price hitting a low point of \$1,323 in June, on the back of European car market weakness. Renewed supply concerns and strong investor demand helped the price recover to \$1,422 by the end of September.

month peak of \$1,730, aided by strong speculator activity that pushed net long positions to a record 3.4 million ounces in mid February. Speculator interest waned towards the end of the month as labour tensions eased in South Africa, and platinum retreated below \$1,600 at the month end.

3 In **March**, strong physical buying on the Shanghai Gold Exchange (SGE) lent support, enabling platinum to hold its ground in a narrow trading range either side of \$1,580. Late in the month came news of talks between South Africa and Russia regarding a co-ordinated marketing proposal for pgm; this supported the price, which ended the month at \$1,583.

1 Platinum fixed at \$1,559 on the first trading day of the year, \$36 higher than the last day of 2012, boosted by a last-minute deal to avoid the so-called 'fiscal cliff' and prevent the US economy from tipping back into recession. During the first half of **January**, platinum continued to appreciate ahead of the announcement of Anglo American Platinum's (Amplats') strategic review of its operations. After the company gave details of its plans to rationalise production, the price reached \$1,697 on the 15th, at a premium to gold for the first time since March 2012. However, the anticipated labour unrest failed to materialise and this, along with an agreement from Amplats to postpone the redundancy process in order to hold discussions with stakeholders, took some of the heat out of the market.

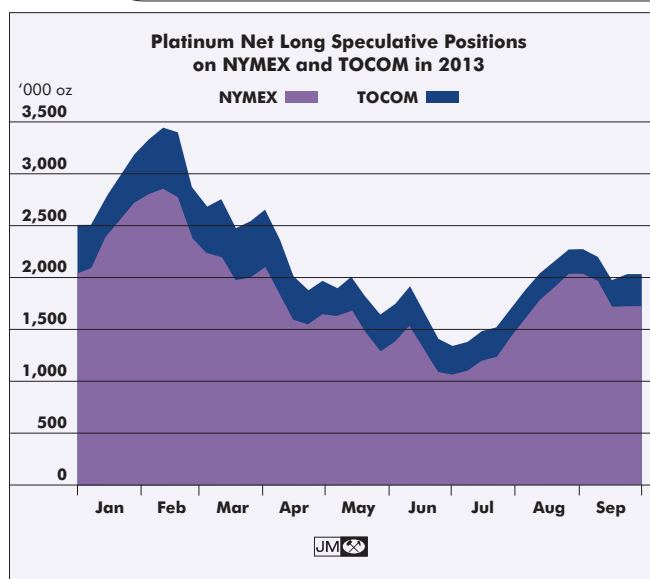
2 Supply considerations continued to dominate sentiment in **February**, as the release of Amplats' annual results – showing a heavy loss for the year – was followed by labour disruption in South Africa and the seizure of land owned by Zimplats by the Zimbabwe government. Platinum moved up to a nine

4 Despite news of a strike at Northam Platinum, it was gold that dominated the precious metal complex during **April**. Early in the month, the gold price headed sharply lower, on reports that Cyprus intended to sell €400 million of gold reserves to part-finance its bailout package, and the release of Federal Open Market Committee (FOMC) minutes suggesting that the end of QE might be in sight. Platinum went along for the ride, falling \$67 in two days to \$1,525 on the 4th. It continued to

Average PGM Prices in \$ per oz (Jan-Sep)			
	2012	2013	Change
Platinum	1,535	1,516	(1%)
Palladium	641	724	13%
Rhodium	1,321	1,102	(17%)
Ruthenium	116	82	(29%)
Iridium	1,077	942	(13%)

Platinum and palladium prices are averages of London am and pm fixings. Other pgm prices are averages of Johnson Matthey European Base Prices.

Net long speculative positions reached record levels in February, reflecting concerns over the potential for supply disruption.



retreat to a monthly low of \$1,416 on the 23rd, before staging a recovery, aided by strong purchasing on the SGE and a surge in ETF holdings prompted by the launch of a new fund based in South Africa. The Absa ETF accumulated over 170,000 oz of investment in just one week of trading, helping the platinum price to recover to \$1,513 on the 30th.

5 Supply concerns re-emerged in early **May**, with Impala Platinum considering rationalisation in response to low prices, and the market anticipating disruption when wage talks began the following month. Nevertheless, a stronger US dollar kept the lid on prices, and platinum traded in a narrow band around \$1,500. The price subsequently eased on news that Amplats had watered down its rationalisation plans following discussions with government. This weakness was exacerbated by the release of FOMC minutes which implied that QE would come to an end sooner rather than later. The prospect of higher interest rates led platinum down to \$1,448 on the 28th, but its losses were stemmed by renewed physical buying both in the ETF market and on the SGE.

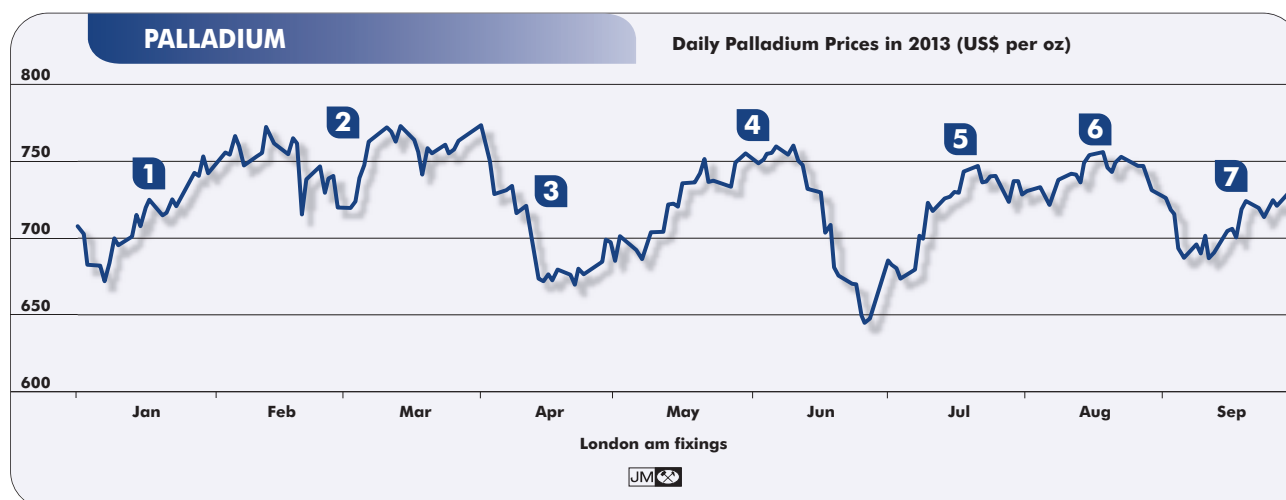
6 In early **June**, the precarious labour situation in South Africa once again came to the fore. The platinum price rose rapidly to \$1,536 on the 7th, lifted by a one-day illegal strike at Impala, the threat of industrial action at Lonmin, and a weaker US dollar. That would end up being the month's highpoint, as a number of developments acted to dampen sentiment thereafter. An official announcement from the Fed that markets could expect QE to end by mid-2014 if the economic recovery continued on its current path, allied with news that European

car sales had hit a 20 year low in May, drove platinum to its nine month low of \$1,323 on 26th June. The prospect of tightening monetary conditions had a greater impact on gold, enabling platinum to decouple and establish a \$100 premium.

7 In early **July**, the signing by mining companies, government and most unions of an agreement for sustainable mining, in which parties agreed to cooperate in addressing mining sector problems, helped to ease supply-side concerns. Platinum fell to \$1,331 on the 5th. Thereafter, there was a widespread recovery in the precious metals complex, the first time in 2013 that the prices of gold, platinum and palladium all ended the month higher than they started. A weaker US dollar combined with wildcat strikes at two Anglo mines gave the platinum price enough impetus to reach \$1,445 on the 24th. The recovery was supported by investor and speculator demand, with ETF holdings rising by another 50,000 oz, and net long futures positions recovering by more than 300,000 oz to reach 1.7 million ounces.

8 The collapse of wage negotiations in the gold mining sector provided further support to the platinum price during **August**. Late in the month, geo-political tensions surrounding the civil war in Syria supported a move higher for gold, which in turn helped platinum reach \$1,548 on the 27th. ETF investors increased their holdings for a sixth consecutive month, while speculators added 400,000 oz to take net longs back to 2.3 million ounces.

9 In **September**, fears that wage strikes at a number of gold mines in South Africa might be a sign of things to come in the platinum industry helped platinum reach \$1,529 on the 4th. However, both gold and platinum subsequently moved lower, following a Russian proposal aimed at avoiding military intervention in Syria. Attention soon turned to the American economy, with the market anticipating that the Fed would begin the process of tapering QE; despite significant dollar weakness, this led the entire precious metals complex lower. The mood of the market turned on a sixpence when the Fed surprised consensus opinion by restating its intention to continue bond purchases at the previous rate for the time being. Platinum promptly recovered its losses. Concern then switched to the Congressional deadlock over raising the US debt ceiling, with the prospect of a government shutdown generating further dollar weakness. The potential for a negative impact on economic growth caused the platinum price to drift to a low of \$1,411 on the 27th.



Palladium began the year at just over \$700, moving to a high of \$774 in early April. These gains were underpinned by strong speculator interest; net long positions on NYMEX achieved several successive all-time highs, reflecting the market consensus that palladium is in structural deficit. The price then retreated, as investors took profits, but strong industrial demand and positive auto sales data lifted the price to \$730 at the end of September.

1 With South African supply concerns viewed as mainly affecting platinum, palladium failed to follow the latter's early **January** rally. On the day of Amplats' restructuring announcement, palladium fixed at \$715, while the price ratio between the two metals stood at 2.37 in platinum's favour, the highest since November 2012. However, later in the month, palladium reached a 16 month peak of \$754 on reports that Russian state stocks were close to exhaustion, combined with growing optimism about US and Chinese vehicle sales.

2 These factors helped palladium recapture the attention of investors during **February** and **March**. In February, palladium ETFs experienced net inflows of close to 150,000 oz, the fifth largest monthly total on record. Speculator interest was also piqued, and net longs on NYMEX grew steadily to reach a record high of 2.9 million ounces on 12th March. Palladium traded above \$750 for most of this two month period, reflecting increasing confidence in the prospects for economic growth in the USA.

3 On 2nd **April**, the price hit \$774, the high point of the first nine months of 2013, as speculative net long positions reached a fresh all-time high of 3 million ounces. However, palladium

subsequently moved lower, slumping to \$670 on the 23rd, in the wake of sharp falls in platinum and gold prices.

4 In **May**, investors reacted positively to Johnson Matthey's Platinum Review, which confirmed that palladium remained in structural deficit. The price outperformed that of platinum, appreciating by 10% to end the month at \$755, with the platinum:palladium price ratio falling under 2:1 for the first time since 2002. In **June**, palladium again followed platinum lower, declining to its nine month low of \$644.

5 **July** saw a recovery, with the price reaching \$747 on the 22nd, boosted by positive US auto market data, and market rumours that Gokhran, the Russian State Precious Metals and Gem Repository, might make purchases of precious metals, including palladium. The latter again outperformed platinum, with the ratio between the two metals falling to a low of 1.91 on the 19th.

6 In **August** palladium drew strength from concerns about potential disruption to production in South Africa, hitting \$756 on the 19th, but ETF investors took profits for the third consecutive month, and the price retreated to \$731 at the month end.

7 Palladium significantly underperformed platinum in early **September**, slumping to \$686 on the 12th. The price proved more resilient thereafter, with positive auto data from China sparking fresh buying interest and enabling palladium to regain the psychologically important \$700 level. Underlying industrial demand fortified investor sentiment towards the end of the month, lifting palladium to \$730.

OTHER PGM

Rhodium rose to a peak of \$1,265 in February, supported by concerns over supply, some industrial buying, and significant physical investment demand. However, precious metal prices came under pressure in April, and rhodium started to give up its gains. In mid year, weaker industrial and investment demand caused the price to slip to \$975, a nine year low. Although this tempted some buyers back into the market, rhodium remained below \$1,000 at the end of September. Ruthenium and iridium prices also fell to multi-year lows, hit by slack industrial demand and increased selling pressure.

Rhodium started 2013 at a Johnson Matthey base price of \$1,080. From mid **January**, it began to make gains, initially in response to the announcement from Amplats that it planned to rationalise pgm output, followed by buying from Asia and Europe which bid the price up to \$1,265 in early **February**.

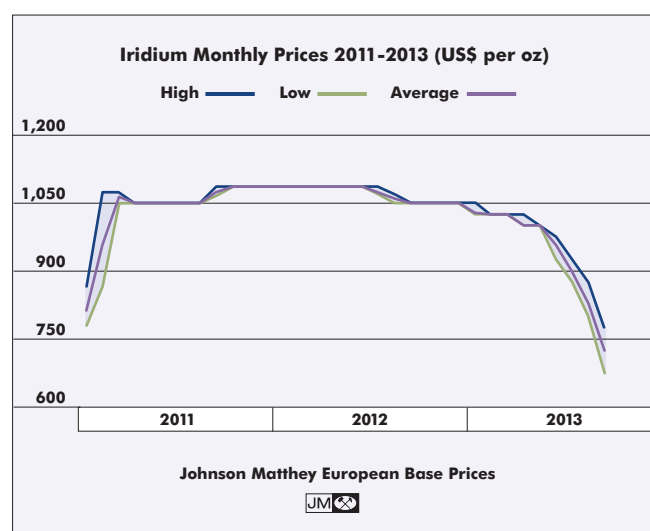
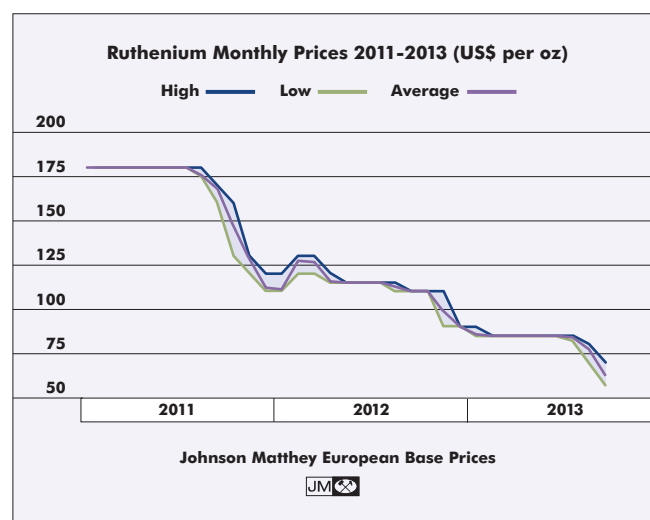
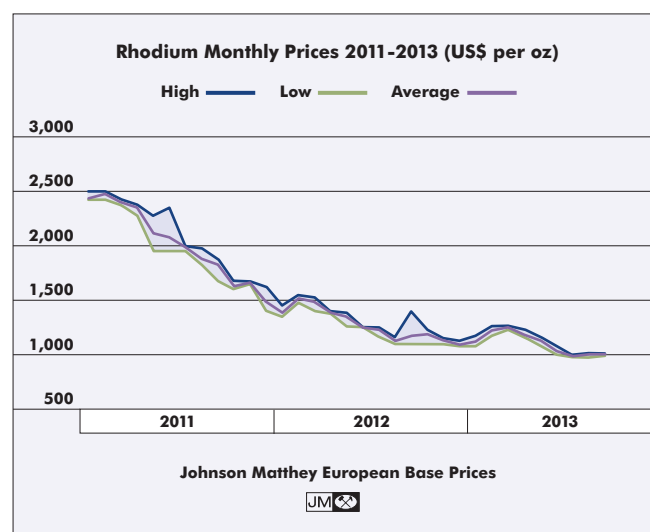
Although supported by significant demand from European ETF investors, the rhodium price softened along with the rest of the precious metals complex during the first half of **April**, falling to \$1,160 in mid month. The downward trajectory continued throughout **May**, with the market under pressure from selling in Europe and North America. Rhodium gave up all of its gains since the start of the year, falling to \$1,080.

Slower industrial and investment demand during **June** and **July** resulted in the price drifting below the \$1,000 level to hit a nine year low of \$975 on 18th July. With the price now down 23% from its first quarter peak, ETF investors were enticed back into the market, adding 11,000 oz to holdings.

During **August**, increased demand from Asia and North America, combined with further ETF buying, lifted the price back above \$1,000 for a short time, but **September** saw an increase in offers of secondary metal, and rhodium edged back to \$990.

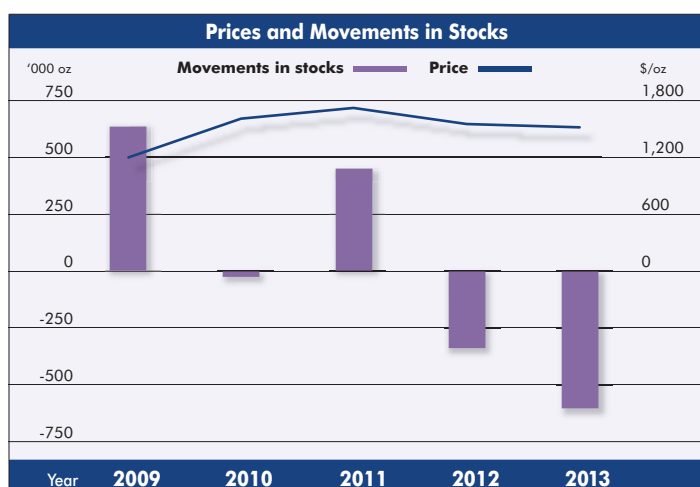
Both ruthenium and iridium have seen steady price erosion since mid 2013. Ruthenium was stable at \$85 between **January** and **July**, but succumbed to increased selling pressure thereafter, edging steadily lower during **August** before dropping sharply to \$60 in early **September**. It ended the month at \$57, an eight year low.

Iridium saw a slow decline during the first six months of the year, with the price easing from \$1,050 in **January** to \$1,000 in early **April**. From **June** onwards, its descent steepened, and by the end of **September** the price stood at \$675 – a decline of more than a third since the start of the year, and its lowest level since May 2010.



SUPPLY AND DEMAND TABLES

Platinum Supply and Demand						
	'000 oz	2009	2010	2011	2012	2013
Supply ¹	South Africa	4,635	4,635	4,860	4,090	4,120
	Russia ²	785	825	835	800	780
	North America	260	200	350	310	315
	Zimbabwe ³	230	280	340	340	400
	Others ³	115	110	100	110	125
	Total Supply	6,025	6,050	6,485	5,650	5,740
Gross Demand by Application ⁴	Autocatalyst ⁴	2,185	3,075	3,185	3,190	3,125
	Chemical	290	440	470	450	540
	Electrical ⁴	190	230	230	165	205
	Glass	10	385	515	160	235
	Investment	660	655	460	455	765
	Jewellery ⁴	2,810	2,420	2,475	2,780	2,740
	Medical & Biomedical ⁵	250	230	230	235	235
	Petroleum	210	170	210	205	155
	Other	190	300	320	390	420
	Total Gross Demand	6,795	7,905	8,095	8,030	8,420
Recycling ⁶	Autocatalyst	(830)	(1,085)	(1,240)	(1,130)	(1,275)
	Electrical	(10)	(10)	(10)	(20)	(25)
	Jewellery	(565)	(735)	(810)	(890)	(775)
	Total Recycling	(1,405)	(1,830)	(2,060)	(2,040)	(2,075)
	Total Net Demand⁷	5,390	6,075	6,035	5,990	6,345
	Movements in Stocks⁸	635	(25)	450	(340)	(605)



Supply	Demand / Recycling
Others	Investment
North America	Industrial
Russia	Jewellery
South Africa	Autocatalyst

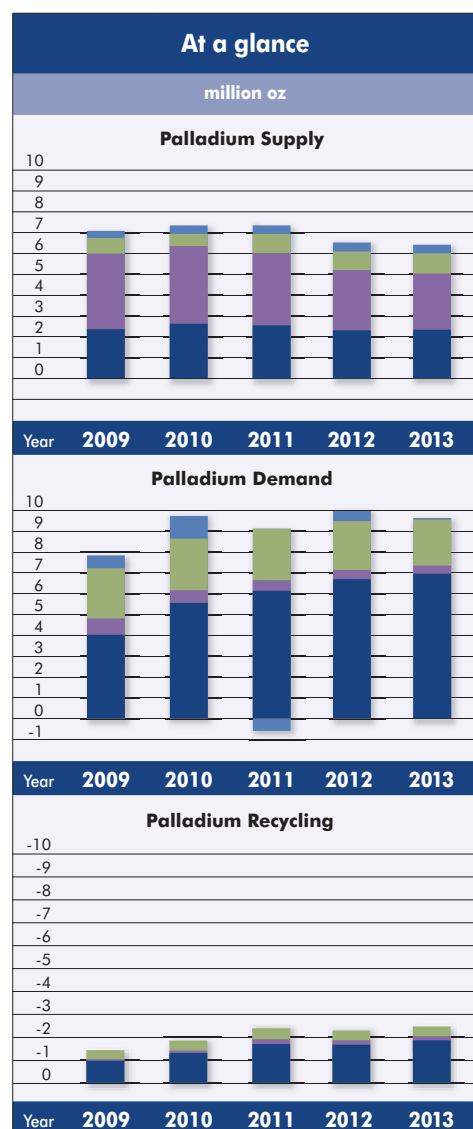
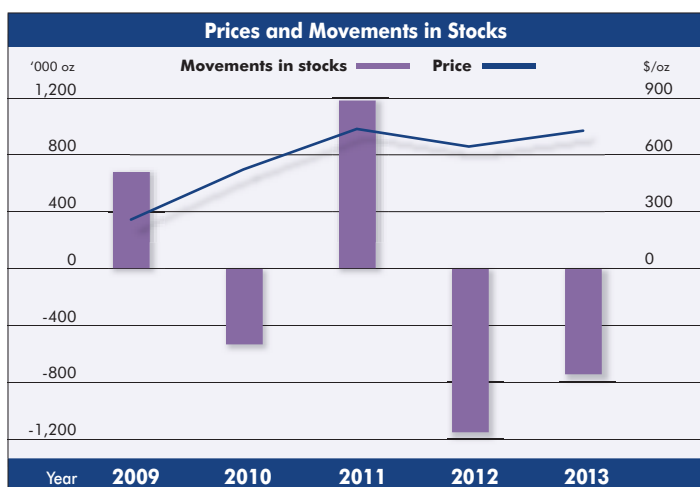
Average Price (US\$ per oz) ⁹					
2009	2010	2011	2012	2013	
1,205	1,611	1,721	1,552	1,516	

Gross Platinum Demand by Region						
	'000 oz	2009	2010	2011	2012	2013
Europe	Autocatalyst	970	1,495	1,505	1,345	1,290
	Chemical	70	110	120	110	105
	Electrical	20	15	20	15	20
	Glass	5	10	30	5	15
	Investment	385	140	155	135	(95)
	Jewellery	185	175	175	180	210
	Medical & Biomedical	115	90	90	90	90
	Petroleum	25	20	35	20	15
	Other	55	100	95	115	120
	Total	1,830	2,155	2,225	2,015	1,770
Japan	Autocatalyst	395	550	500	600	580
	Chemical	45	50	35	35	40
	Electrical	30	30	25	20	25
	Glass	40	90	130	10	(25)
	Investment	160	45	250	100	(70)
	Jewellery	335	325	310	310	300
	Medical & Biomedical	20	20	20	20	20
	Petroleum	10	5	5	5	5
	Other	15	40	40	60	65
	Total	1,050	1,155	1,315	1,160	940
North America	Autocatalyst	370	405	370	400	375
	Chemical	65	100	95	105	100
	Electrical	25	25	25	20	20
	Glass	(35)	10	(5)	10	10
	Investment	105	465	10	190	120
	Jewellery	135	175	185	185	205
	Medical & Biomedical	90	90	90	90	85
	Petroleum	15	25	50	60	40
	Other	90	105	110	115	125
	Total	860	1,400	930	1,175	1,080
China	Autocatalyst	85	100	105	105	120
	Chemical	40	80	100	90	130
	Electrical	20	30	30	25	30
	Glass	(90)	130	10	45	150
	Investment	0	0	0	0	0
	Jewellery	2,080	1,650	1,680	1,950	1,850
	Medical & Biomedical	10	10	10	15	15
	Petroleum	10	15	15	15	10
	Other	10	25	30	40	45
	Total	2,165	2,040	1,980	2,285	2,350
Rest of the World	Autocatalyst	365	525	705	740	760
	Chemical	70	100	120	110	165
	Electrical	95	130	130	85	110
	Glass	90	145	350	90	85
	Investment	10	5	45	30	810
	Jewellery	75	95	125	155	175
	Medical & Biomedical	15	20	20	20	25
	Petroleum	150	105	105	105	85
	Other	20	30	45	60	65
	Total	890	1,155	1,645	1,395	2,280
Total Gross Demand		6,795	7,905	8,095	8,030	8,420



SUPPLY AND DEMAND TABLES

Palladium Supply and Demand						
	'000 oz	2009	2010	2011	2012	2013
Supply ¹	South Africa	2,370	2,640	2,560	2,320	2,350
	Russia ²					
	Primary	2,675	2,720	2,705	2,630	2,600
	Stock Sales	960	1,000	775	260	100
	North America	755	590	900	895	930
	Zimbabwe ³	180	220	265	265	310
	Others ³	160	185	155	160	140
	Total Supply	7,100	7,355	7,360	6,530	6,430
Gross Demand by Application ⁴	Autocatalyst ⁴	4,050	5,580	6,155	6,705	6,970
	Chemical	325	370	440	530	530
	Dental	635	595	540	530	510
	Electrical ⁴	1,370	1,410	1,375	1,190	1,055
	Investment	625	1,095	(565)	470	75
	Jewellery ⁴	775	595	505	445	390
	Other	70	90	110	100	100
	Total Gross Demand	7,850	9,735	8,560	9,970	9,630
Recycling ⁶	Autocatalyst	(965)	(1,310)	(1,695)	(1,670)	(1,860)
	Electrical	(395)	(440)	(480)	(430)	(420)
	Jewellery	(70)	(100)	(210)	(190)	(180)
	Total Recycling	(1,430)	(1,850)	(2,385)	(2,290)	(2,460)
	Total Net Demand⁷	6,420	7,885	6,175	7,680	7,170
	Movements in Stocks⁸	680	(530)	1,185	(1,150)	(740)

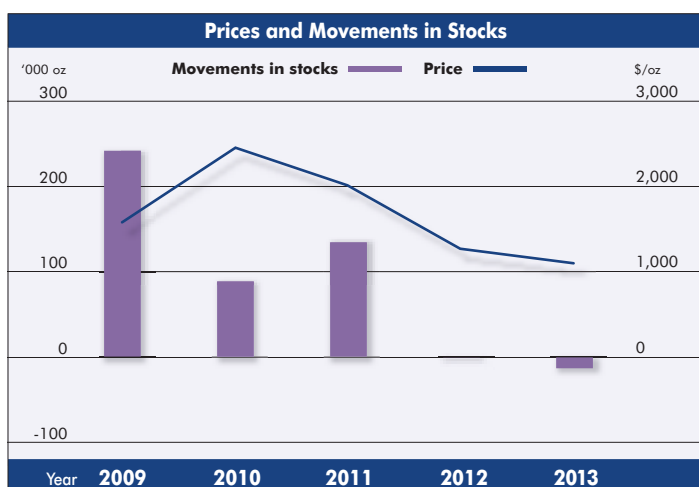


Gross Palladium Demand by Region						
	'000 oz	2009	2010	2011	2012	2013
Europe	Autocatalyst	995	1,330	1,485	1,450	1,495
	Chemical	85	105	80	85	90
	Dental	65	80	80	75	75
	Electrical	195	195	190	185	165
	Investment	525	(5)	(35)	165	30
	Jewellery	50	65	60	65	65
	Other	20	30	25	25	25
	Total	1,935	1,800	1,885	2,050	1,945
Japan	Autocatalyst	590	820	680	790	765
	Chemical	20	20	20	15	20
	Dental	295	250	220	220	205
	Electrical	270	295	300	310	225
	Investment	0	10	5	0	(5)
	Jewellery	80	75	70	70	70
	Other	10	10	10	10	10
	Total	1,265	1,480	1,305	1,415	1,290
North America	Autocatalyst	1,020	1,355	1,545	1,815	1,820
	Chemical	50	65	80	85	80
	Dental	260	250	225	220	215
	Electrical	170	160	145	140	135
	Investment	95	1,090	(535)	305	50
	Jewellery	60	65	45	45	45
	Other	15	25	45	35	35
	Total	1,670	3,010	1,550	2,645	2,380
China	Autocatalyst	685	1,005	1,155	1,330	1,505
	Chemical	75	65	145	215	190
	Dental	0	0	0	0	0
	Electrical	335	360	270	175	165
	Investment	0	0	0	0	0
	Jewellery	560	360	305	240	185
	Other	10	10	10	10	10
	Total	1,665	1,800	1,885	1,970	2,055
Rest of the World	Autocatalyst	760	1,070	1,290	1,320	1,385
	Chemical	95	115	115	130	150
	Dental	15	15	15	15	15
	Electrical	400	400	470	380	365
	Investment	5	0	0	0	0
	Jewellery	25	30	25	25	25
	Other	15	15	20	20	20
	Total	1,315	1,645	1,935	1,890	1,960
Total Gross Demand		7,850	9,735	8,560	9,970	9,630



SUPPLY AND DEMAND TABLES

Rhodium Supply and Demand						
	'000 oz	2009	2010	2011	2012	2013
Supply ¹	South Africa	663	632	641	577	574
	Russia ²	70	70	70	90	85
	North America	15	10	23	22	24
	Zimbabwe ³	19	19	29	29	33
	Others ³	3	3	2	3	5
	Total Supply	770	734	765	721	721
Gross Demand by Application ⁴	Autocatalyst ⁴	619	727	715	790	801
	Chemical	54	67	72	81	79
	Electrical	3	4	6	6	7
	Glass	19	68	77	31	40
	Other	21	21	38	66	89
	Total Gross Demand	716	887	908	974	1,016
Recycling ⁶	Autocatalyst	(187)	(241)	(277)	(252)	(281)
	Total Recycling	(187)	(241)	(277)	(252)	(281)
	Total Net Demand⁷	529	646	631	722	735
	Movements in Stocks⁸	241	88	134	(1)	(14)



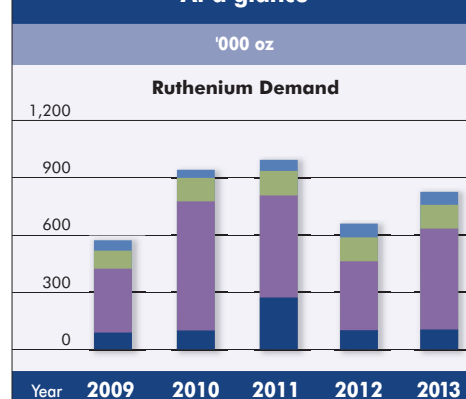
Supply	Demand / Recycling
Others	Other
North America	Glass
Russia	Chemical
South Africa	Autocatalyst

Average Price (US\$ per oz) ⁹					
2009	2010	2011	2012	2013	
1,592	2,458	2,022	1,276	1,102	

Ruthenium Demand

'000 oz		2009	2010	2011	2012	2013
Demand by Application	Chemical	89	100	273	101	104
	Electrical	336	679	536	361	531
	Electrochemical	95	124	130	127	125
	Other	54	42	58	72	68
	Total Demand	574	945	997	661	828

At a glance

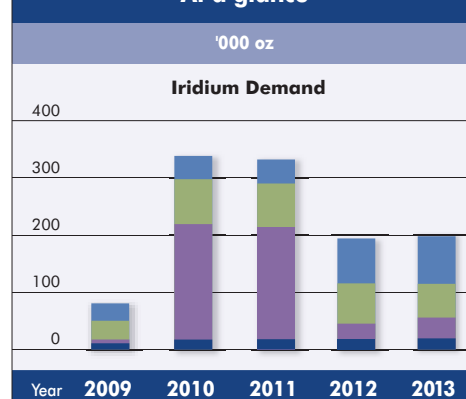
Average Price (US\$ per oz)⁹

2009	2010	2011	2012	2013
95	197	166	112	82

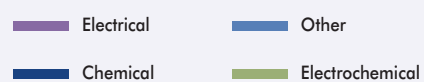
Iridium Demand

'000 oz		2009	2010	2011	2012	2013
Demand by Application	Chemical	11	18	19	19	20
	Electrical	7	201	195	27	36
	Electrochemical	33	79	76	70	59
	Other	30	40	42	78	83
	Total Demand	81	338	332	194	198

At a glance

Average Price (US\$ per oz)⁹

2009	2010	2011	2012	2013
425	642	1,036	1,070	942



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. In our recycling charts, we label recovery of electrical scrap as 'industrial' recycling.

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.

⁹ **Average price** figures for platinum and palladium are the mean of all daily fixing values in a given year except for 2013 which cover the period January to September inclusive. Average price figures for rhodium, ruthenium and iridium are based on Johnson Matthey European Base Prices.

GLOSSARY

AMCU	Association of Mineworkers & Construction Union	pgm	Platinum Group Metal(s)
CO	Carbon Monoxide	Platreef	A platiniferous ore body in South Africa
CUV	Crossover Utility Vehicle	PM	Particulate Matter
DOC	Diesel Oxidation Catalyst	PTA	Purified Terephthalic Acid
DPF	Diesel Particulate Filter	PZEV	Partial Zero Emission Vehicle
ETF	Exchange Traded Fund	QE	Quantitative Easing
Fed	US Federal Reserve	SCR	Selective Catalytic Reduction
g	Gram	SGE	Shanghai Gold Exchange
GDP	Gross Domestic Product	SUV	Sports Utility Vehicle
HC	Hydrocarbons	TOCOM	Tokyo Commodity Exchange
JV	Joint Venture	tonne	1,000 kg
kg	Kilogram	TWC	Three-Way Catalyst
LCD	Liquid Crystal Display	UG2	A platiniferous ore body in South Africa
LED	Light-Emitting Diode	ULEV	Ultra Low Emission Vehicle
LNT	Lean NOx trap		
Merensky	A platiniferous ore body in South Africa		
MLCC	Multi-Layer Ceramic Capacitor		
NO	Nitric Oxide		
NOx	Oxides of Nitrogen		
NUM	National Union of Mineworkers		
NYMEX	New York Mercantile Exchange		
OLED	Organic Light-Emitting Diode		
oz	Ounces Troy		

NOTE ON PRICES

All prices are quoted per oz unless otherwise stated.

R	South African Rand
£	UK Pound
\$	US Dollar
¥	Japanese Yen
€	Euro
RMB	Chinese Renminbi

PICTURE CREDITS

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Johnson Matthey

Precious Metals Marketing, Orchard Road, Royston, Hertfordshire, SG8 5HE, England
Telephone: +44 (0)1763 256315 Fax: +44 (0)1763 256339
Email: ptbook@matthey.com