PLATINUM 2005

Interim Review

Johnson Matthey

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The image below is a coloured scanning electron micrograph of metallic palladium crystals (magnification approximately x1,500)

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Interim Review

by Tom Kendall

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SUMMARY AND OUTLOOK

PLATINUM

Demand for platinum is forecast to expand by 2 per cent in 2005 to reach a new high of 6.71 million oz. Purchases of platinum for use in autocatalysts will increase robustly, the sixth year of growth in succession. In contrast, however, higher platinum prices will result in purchases by the jewellery sector falling for the third consecutive year. Supplies of platinum are projected to total 6.59 million oz, also 2 per cent up on 2004 , with slower growth in South African output than previously anticipated. With the platinum market again expected to be in moderate deficit, the price will remain strong.

Autocatalyst demand for platinum is forecast to increase by 300,000 oz in 2005 to reach a total of 3.86 million oz. European auto makers will purchase substantially more platinum as sales of diesel-powered light vehicles continue to grow, and as average diesel catalyst loadings increase to meet Euro IV emissions limits. Increased demand from diesel truck manufacturers in Japan; the retrofitting of catalysts to heavy duty diesel vehicles in the USA; and higher light vehicle production in Asia will also contribute to growth in platinum demand.

- **Demand** for platinum is forecast to rise by 2 per cent to 6.71 million oz in 2005. Purchases by the autocatalyst sector will grow strongly but jewellery demand is set to weaken.
- **Autocatalyst** demand for platinum is projected to rise by 8 per cent to 3.86 million oz. Diesel car sales continue to climb in Europe, and regulation of emissions from both light and heavy duty diesel vehicles is tightening world-wide.
- **Jewellery** demand for platinum is forecast to drop by more than 6 per cent to 2.02 million oz as Chinese purchases of metal fall for the third year in a row.
- Demand for platinum in **industrial** applications is set to increase by 5 per cent to 1.615 million oz, with greater production of hard disks making the biggest contribution to growth.
- **Supplies** of platinum are forecast to edge up by 2 per cent to 6.59 million oz this year. Growth in South African output will be less than previously expected and North American production will fall.
- The **price** of platinum climbed from a low of $843 in January to reach $941 in mid-October. The rally was primarily driven by fund buying and investor interest in the metal remains high. Our forecast for the next six months is for platinum to trade between $890 and $1,030.

In contrast, purchases of platinum for **jewellery** manufacture are forecast to decline to 2.02 million oz, a fall of 140,000 oz. Demand in China will drop for the third year in a row, and is also expected to weaken in Japan and North America. The strength of the platinum price has led to a reduction in trade stocks of platinum jewellery and an increase in the volume of old pieces being recycled.

Platinum Supply and Demand
'000 oz

		2004	2005
Supply			
South Africa		4,970	5,120
Russia		850	860
North America		385	340
Others		255	270
Total Supply		**6,460**	**6,590**
Demand			
Autocatalyst:	gross	3,560	3,860
	recovery	(705)	(800)
Jewellery		2,160	2,020
Industrial		1,535	1,615
Investment		40	15
Total Demand		**6,590**	**6,710**
Movements in Stock		**(130)**	**(120)**

Demand for platinum in **industrial** applications is expected to grow by 80,000 oz to 1.615 million oz. Consumption of the metal in electrical applications will increase substantially this year thanks to rising production of hard disks. Demand from the glass industry is also forecast to be strong as manufacturers of glass for flat panel displays continue to invest in new capacity in Asia. At just 15,000 oz, however, sales of physical **investment** products will remain small.

Supplies of platinum are forecast to rise by 130,000 oz to 6.59 million oz this year. South African production will continue to expand but once again the rate of growth will fall short of previous expectations. Sales of metal from Russia are likely to edge upwards but should continue to closely reflect mine production, whilst output in Zimbabwe is expected to be a little higher than in 2004. North American supplies of platinum, however, will not match last year's total.

As in 2004 the platinum market is on course to record a moderate deficit this year; a fact that has been reflected in the strength of the **price**. However, the momentum that took platinum up out of its $860 to $880 trading range from mid-June onwards was much more a result of fund buying than physical demand.

The net non-commercial position in NYMEX futures, which broadly reflects the overall pattern of fund investment in platinum, climbed from a low of 130,000 oz in January to

almost 550,000 oz during the first half of October. Funds have also been active on TOCOM throughout the year to date, with the net speculative long position estimated to have risen to the equivalent of 650-700,000 oz over the same period. As a result, the price moved up in a series of strong rallies, hitting $941 on the London fixings in early October, the highest since March 1980.

Whilst the fundamentals are important in driving investment decisions, the increased fund exposure to platinum has also stemmed from the attraction of commodities as a means towards portfolio diversification, higher absolute returns and as a hedge against inflation and dollar depreciation.

Supply

South African supplies of platinum are forecast to increase by 150,000 oz in 2005 to total 5.12 million oz. Output would have been higher but for the closure of Anglo Platinum's smelter in Polokwane for repairs following an explosion in September. The incident will result in the group's refined platinum output falling short of its target for the year of 2.6 million oz, perhaps by as much as 150,000 oz.

Platinum output from Impala's operations on the western limb of the Bushveld Complex increased by 4 per cent during the first half of 2005 thanks to increased productivity and higher mill throughput. The operation is on course to exceed 1.1 million oz of platinum production for the second year in a row. The rate of development at the company's Marula mine on the eastern Bushveld, however, has been constrained by the need to switch from mechanised to conventional mining methods.

Lonmin's production of platinum fell by 11 per cent during the first half of the year to 457,000 oz, largely due to the depletion of shallow UG2 reserves. However, the company's output during the second half should get a boost from the refining of pipeline stocks of metal that accumulated following a smelter shutdown in late 2004.

Platinum output at Northam reached 109,000 oz during the first six months of 2005, up by 12 per cent year-on-year. Greater production should also be seen from Aquarius Platinum's Kroondal and Marikana mines, which both now operate under pool and share agreements with Anglo Platinum.

Shipments of platinum from Russia this year are forecast to total 860,000 oz, marginally higher than in 2004. Norilsk Nickel published data on its output of platinum and palladium for the first time in September, revealing that it had produced 355,000 oz of platinum in the first six months of 2005 and estimating output for the full year of 730,000 oz. Production from the alluvial operations in the far east of Russia is likely to slip lower, whilst sales of metal from state stocks are again expected to be minimal.

North American supplies of platinum will fall to an estimated 340,000 oz in 2005: sales by Inco will decline due to the temporary closure of its smelter for scheduled maintenance, and production from North American Palladium will drop in line with reduced palladium output. Shipments of platinum from Zimbabwe, however, are expected to rise by 5 per cent to 155,000 oz as a result of higher production at both the Ngezi and Mimosa mines.

Demand

Autocatalyst demand for platinum is forecast to climb by 8 per cent or 300,000 oz this year to set a new record of 3.86 million oz. The trend of strong annual growth in demand in Europe will continue, with auto makers in the region expected to purchase 1.94 million oz of platinum, up by more than 15 per cent compared with 2004. Sales of diesel cars are still growing, with the market share taken by diesels in Western Europe likely to near 50 per cent over the year as a whole. At the same time, the introduction of models that meet Euro IV emissions legislation will result in an increase in the average platinum loading per diesel vehicle.

Japanese auto industry purchases of platinum are forecast to slip by 25,000 oz to 580,000 oz in 2005 as vehicle manufacturers add less metal to inventories than the year before. However, the use of metal in catalysts is expected to increase as new emissions standards generate greater demand from the heavy duty diesel sector.

Auto industry demand for platinum in North America is forecast to edge up by 20,000 oz to 820,000 oz in 2005. The retrofitting of heavy duty diesel vehicles with exhaust after-treatment systems will generate a modest volume of additional platinum demand.

Purchases of platinum by auto manufacturers in China

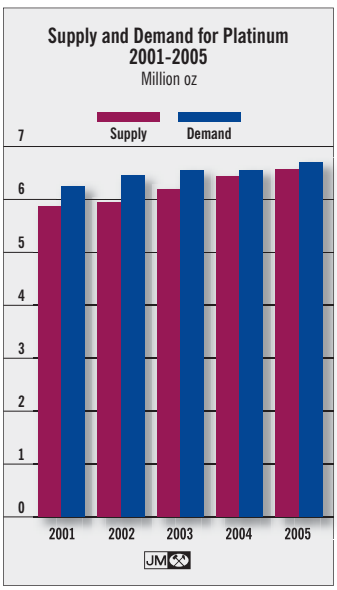
are forecast to climb by 30,000 oz this year to 110,000 oz, in line with further strong growth in car production and tighter vehicle emissions limits. The same factors will push autocatalyst demand for platinum in the Rest of the World up by 4 per cent to 410,000 oz.

Purchases of platinum for jewellery manufacture are forecast to decline by just over 6 per cent in 2005 to 2.02 million oz. Demand in China is almost certain to fall for the third year in succession, and purchases by jewellery manufacturers in Japan and North America are also likely to weaken. In all regions the increased price of platinum has had a detrimental effect on demand for the metal.

Chinese purchases of platinum for the manufacture of jewellery are projected to drop by 100,000 oz to 910,000 oz this year, more than 500,000 oz below the peak level of demand seen in 2002.

The rising cost of financing inventories of platinum jewellery and the volatility of the platinum price have led to an ongoing reduction in stock levels throughout the Chinese jewellery trade, with most manufacturers now only producing platinum pieces to order. Output of diamond set jewellery has dropped particularly sharply this year, a reflection of previously over-optimistic levels of production.

Palladium jewellery has won a greater share of retail counter space this year, contributing to the reduction in platinum jewellery inventories. Meanwhile, higher platinum prices have led to an upturn in the number of consumers trading in old items of platinum jewellery in exchange for new, rather than buying new pieces outright.



Nevertheless, the situation at the retail level remains very mixed. In Shanghai the majority of leading jewellery and department stores have not introduced palladium, and while there is some palladium on display in Beijing it has received little interest from consumers. In both cities, sales of platinum jewellery have held up well despite higher retail prices.

In North America, the increased price of platinum has also resulted in inventories being reduced throughout the trade. With retail sales also facing strong competition from white gold, purchases of platinum are forecast to drop by 10 per cent to 260,000 oz.

Increased production of diesel oxidation catalysts and diesel particulate filters will generate substantial growth in demand for platinum in 2005.

Purchases of platinum for jewellery manufacture in Japan are projected to weaken by 10,000 oz to 550,000 oz in 2005, a smaller rate of decline than in the previous two years. The volume of metal being recycled from trade inventories appears to have stabilised but the strong platinum price has encouraged more consumers to trade-in and pawn old pieces of jewellery.

Platinum purchases for use in industrial applications are forecast to climb by 5 per cent to 1.615 million oz in 2005. Demand for platinum in electrical applications is on course to reach 355,000 oz this year, an annual increase of 55,000 oz. The growth will be driven by the hard disk sector, with manufacturing rates pulled sharply upwards by substantially higher sales of computers and consumer electronics.

Glass industry purchases of platinum are forecast to increase by almost 9 per cent to 315,000 oz. Substantial investment continues to be made in the construction of new plants in Asia for the manufacture of high quality glass for flat panel displays.

In the chemicals sector, purchases of platinum are expected to soften to 320,000 oz, with less paraxylene capacity scheduled to come on stream this year than in 2004. Demand for platinum used in petroleum refining

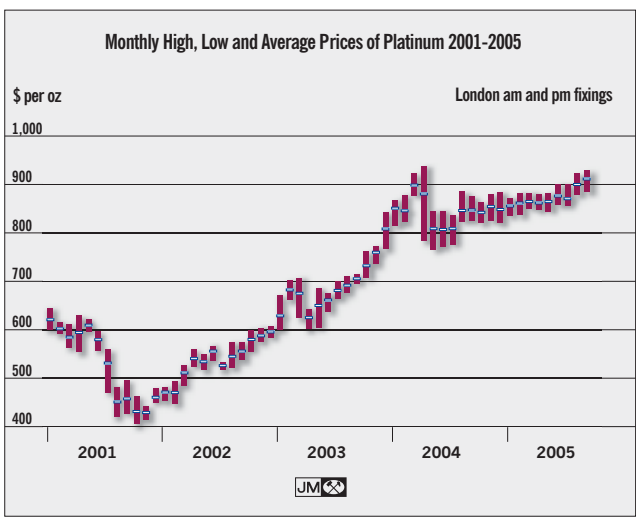
catalysts, on the other hand, is projected to increase by 7 per cent to 160,000 oz, benefiting from high operating rates within the industry.

Outlook

Platinum demand is expected to extend its decade-long upward trend in 2006, with growth likely to accelerate compared with 2005. The autocatalyst market will continue to generate much of the forecast additional demand, with purchases of platinum expected to climb in Europe, North America and Asia.

Sales of light duty diesel vehicles in Europe are set to continue to rise, with higher fuel prices reinforcing the advantage of better fuel efficiency that they have over gasoline vehicles. At the same time the fitment of catalysed diesel particulate filters (DPF) will increase, pushing the average platinum loading per vehicle upwards. The majority of auto makers now offer DPF as optional extras and one European manufacturer has already begun fitting them as standard equipment.

In North America, new demand from the heavy duty diesel sector is expected to provide a boost to platinum purchases next year. Truck manufacturers serving the US market will begin producing models that comply with strict new emissions legislation, which necessitates the use of diesel oxidation catalysts and, on some vehicles, particulate filters. The impact of this on platinum demand will outweigh by a considerable margin the effects of the ongoing switch to palladium-based catalysts for gasoline light vehicles.



Further growth in platinum demand will stem from higher production of light vehicles in China, India and South East Asia and the tightening of emissions limits in several major vehicle markets.

In contrast, in the current price environment jewellery demand for platinum will remain vulnerable. A further contraction in stocks held by retailers and an increase in recycling is probable in China. There is also the possibility that growth in retail sales of palladium jewellery may occur partly at the expense of platinum.

The outlook for purchases of platinum for jewellery in other markets is also uncertain – it is possible that demand in Europe, Japan and North America will stabilise at current levels but platinum will continue to face strong competition from other white metals.

The prognosis for the use of platinum in industrial applications is positive. Further growth in production of hard disks and additional investment in new LCD glass manufacturing plants in Asia should see demand from the electrical and glass sectors rise again; and consumption of the metal in catalysts for the chemicals industry is also forecast to increase, primarily due to investment in new manufacturing capacity in China.

As with demand, supplies of platinum are set to grow more rapidly next year than this, barring any further disruptions to production in South Africa. The ongoing expansion of mining operations should deliver a greater increase in refined platinum output next year. This, plus the release of any metal that builds up in Anglo Platinum's process pipeline as a result of the temporary closure of its Polokwane smelter, is expected to result in a more meaningful increase in supplies from South Africa.

North American output should also improve in 2006 and production in Zimbabwe is likely to continue growing slowly. Russian sales of platinum are forecast to be maintained at or close to the rate of mine production.

Supplies of platinum and demand for the metal are projected to grow at similar rates in 2006, and the market is therefore set to remain in deficit. With fund interest in precious metals still high and the fundamentals supportive, the price of platinum could trade up to as much as $1,030 during the next six months. Conversely, we do not expect platinum to fall below $890 unless demand from jewellery manufacturers contracts more substantially than current trends suggest.

PALLADIUM

Demand for palladium is forecast to rise by 410,000 oz in 2005 to 6.89 million oz. Most of the growth will be due to a surge in purchases of the metal for the manufacture of jewellery in China. Supplies of palladium, however, will drop by an estimated 370,000 oz to 7.54 million oz. The surplus between supply and demand is forecast to fall by more than 50 per cent to 650,000 oz as a result.

Autocatalyst demand for palladium is projected to slip by 1 per cent to 3.69 million oz in 2005. The effects of lower gasoline vehicle output in Europe and thrifting in the USA will outweigh greater purchases in Asia.

In contrast, purchases of palladium for the manufacture of **jewellery** are forecast to soar to 1.43 million oz, an increase of more than 500,000 oz compared with 2004. Almost all of the growth will stem from increased production of palladium jewellery in China. Demand from the **electronics** sector should rise to 970,000 oz on the back of greater use of the metal in plating solutions, whilst consumption in other applications will be broadly stable.

Less palladium is expected to enter the market from Russian stocks this year, whilst a drop in mine production in North America is forecast to outweigh higher output in South Africa. **Supplies** of the metal are therefore set to fall by 5 per cent to 7.54 million oz.

During the first nine months of the year firm physical demand helped to underpin the palladium **price** at around $180, whereas very substantial fund buying failed to lift it above $200 for any sustained period. Lease rates of the order of 1 per cent were indicative of the large volume of metal available to the market.

- **Palladium** demand is forecast to grow by 6 per cent to 6.89 million oz in 2005.
- The manufacture of **jewellery** will be the second largest application for palladium in 2005 as demand surges to 1.43 million oz; a result of a more than 70 per cent increase in the production of palladium jewellery in China.
- **Autocatalyst** demand for palladium is expected to weaken to 3.69 million oz due to lower production of gasoline vehicles in Europe and thrifting in the USA.
- **Electronics** demand for palladium is forecast to improve by 2 per cent to 970,000 oz this year.
- **Supplies** of palladium are projected to fall by 5 per cent to 7.54 million oz, primarily due to reduced sales of metal from Russia.
- The palladium **price** was confined between $180 and $200 for much of the first nine months of 2005, despite heavy speculative investment. However, with the outlook for the metal's fundamentals improving, we expect palladium to trade in a wider $190 to $270 range for the next six months.

Palladium Supply and Demand
'000 oz

		2004	2005
Supply			
South Africa		2,510	2,600
Russia		4,100	3,730
North America		1,035	925
Others		265	285
Total Supply		**7,910**	**7,540**
Demand			
Autocatalyst:	gross	3,720	3,690
	recovery	(535)	(680)
Dental		850	860
Electronics		920	970
Other		1,525	2,050
Total Demand		**6,480**	**6,890**
Movements in Stock		**1,430**	**650**

JM

Supply

Sales of Russian palladium are forecast to total 3.73 million oz in 2005, considerably less than 4.10 million oz the year before. Shipments from Norilsk Nickel are likely to be close to 3 million oz, whilst Stillwater Mining is scheduled to sell almost 440,000 oz of palladium from the stock it gained when Norilsk took a majority share in the company in 2003.

Very substantial exports of palladium were made from Russia to Switzerland in the final two months of 2004, most probably on behalf of Gokhran (the State Treasury), and some of this metal entered the market in the first quarter of this year. Since then, however, there has been little evidence of further sales from stocks by either Gokhran or the Central Bank.

South African supplies of palladium are projected to rise by almost 4 per cent to reach 2.60 million oz this year, but North American output will fall due to lower production at Inco and North American Palladium.

Demand

European autocatalyst demand for palladium is expected to drop to just over 1 million oz this year, the lowest level for almost a decade. Consumption of palladium in the region will again be adversely affected by a fall in production of gasoline light vehicles. North

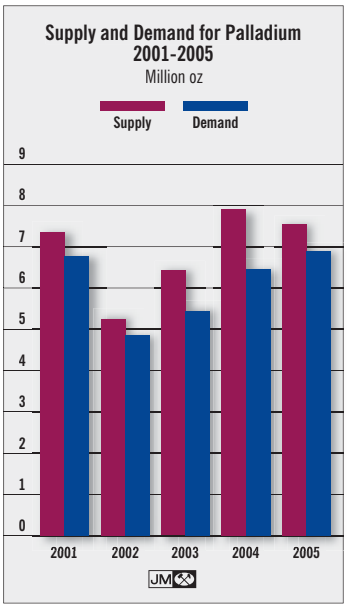
American demand for palladium in autocatalysts is also forecast to slide as the effect of thrifiting outweighs the continuing switch towards greater use of palladium-based catalyst systems on gasoline light vehicles. On the positive side, however, higher vehicle production rates in China and the Rest of the World will lead to increased autocatalyst demand for palladium.

Purchases of palladium for jewellery manufacture in China are forecast to jump by a remarkable 71 per cent to 1.20 million oz this year as the trade pipeline continues to fill and retail sales develop. For jewellery manufacturers the much lower metal costs associated with palladium compared to platinum, plus the relative stability of the palladium price, are major advantages. For retailers in China, palladium jewellery has the additional benefit of carrying significantly higher profit margins per piece than platinum. As a result, the numbers of stores stocking palladium and the amount of counter space apportioned to it have increased.

Demand for palladium in electronics applications is forecast to rise by 5 per cent to 970,000 oz in 2005 as a result of strong growth in consumption of the metal in plating solutions. The use of palladium in most other applications, including dental alloys and catalysts for chemicals manufacture, is expected to rise slightly.

Outlook

Autocatalyst demand for palladium is forecast to return to growth in 2006. The ongoing move away from platinum-based autocatalysts to those using palladium in North America should have a more substantial effect on purchases of the metal, whilst the negative effect of thrifting is expected to diminish.

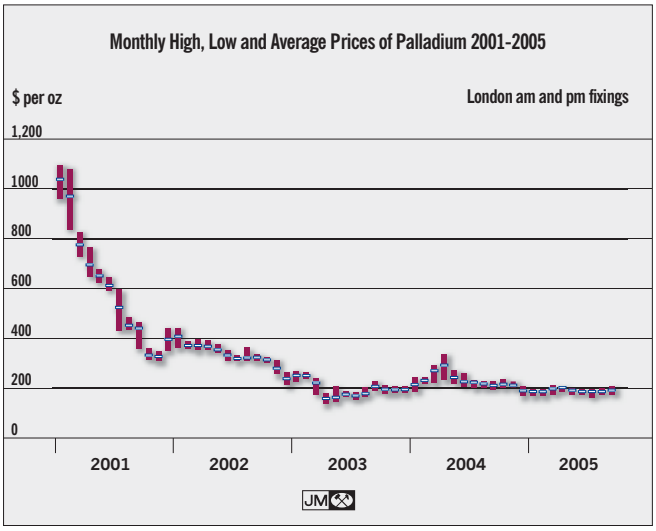


Autocatalyst demand for palladium in Japan is also projected to expand as a greater proportion of light vehicles produced for both the domestic and European markets will meet more stringent emissions limits. Purchases of palladium for autocatalysts in China and elsewhere in Asia will continue to rise as light vehicle output grows but will decline again in Europe as diesels gain additional market share.

Palladium has expanded the market for white precious metal jewellery in China by offering less affluent consumers a high purity but relatively affordable product. How the market continues to develop will depend upon numerous factors, including the amount of promotion undertaken, the price of the metal, and whether it becomes available to trade on the Shanghai Gold Exchange. On balance we believe that jewellery demand for palladium has the potential to increase further in 2006, but as expansion of the trade pipeline is expected to slow, the rate of growth is forecast to be much less dramatic than this year.

If no sales are made from Russian state stocks next year, total palladium supplies will decline again. South African production should increase significantly and North American output is also forecast to improve, but Stillwater Mining will have fully sold its inventory of Russian metal by the end of the first quarter.

After five years of significant surpluses, the palladium market could move close to balance in 2006. Market stocks of metal, however, remain substantial and so the direction of the price will continue to rest largely with funds. The improving fundamentals of the palladium market should keep sentiment positive and may draw in sufficient additional speculative investment to push the price upwards, particularly if gold and platinum also rally. We therefore forecast that palladium will trade between $190 and $270 for the next six months.



SUPPLIES, MINING & EXPLORATION

SOUTH AFRICA

Supplies of platinum from South Africa are forecast to total 5.12 million oz in 2005, up by 3 per cent compared with last year. A three month shut-down at Anglo Platinum's Polokwane smelter is expected to reduce the group's output, which is now unlikely to reach the target of 2.6 million oz. Most other producers are expected to achieve modest growth in pgm production.

Anglo Platinum

At Anglo Platinum's Amandelbult mine, pgm output fell sharply during the first six months of this year due to difficult geological conditions at the No.2 shaft; production also declined at the Rustenburg Merensky operations. However, these losses were offset by an increase in output from the Rustenburg UG2 project, greater production from the developing Modikwa mine (a joint venture with ARM Platinum), and by the processing of the first concentrate under the Kroondal Pool and Share Agreement (P&SA) with Aquarius Platinum. A second concentrator was commissioned at Kroondal in March 2005 and production from this plant will be refined by Anglo Platinum.

Anglo Platinum announced two new joint ventures during the first nine months of 2005. In July, a second P&SA with Aquarius was unveiled, under which the two companies will pool mineral reserves in the vicinity of the existing Marikana operation. Under the deal, total pgm output should reach a rate of 250,000 oz per annum by the end of 2006.

PGM Supplies: South Africa
'000 oz

	2004	2005
Platinum	4,970	5,120
Palladium	2,510	2,600
Rhodium	576	616

In August the Mototolo joint venture with Xstrata was confirmed. A new mine on the eastern limb of the Bushveld Complex will exploit ore reserves owned by the two companies. At full production the mine is expected to produce 132,000 oz of platinum and 82,000 oz of palladium in concentrate each year; first production is expected towards the end of 2006.

Following an explosion at its Polokwane smelter in September 2005, Anglo Platinum announced that the plant would be shut for three months. Although the group currently has excess smelting capacity, and will be able to divert much of its Polokwane feed to its Waterval smelter, the incident will result in a build-up of untreated concentrate. Unless this material is toll-processed, Anglo Platinum's output could be reduced to around 2.45 million oz of platinum this year, 150,000 oz below the previous target of 2.6 million oz. Any stocks of untreated concentrate will then be smelted and refined during the first half of 2006.

Impala Platinum

During the first half of 2005, output of platinum from the Impala lease area rose by 4 per cent to 567,000 oz. The increase in output was principally due to higher mill throughput as production from the mechanised section at No.12 shaft improved, and the company exploited ore reserves left behind in previously mined sections. Productivity is being enhanced via an expansion of mechanised mining and the introduction of new mining technology such as drill jigs. The operation is on target to reach a production level of over 1.1 million oz of platinum this year.

Production of platinum at Impala's Marula mine on the eastern Bushveld was unchanged at 13,000 oz in the first half of 2005. The mine's slow progress has resulted from the need to change from mechanised room and pillar mining to conventional narrow-stoping methods. This has delayed the build-up of production but will ultimately result in better grades and higher annual output.

Lonmin Platinum

At Lonmin's western Bushveld operations, mill throughput in January to June 2005 fell by 10 per cent relative to the same period in 2004, primarily because of a substantial reduction in the volume of open pit ore mined. Shallow UG2 reserves amenable to open-casting have largely been depleted, and the near-surface Merensky reserves are less attractive. The company therefore opted to reduce open-cast mining in order to focus on higher grade underground ore. Output of platinum fell 11 per cent to 457,000 oz. Stocks of unrefined metal, however, remained higher than usual during the period, following a smelter shutdown in late 2004. Lonmin expects this material to be processed before the end of 2005.

In June 2005 Lonmin completed the acquisition of Southern Platinum, owner of the Messina platinum project. The Messina lease area currently hosts one mine, Voorspoed, which produced around 45,000 oz of platinum in 2004. Lonmin intends to proceed with an expansion to raise annual output to 75,000 oz by 2007.

Other Producers

Following a difficult 2004, production at Northam recovered strongly in the first six months of this year, with platinum output rising 12 per cent to 109,000 oz. Mill throughput was up 14 per cent, largely due to a sharp increase in tonnage from the UG2 reef. There was also an improvement in Merensky production, although geological conditions remained very difficult. The average head grade declined slightly, in line with the change in the ore mix, but this was offset by an improvement in recoveries from the UG2 ore.

In addition to its Kroondal and Marikana operations, both of which are the subject of agreements with Anglo Platinum (*see earlier*), Aquarius Platinum has a third South African platinum mine currently under development at Everest South. A 250,000 tonne per month concentrator is due for commissioning in December 2005, although the first refined metal from the project will not be seen until early next year. The initial feed for the concentrator will come from two small open pits before mining subsequently moves underground. At full production Everest South is planned to produce 225,000 oz of pgm annually.

An explosion at Anglo Platinum's Polokwane smelter in September will result in the group's output of refined platinum falling short of its target of 2.6 million oz in 2005.

ARM Platinum is involved in three pgm-producing joint ventures: it currently holds a 41.5 per cent stake in Modikwa (joint venture with Anglo Platinum), 50 per cent of the Nkomati nickel mine (with LionOre) and 55 per cent of the Two Rivers project (with Impala).

In June 2005, ARM and Impala Platinum confirmed their decision to proceed with the Two Rivers pgm project following a successful trial mining operation. Production is due to start in the second half of 2006, with a stockpile of around 300,000 tonnes of UG2 ore already having been established. At full capacity the operation is scheduled to produce 120,000 oz of platinum, 68,000 oz of palladium and 20,000 oz of rhodium annually.

The Nkomati nickel mine reported higher sales of by-product pgm in the first half of this year, up 8 per cent to 18,000 oz. ARM Platinum and LionOre are currently evaluating an expansion that would more than triple nickel production at Nkomati; the increase in pgm output would be proportionately slightly less.

RUSSIA

Sales of Russian palladium are expected to decline by 9 per cent to 3.73 million oz in 2005, with little metal being supplied by Gokhran or the Central Bank. This total includes 438,000 oz of metal that is being sold from stocks held by Stillwater Mining in the USA. Shipments of platinum and rhodium in 2005 from Russia are forecast to be 860,000 oz and 90,000 oz respectively.

Norilsk Nickel revealed its production of platinum and palladium for the first time in September, stating that it had produced 1.483 million oz of palladium and 355,000 oz of platinum in the first six months of 2005. Sales were slightly below production levels, at 1.469 million oz of palladium and 327,000 oz of platinum. Full year production was forecast at 3.08 million oz of palladium and 730,000 oz of platinum.

We now believe that the 1.68 million oz of palladium imported into Switzerland from Russia in November and December 2004 was mainly State Fund (Gokhran) metal and was sold then or early in 2005. No such shipments have been reported to date this year. Information on stocks of pgm held by Gokhran and the

Central Bank, and details of any sales of these metals, have not been published and seem likely to remain secret for at least the immediate future.

Production of platinum from the alluvial mines of the Far East of Russia, primarily Kondyor (Khabarovsk) and Koryak (Kamchatka), can only take place in the period May-September and the outcome for 2005 is not finalised. However, output at both locations is believed to be in gentle decline.

PGM Supplies: Russia
'000 oz

	2004	2005
Platinum	850	860
Palladium	4,100	3,730
Rhodium	105	90

JM

The 2005 Russian supply figure for palladium includes metal that will be sold by Stillwater Mining from the 877,169 oz transferred in 2003 by Norilsk Nickel in part payment for a majority shareholding in the company. Although the metal was exported from Russia in 2003, none was sold during that year and so it was not included in our supply data. Early in 2004, Stillwater entered into agreements to sell palladium at a rate of approximately 36,500 oz per month from this stock, and is therefore expected to ship a total of 438,000 oz this year. The remaining inventory is scheduled to be sold during the first quarter of 2006.

NORTH AMERICA

North American supplies of pgm are forecast to decline in 2005 due to lower production from both Inco and North American Palladium. Platinum shipments are expected to total 340,000 oz, down 12 per cent compared with 2004, while sales of palladium will decline by 11 per cent to 925,000 oz. The Lac des Iles open pit mine operated by North America Palladium had a difficult start to 2005. The operation produced 101,000 oz of palladium in concentrate in the first six months of this year, 60 per cent less compared with the same period in 2004. Problems with mill availability and a fall in palladium head grades to less than 2 grams per tonne were key factors in the drop in output. An underground mine is currently under development at Lac des Iles. This will exploit deeper reserves grading over 6 grams per tonne palladium, and should therefore lift overall head grades when it enters production in early 2006.

By-product pgm output from nickel-copper mines in Canada is also forecast to decrease this year. Following a scheduled shutdown of its smelter for maintenance and upgrading, Inco now expects its pgm production to total around 380,000 oz this year compared with 422,000 oz in 2004. At Falconbridge's Sudbury operations, pgm output should be similar to last year, but production from Raglan is expected to drop a little in line with lower nickel and pgm grades.

At Stillwater Mining's operations in Montana, pgm production fell slightly in the first half of 2005. The company's total mill throughput was almost unchanged but there were declines in grade at both the Stillwater and the East Boulder mines. As a result, palladium output dropped 4 per cent to 218,000 oz in the six months to June 2005, while platinum production slipped 3 per cent to 65,000 oz.

PGM Supplies: North America
'000 oz

	2004	2005
Platinum	385	340
Palladium	1,035	925
Rhodium	17	21

JM

ZIMBABWE

Production of platinum in Zimbabwe is expected to rise by 5 per cent to 155,000 oz in 2005. A further increase should be seen next year as an upgrade of the Mimosa mine comes on-stream. However, a planned expansion at Ngezi has been put on hold until political and economic conditions improve.

At the Ngezi mine, owned by Zimplats (in which Impala has an 87 per cent share), mill throughput in the first half of 2005 was steady at 1.03 million tonnes. However, an increasing proportion of this ore came from underground, contributing to improvements in head grades and recoveries. As a result, production of pgm in concentrate rose by 5 per cent to 90,000 oz.

PGM Supplies: Zimbabwe and Others
'000 oz

	2004	2005
Platinum	255	270
Palladium	265	285
Rhodium	16	17

JM

At the Mimosa mine (a joint venture between Impala and Aquarius) a strong increase in mill throughput and an increase in the average head grade during the first half of the year more than offset a slight decrease in recoveries. Production of pgm in concentrate rose by 20 per cent to 69,000 oz as a result. In October, work commenced on a project that will increase mill throughput by a further 25 per cent and expand the mine's annual rate of production to nearly 170,000 oz of pgm by mid-2006.

PLATINUM

AUTOCATALYST

Autocatalyst demand for platinum is forecast to climb by 8 per cent to 3.86 million oz in 2005, the sixth annual increase in succession. Demand is being predominantly driven by rising sales of light duty diesels in Europe and tighter restrictions on emissions from both light duty and heavy duty diesel vehicles worldwide. The ongoing growth in light vehicle production and sales in China will also make a contribution to higher autocatalyst demand for platinum this year.

Europe

European demand for platinum in autocatalysts is forecast to increase by 16 per cent in 2005 to 1.94 million oz. Production of diesel cars in Europe continued to rise during the first nine months of the year, with diesels taking further market share from gasoline powered variants. For the year as a whole, output of diesel cars and light trucks is on course to expand by around 6 per cent, equivalent to an additional 470,000 vehicles.

Platinum Demand: Autocatalyst
'000 oz

	2004	2005
Europe	1,680	1,940
Japan	605	580
North America	800	820
Rest of the World		
China	80	110
Other	395	410
Total	**3,560**	**3,860**

JM

Euro IV emissions standards, which will apply to light duty vehicles registered from January 2006 onwards, stipulate substantial reductions in emissions of all major classes of pollutants. As a result, average loadings for diesel oxidation catalyst have increased.

The growing regulatory (and media) focus on the issue of emissions of particulate matter in Europe has also led to increasing fitment of platinum-catalysed diesel particulate filters (DPF, also referred to as catalysed soot filters or CSF). Although the majority of passenger cars and many light duty truck models are able to meet the Euro IV limits without the use of a DPF, they are increasingly offered as optional extras.

Japan

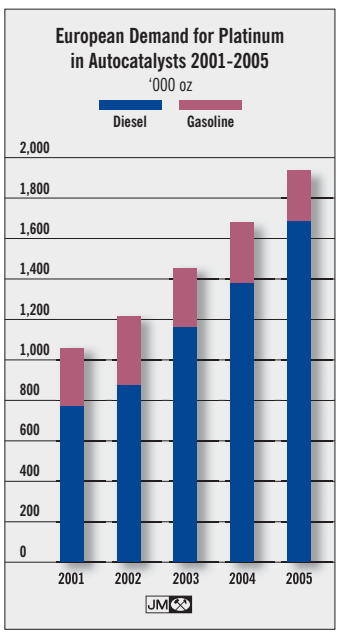
Japanese auto industry purchases of platinum are forecast to total 580,000 oz in 2005, down by 4 per cent on 2004. However, because demand last year was inflated by the purchase of metal for inventories, the year on year comparison does not reflect the trend in actual use of metal in catalysts, which is expected to increase for the seventh year in succession.

With Japanese production of light vehicles forecast to be flat or slightly lower, the growth in use of platinum will be primarily due to greater demand from the heavy duty diesel sector. New emissions standards for heavy duty diesel vehicles came into effect nationwide in October this year. In order to meet the tougher emission limits, almost all new truck models require at least one diesel oxidation catalyst, with some emissions systems comprising both an oxidation catalyst and a catalysed diesel particulate filter.

North America

Auto industry demand for platinum in North America is forecast to edge up by 2.5 per cent to 820,000 oz in 2005. A proportion of the increase will be due to greater retrofitting of diesel oxidation catalysts to heavy duty diesel vehicles. The number of local authorities requiring catalyst after-treatment systems to be fitted to buses, refuse trucks and other municipal vehicles is steadily rising, whilst a number of corporate operators of large delivery vehicle fleets have also embarked on retrofit programmes.

US auto manufacturers continue to work towards reducing the amount of platinum used in after-treatment systems for gasoline-powered light vehicles. Total use of the metal by the big three US-based car companies is expected to continue to trend slowly downwards this year. However, non-US auto makers tend to make use of catalyst systems with higher average platinum loadings, and these companies are on course to increase their share of the North American light vehicle market this year. The net effect of this will be a moderate increase in platinum demand.



China

Demand for platinum from auto manufacturers in China is forecast to climb by 30,000 oz this year to 110,000 oz. The Chinese car market has continued to grow robustly during 2005, in line with the strong domestic economy and rising disposable incomes. Sales and production of light vehicles are growing at an annualised rate of 13 to 14 per cent, with both expected to exceed 5 million units for the first time.

The introduction of progressively tighter emissions standards for light vehicles is continuing in China and is contributing to rising autocatalyst demand for pgm. Euro II equivalent standards have applied nationwide since mid-2004, whilst Euro III limits may be introduced in Beijing in 2006.

Rest of the World

Autocatalyst demand for platinum in the Rest of the World (excluding China) is forecast to rise by 4 per cent to 410,000 oz. Much of the increase will stem from greater light vehicle output in Asia, with the South Korean auto industry in particular set to record significantly higher production in 2005 than the year before. Indian in the market has slowed as a result of the introduction of VAT in April by a majority of Indian states.

Emissions legislation will also continue to push autocatalyst demand for platinum up. Euro II equivalent standards have applied to all new cars in India since April 2005, whilst several of the largest Indian cities have introduced Euro III equivalent emissions limits. In South Korea, changes to emissions regulations have resulted in the increased retrofitment of oxidation catalysts to heavy duty diesel vehicles.

Autocatalyst Recovery

The volume of platinum recovered from recycled autocatalysts is expected to grow by 13 per cent in 2005, reaching an estimated 800,000 oz. Double-digit increases in recovery are forecast in both North America and Europe, reflecting the historical pattern of pgm use on catalysts in the former and the imminent implementation of the European End of Life Vehicle directive in the latter. The strength of the platinum price has also encouraged participants in the autocatalyst recycling sector to maximise catalyst collection rates and pgm recovery. Autocatalyst recovery of platinum in Japan, however, is likely to show little change from the previous year as collection rates have reached a plateau.

Platinum Demand: Autocatalyst Recovery
'000 oz

	2004	2005
Europe	(145)	(170)
Japan	(60)	(60)
North America	(440)	(510)
Rest of the World	(60)	(60)
Total	**(705)**	**(800)**

JM

JEWELLERY

Purchases of platinum for jewellery manufacture are forecast to decline by 6 per cent in 2005 to 2.02 million oz. Demand in China is expected to contract for the third year in succession, largely as a result of the performance of the platinum price. Demand in Japan and North America is also likely to be weaker than in 2004, but is projected to be flat in Europe and the Rest of the World.

Europe

Demand for platinum for jewellery manufacture in Europe is forecast to be unchanged at 195,000 oz in 2005. After several years of exceptional growth, UK demand for platinum for jewellery manufacture appears likely to be flat in 2005. The number of items hallmarked during the first three quarters of the year slipped lower and whilst this was largely offset by a consumer preference for heavier rings, UK manufacturers also faced increased competition from imported jewellery. Although platinum has established a strong presence in the UK bridal market, the rise in the price has held back development of the fashion sector.

Demand for platinum from Swiss jewellery manufacturers is also forecast to be unchanged in 2005, following a strong increase in 2004. Sales and orders for platinum watches are likely to slip behind the levels seen last year, but this decline should be countered by a rise in output of Swiss manufactured rings and other platinum jewellery.

Purchases of platinum by German and Italian jewellery companies will also reflect a mixed picture at the retail end of the market. Increased promotion and marketing of non-bridal platinum jewellery is likely

to encourage growth at the upper end of the market. At the lower-priced end of the spectrum, however, platinum remains under pressure from alternative precious and non-precious white metals.

Japan

Japanese demand for platinum in jewellery is forecast to soften once again in 2005 but the decline is expected to be marginal: from 560,000 oz in 2004 to 550,000 oz this year.

Platinum retains a strong hold on the engagement and wedding ring sectors of the market, although over the longer term the marriage rate in the country is in steady decline. In the non-bridal side of the market, the squeeze on retail sales of platinum jewellery from white gold has been exacerbated by the rise in the platinum price, which increased by around 20 per cent in yen terms over the first nine months of the year.

One positive factor for platinum purchases by jewellery manufacturers is that the volume of metal being recycled from trade inventories is unlikely to increase this year, and may actually decline as fewer wholesalers and retailers exit the business. However, the flow of metal from consumers trading in old pieces of platinum jewellery appears to be steady, if not increasing.

North America

Purchases of platinum by the North American jewellery trade are forecast to decline by 10 per cent to 260,000 oz in 2005, more than 100,000 oz below the recent peak in demand in 2000.

As elsewhere, the pattern of retail sales to date has been mixed. Some growth in sales has been recorded in the upper end of the market, with platinum jewellery benefiting from increased celebrity endorsements and marketing. At the lower end of the market, however, platinum has continued to lose ground to white gold as the price of the metal has risen.

China

Chinese purchases of platinum for the manufacture of jewellery are forecast to fall by 10 per cent in 2005 to 910,000 oz, the lowest level of demand since 1998. Demand has declined as a result of the increase in the platinum price and the speed at which it has risen on several occasions during 2005 to date.

The increased cost of financing inventories of platinum jewellery has led to an ongoing reduction in stock levels throughout the trade. The volume of out-dated plain platinum products returned by retailers to manufacturers for recycling has risen; wholesalers have cut back their inventories; and the number of consumers trading in pieces of old platinum jewellery for new ones has increased.

At the same time, substantial inventories of diamond set precious metal jewellery have accumulated throughout the trade, reflecting previously over-optimistic production rates. This has led to a marked reduction in the manufacture of diamond set platinum jewellery so far this year.

The majority of jewellery manufacturers have expanded their production of palladium products, as the trade takes advantage of higher margins per piece and lower metal financing costs, and many are now only producing platinum to order.

Outside the largest metropolitan areas, some stores have reduced the display space devoted to platinum in favour of more profitable palladium, although retailers vary considerably in their approach to stocking and promoting it. In addition, the strong rally in the platinum price in September had a detrimental impact on the amount of stock that retailers were prepared to order ahead of the National Day holiday period at the beginning of October. This in turn fed through to lower purchases of metal by manufacturers.

Platinum Demand: Jewellery
'000 oz

	2004	2005
Europe	195	195
Japan	560	550
North America	290	260
Rest of the World		
China	1,010	910
Other	105	105
Total	**2,160**	**2,020**

JM

Nevertheless, sales of platinum jewellery have remained relatively firm in cities such as Beijing and Shanghai, where few of the leading retailers have stocked palladium. Profit margins on platinum jewellery have been largely stable throughout 2005 to date as retail prices have tended to move more closely in line with the price of the metal. Higher prices in the stores have not yet had a discernable impact on consumer purchases and have, if anything, reinforced the status of platinum.

Rest of the World

Demand for platinum from jewellery manufacturers in the Rest of the World is projected to be unchanged at 105,000 oz in 2005. Manufacturers in India, Taiwan and elsewhere in the Asia-Pacific region have increased their share of certain export markets, but this has been offset by the contraction in demand in North America and Japan. Sales of platinum jewellery in the Indian domestic market continue to develop, and production of platinum jewellery in South Africa is expanding, albeit from a very small base.

INDUSTRIAL

Purchases of platinum for use in industrial applications are forecast to climb by 5 per cent to 1.615 million oz in 2005. Greater production of hard disks will generate good growth in demand from the electrical sector and purchases by the glass industry are expected to rise. Demand for platinum for use in chemical catalysts is projected to soften but this is likely to be outweighed by increased sales of platinum-based petroleum refining catalysts.

Demand for platinum used in electrical applications is forecast to grow by 18 per cent in 2005, reaching 355,000 oz. The growth will be predominantly a result of a strong increase in production of hard disks on the back of substantially higher sales of computers and consumer electronics, such as personal digital music players. The hard disk manufacturing industry in Asia has been expanding rapidly to meet this demand.

After a strong 2004, demand for platinum from the glass manufacturing industry is set to increase further in 2005, rising to 315,000 oz. The rate at which glass manufacturers are investing in new production plants in Asia is continuing at a remarkable pace – in line with industry projections of continued rapid growth in demand for flat panel displays. In 2005, more than 20 new glass tanks for the production of LCD and other flat panel display glass are scheduled to be completed in Japan, Taiwan, South Korea and Singapore.

Demand for platinum in chemical applications is forecast to soften slightly in 2005 to 320,000 oz, although this is still at the top end of the recent historical range. The rate of expansion in the global paraxylene industry is expected to slow compared to 2004, and demand for platinum gauze from nitric acid manufacturers is also projected to soften.

With strong global demand and tightness in supply, a majority of petroleum refineries have been operating close to or at effective capacity this year. As a result of the high operating rates the frequency at which installed catalyst beds have had to be topped up has increased, leading to a forecast increase in platinum demand of almost 7 per cent in 2005 to 160,000 oz.

Demand for platinum in most other industrial applications, including turbine blade coatings and biomedical equipment, is also expected to rise this year. In contrast, use of the metal in dental alloys will fall as a direct result of the increase in the price.

Platinum Demand: Industrial
'000 oz

	2004	2005
Chemical	325	320
Electrical	300	355
Glass	290	315
Petroleum	150	160
Other	470	465
Total	**1,535**	**1,615**

JM

INVESTMENT

Demand for physical investment products in both North America and Japan is forecast to fall in 2005, largely as a consequence of the strength of the platinum price. As a result, total investment demand is expected to decline to just 15,000 oz.

Sales of the US Mint's Platinum Eagle series of bullion coins during the first three quarters of the year were 26 per cent down on 2004, with only around 10,000 oz of coins sold. Sales of Platinum Eagle proof coins to collectors generally lag those of the bullion series, and are unlikely to exceed 10,000 oz for the year as a whole. With some sales being made back to the market, net demand for platinum investment products in North America is forecast to fall to 15,000 oz in 2005.

In Japan, the average rate of sales of large investment bars to private investors has also slowed compared with 2004 as the price of platinum has increased. At the same time, the volume of bars sold back to dealers has risen and is projected to outweigh new purchases by 5,000 oz over the course of the year.

Platinum Demand: Investment
'000 oz

	2004	2005
Coins and small bars		
Europe	0	0
Japan	5	0
North America	20	15
Rest of the World	0	5
Large bars in Japan	**15**	**-5**
Total	**40**	**15**

JM

PALLADIUM

AUTOCATALYST

Demand for palladium for use in autocatalysts is forecast to slip by 1 per cent to 3.69 million oz in 2005. Purchases by the European auto industry appear certain to fall for the fifth year in a row as production of gasoline light vehicles in the region continues to decline. US demand for palladium in autocatalysts is also expected to weaken as a result of ongoing thrifting programmes. Demand in China and the Rest of the World, however, is projected to grow in line with rising light vehicle output.

Europe

European demand for palladium from the autocatalyst sector is forecast to drop by 9 per cent (100,000 oz) to just over 1 million oz in 2005, the lowest level of demand since 1996. The continuing rise in the market share taken by diesel cars in Europe is expected to result in a decline in production of gasoline light vehicles of around 3 per cent this year, equivalent to more than 300,000 units. At the same time, average palladium loading levels in gasoline autocatalysts are still trending downwards and this thrifting will contribute to the fall in demand for the metal. The development of diesel oxidation catalysts that contain a proportion of palladium in place of platinum will not have a material impact on demand for either metal this year.

Japan

Purchases of palladium by the Japanese auto industry are forecast to edge up by 10,000 oz to 645,000 oz in 2005. Light vehicle production is likely to increase by around 2 per cent this year. At the same time, the proportion of vehicles manufactured to stringent Japanese ultra low emissions vehicle (ULEV) standards will rise. Although ULEV limits are not mandatory, the environmental credentials of light vehicles are generally an important consideration for new car buyers in Japan.

Palladium Demand: Autocatalyst
'000 oz

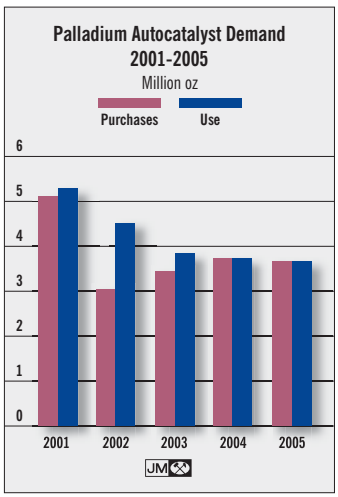
	2004	2005
Europe	1,105	1,005
Japan	635	645
North America	1,445	1,395
Rest of the World		
China	105	150
Other	430	495
Total	**3,720**	**3,690**
Autocatalyst recovery	**(535)**	**(680)**

JM

North America

Purchases of palladium by the North American auto industry are forecast to weaken by 3 per cent in 2005 to 1.395 million oz. Thrifting will continue to reduce average catalyst palladium loading levels and, this year at least, will outweigh the positive effects of auto manufacturers switching from platinum to palladium-based systems on gasoline vehicles.

The rate of light vehicle production in North America is also expected to slow moderately compared with 2004. The decrease in output of larger SUVs and pick-up trucks is likely to be greater than the overall decline, as the rapid rise in the price of gasoline had a noticeable impact on sales during the middle of the year. These heavy, large-engined vehicles generally utilise catalyst systems with relatively high palladium contents.



With no changes to auto industry stocks, purchases of palladium have been representative of use for the last two years.

China

Demand for palladium from the Chinese automotive industry is forecast to jump by 43 per cent to reach 150,000 oz in 2005. The surge in demand will reflect higher light vehicle production, which is on track to record double-digit percentage growth.

Purchases of palladium will also be boosted by a further increase in the proportion of light trucks fitted with catalysts and a rise in average catalyst loading levels, a result of the introduction of more stringent emissions standards.

Rest of the World

Autocatalyst demand for palladium in the Rest of the World is expected to reach 495,000 oz this year, an annual increase of 15 per cent. As with platinum, demand will be driven by a combination of higher light vehicle production in South Korea, India and South East Asia, and tightening emissions limits in a number of countries.

Autocatalyst Recovery

An estimated 680,000 oz of palladium will be recovered from scrapped autocatalysts in 2005, up from 535,000 oz the year before. Recovery in North America is expected to climb by 23 per cent to reach 425,000 oz as greater volumes of palladium-rich catalysts from vehicles dating from the mid-1990s enter the recycling stream.

The average palladium content of scrapped catalysts in Europe is also projected to increase and recovery rates in the region are rising. The volume of palladium recovered in 2005 is consequently forecast to expand by 50 per cent to 165,000 oz.

Dental

A marginal increase in demand for palladium in dental alloys is expected this year, total purchases rising by 10,000 oz to 860,000 oz. European demand is forecast to weaken further but this is likely to be offset by some growth in the Japanese and North American markets.

Japan remains by far the biggest dental market for palladium thanks to the state subsidy of the cost of 'kinpala' alloys, which contain 20 per cent of the metal by weight. Little change in this mature market is expected in 2005 and palladium demand is forecast to edge up by 1 per cent to 525,000 oz.

Palladium Demand: Dental
'000 oz

	2004	2005
Europe	80	75
Japan	520	525
North America	235	245
Rest of the World	15	15
Total	**850**	**860**

JM

In the more price sensitive North American market, the low and stable price of palladium relative to gold this year is likely to result in demand in dental alloys rising by 4 per cent to 245,000 oz. In Europe, however, palladium retains only a niche position in the dental sector and purchases of metal are forecast to weaken slightly to 75,000 oz.

ELECTRONICS

Purchases of palladium by the global electronics industry are forecast to increase by just over 5 per cent in 2005 to reach 970,000 oz, continuing the steady recovery from the nadir of 670,000 oz in 2001. Although demand from the multi-layer ceramic capacitor (MLCC) sector will continue to decline, use of the metal in plating applications is expected to show robust growth.

Although MLCC output is expected to grow this year, palladium demand is forecast to fall, continuing the trend of the last five years. The market share of nickel-based MLCC is on course to reach 70 per cent as a result of further substitution of palladium-based capacitors, whilst miniaturisation will also continue to adversely affect metal usage. At the same time, the average palladium content of the conductive pastes used in MLCC production is still declining.

Palladium Demand: Electronics
'000 oz

	2004	2005
Europe	115	115
Japan	235	245
North America	185	190
Rest of the World	385	420
Total	**920**	**970**

JM

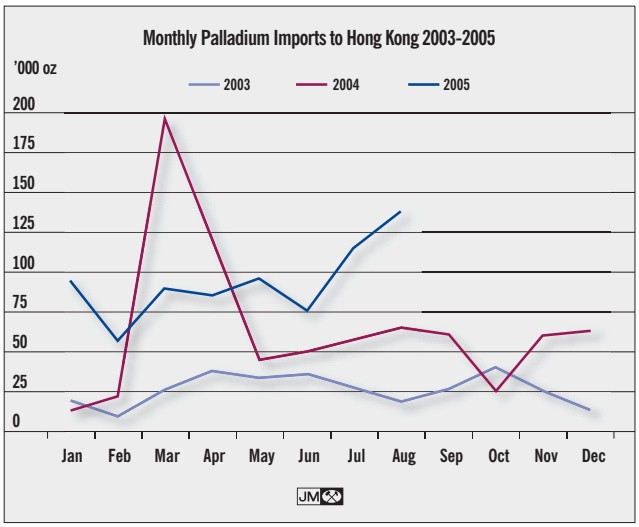
In contrast, demand for palladium from the plating sector is forecast to expand by close to 30 per cent in 2005. Demand will benefit from the overall growth in production and sales of electronic components; from the drive to replace solders containing lead with alternative formulations; and from the widening difference between the price of palladium and gold, which has stimulated increased demand for plating compounds based on the former for the plating of connectors.

Further growth in demand for palladium this year will come from higher production of resistor chips and related components, driven in part by strong demand for automotive electronics. Use of palladium in hybrid integrated circuits is expected to be stable.

JEWELLERY

Global demand for palladium in jewellery manufacture is forecast to rocket to 1.43 million oz in 2005, an annual increase of 55 per cent. Virtually all the growth will come from China, where the production of palladium jewellery has expanded remarkably quickly.

Purchases of palladium for jewellery manufacture in China are projected to soar to 1.2 million oz in 2005, up by 71 per cent compared to 2004 (700,000 oz). Most of the leading jewellery manufacturers in Shenzhen are now producing palladium jewellery in addition to platinum, and for several of them palladium accounts



Apart from March and April (which were exceptional months in 2004) palladium imports to Hong Kong in 2005 have been running well ahead of last year.

for the majority of their output. Manufacturers, wholesalers and retailers all benefit from the much lower metal funding costs for palladium compared to platinum, whilst the comparatively low volatility of the palladium price during 2005 to date has reduced the financial risk of holding stock.

In addition, although the manufacturing margins for palladium jewellery have declined to the point at which they are now little different from those on platinum, profit margins per piece of jewellery at the retail end of the market remain considerably more attractive.

This year has seen the number of jewellery stores stocking palladium increase, whilst the availability of a wider range of new designs has encouraged some retailers to expand the proportion of counter space that they have allotted to palladium. Meanwhile, the technical and quality problems experienced with some of the earlier palladium jewellery production appear to have been largely overcome.

The introduction of Pd990 alloys (99 per cent palladium) in place of Pd950 alloys has also proved successful – high purity is a key selling point and gives palladium a major advantage over white gold.

Retailers are promoting palladium jewellery on the basis that it shares many attributes with platinum: that it is a pure, rare, durable, white fashionable precious metal. The suggestion that palladium jewellery could appreciate in value in the same way that platinum has is also a frequently used sales message. In essence, palladium offers less affluent consumers high purity white precious metal jewellery at an affordable price.

However, the pattern of retail sales of palladium jewellery is still rather patchy, both on a broad geographical level and from one store to the next. Where palladium is selling well, typically in second and third tier cities, it appears to have taken some market share from traditional yellow gold, white gold and from the lower end of the plain platinum jewellery market. In contrast, in Shanghai and Beijing platinum remains the metal of choice for middle-class consumers and many leading retailers have held back from stocking palladium jewellery.

OTHER

Demand for palladium in other applications is forecast to rise by 2 per cent to 620,000 oz in 2005. The growth will come primarily from greater use of the metal in chemical catalysts. Purchases of physical investment products is also likely to be moderately higher.

Purchases of palladium for use in chemical catalyst applications are forecast to grow by around 3 per cent to reach 320,000 oz in 2005. Demand for palladium catchment gauze from the nitric acid industry is likely to be broadly stable, whereas the construction of new purified terephthalic acid manufacturing capacity in Europe and Asia will give a boost to demand for palladium-based process catalysts. Demand for palladium from other smaller industrial applications, including petroleum cracking catalysts, is not expected to change significantly.

Private investors continue to show a strong appetite for palladium, with total investment demand projected to rise 5 per cent to 220,000 oz this year. Small 1 and 10 oz bars have been selling well in the US market, benefiting from the high level of interest in commodities and precious metals in particular. In the fourth quarter of the year the Royal Canadian Mint launched a series of 1 oz palladium Maple Leaf coins.

Palladium Demand: Jewellery
'000 oz

	2004	2005
Europe	35	35
Japan	155	160
North America	0	5
Rest of the World	730	1,230
Total	**920**	**1,430**

JM

Palladium Demand: Other
'000 oz

	2004	2005
Europe	25	20
Japan	10	10
North America	235	250
Rest of the World	25	20
Total	**295**	**300**

JM

OTHER PLATINUM GROUP METALS

RHODIUM

Demand for rhodium is forecast to increase by almost 9 per cent to 790,000 oz in 2005. Most of this growth will be due to greater purchases of metal for use in autocatalysts, in turn driven by tightening vehicle emissions limits world-wide. Demand from the glass industry for rhodium is also expected to be strong again this year, with further expansion of LCD glass manufacturing capacity in Asia.

Autocatalyst

The use of rhodium in autocatalysts is forecast to rise by 3 per cent in 2005. However, purchases of rhodium by auto makers are projected to climb by 8 per cent to reach 820,000 oz, an increase of 62,000 oz compared with 2004. The difference is explained by year-to-year changes in stocks within the auto industry.

Rhodium Supply and Demand
'000 oz

	2004	2005
Supply		
South Africa	576	616
Russia	105	90
North America	17	21
Others	16	17
Total Supply	**714**	**744**
Demand		
Autocatalyst: gross	758	820
recovery	-141	-150
Chemical	42	45
Electrical	7	9
Glass	47	50
Other	14	16
Total Demand	**727**	**790**
Movements in Stocks	**(13)**	**(46)**

JM

Much of the expansion in autocatalyst demand for rhodium this year will come from the US auto industry. Growth in demand in 2004 was muted by the draw down of metal from stocks but with no further inventory reductions expected this year, purchases are forecast to jump by 30 per cent to 291,000 oz.

The use of rhodium on autocatalysts in the USA is trending slowly upwards in response to tighter emissions limits that are currently being phased in under the Tier II regulations. In particular, rhodium benefits from the strong focus on reducing NOx emissions as it is highly effective at catalysing the reduction of NOx to nitrogen.

At 184,000 oz, European autocatalyst demand for rhodium in 2005 is forecast to be only marginally higher than in the previous year. A small increase in average rhodium loading levels will be largely offset by the expected fall in production of gasoline light vehicles.

Japanese demand for rhodium in autocatalysts is likely to slip from 229,000 oz in 2004 to 211,000 oz this year. The underlying use of rhodium on autocatalysts in Japan is projected to be broadly stable but the auto industry is expected to purchase less metal for inventories. In China and the Rest of the World, however, rhodium demand is on course to increase by more than 12 per cent to reach 134,000 oz in 2005, in line with greater production of gasoline light vehicles.

Recovery of rhodium from autocatalysts is forecast to increase by 6 per cent to 150,000 oz this year. The growth in recovery will be concentrated in North America and Europe, and will reflect the changing mix of vehicle models and catalyst systems entering the recycling chain. Vehicle recycling and catalyst recovery rates are also increasing in Europe in response to new end-of-life vehicle legislation.

Other Demand

Demand for rhodium from the glass industry is forecast to rise by 6 per cent to reach 50,000 oz in 2005. The majority of demand will originate from Asia, where manufacturers of flat panel display glass have continued to invest heavily in new production capacity.

Purchases of rhodium for use in catalysts for the chemicals industry are expected to climb by 7 per cent to 45,000 oz this year. The construction of new plants for the manufacture of oxo-alcohols and acetic acid in Asia will be the source of much of the growth in demand.

Demand for rhodium in most other minor applications is also projected to grow moderately in 2005, including use of the metal in jewellery plating solutions and thermocouple wire.

RUTHENIUM & IRIDIUM

Demand for ruthenium is forecast to rise by 9 per cent in 2005 to 734,000 oz, as rapid growth in the use of the metal in electronics applications outweighs weaker demand from the chemicals industry. Purchases of iridium for chemical catalyst applications, on the other hand, are projected to increase, contributing to a 10 per cent rise in demand for the metal to 131,000 oz.

Growth in demand for ruthenium from the electronics sector was robust during the first nine months of 2005. Over the year as a whole demand is forecast to

Ruthenium Demand by Application '000 oz		
	2004	2005
Chemical	123	93
Electrochemical	96	94
Electronics	388	474
Other	68	73
Total Supply	**675**	**734**

JM

climb by 22 per cent to 474,000 oz, with electronic applications accounting for two-thirds of total ruthenium demand. Use of ruthenium-based pastes in the manufacture of resistor chips and similar components is rising strongly, in line with higher production of mobile phones, computers, other consumer products and increased demand for automobile electronics.

Demand for ruthenium from manufacturers of hard disks is also forecast to climb in 2005. The inclusion of ruthenium within the platinum-cobalt alloy layer used in hard disks has enabled substantial increases in data storage capacity to be achieved. The proportion of disks manufactured using this technology is rising.

In contrast, demand for ruthenium for use in chemical process catalysts is projected to fall by 24 per cent to 93,000 oz in 2005. The decline reflects a reduced rate of capacity expansion in several sectors of the chemicals industry. In particular, after several years of rapid growth, less acetic acid manufacturing capacity based on the Cativa process is scheduled to be constructed this year.

Consumption of ruthenium in the electrochemical market is forecast to soften slightly in 2005, edging down to 94,000 oz. Purchases of metal by chlor-alkali manufacturers in North America are expected to be stable, whereas European demand will weaken as producers continue to switch to membrane technology (which uses iridium-ruthenium anode coatings, rather than ruthenium alone). Conversely, this trend will lead to an increase in iridium demand from the electrochemical market, which is projected to reach 28,000 oz.

Iridium Demand by Application '000 oz		
	2004	2005
Chemical	25	31
Electrochemical	26	28
Electronics	29	31
Other	39	41
Total Supply	**119**	**131**

JM

Purchases of iridium for the manufacture of crucibles, which are used to grow high purity crystals for a range of specialised applications, are forecast to improve in 2005 on the back of good demand from the electronics industry. However, use of the metal in electronic components (FRAM memory chips, for example), is likely to slip lower. Total electronics demand for iridium is expected to increase marginally to 31,000 oz.

Demand for iridium-based catalysts from the chemicals industry is forecast to climb by 6,000 oz to reach 31,000 oz, driven by rising production rates and investment in new capacity for a number of speciality chemicals. The production of iridium-tipped spark plugs is also expected to grow in 2005, as use of the high-performance plugs by auto makers expands.

OTHER PGM SUPPLIES

Total supplies of rhodium are forecast to rise by 4 per cent (30,000 oz) in 2005 to reach 744,000 oz. South African output is expected to increase by 7 per cent to 616,000 oz as production expands in tandem with higher platinum output. In addition, changes to the rhodium refining circuit at Anglo Platinum's precious metals refinery resulted in the release of metal from the process pipeline during the first half of the year.

Russian sales of rhodium, however, are projected to slip to 90,000 oz, down from 105,000 oz the previous year. Norilsk Nickel is expected to sell its full production of the metal, but shipments from central stocks during the first nine months of the year fell behind the rate of sales seen in 2004.

With growth in demand for rhodium increasing faster than supplies this year, the market is projected to show a deficit of 46,000 oz. At the same time speculators have been active, bidding for spot metal and withdrawing rhodium that was previously on loan. The effect on the price has been considerable, the Johnson Matthey base price for rhodium climbing from $1,330 at the beginning of the year to a peak of $3,000 in October.

Ruthenium & Iridium

South African output of ruthenium and iridium continues to rise on the back of expanding platinum production. The availability of refined metal, however, was insufficient to prevent the price of both metals from strengthening during the second and third quarters of 2005 in the face of good industrial demand.

PRICES & FUTURES MARKETS

PLATINUM

During the first nine months of 2005 supplies of platinum increased but failed to keep pace with strong growth in demand. The availability of metal, however, was not excessively tight, with short-term lease rates typically being quoted in the 3 to 6 per cent range. The primary stimulus to the price came from the speculative side of the market, with funds building record long positions.

The platinum price rallied from a low of $843 in early January 2005 to a peak of $881 at the beginning of February, and then largely traded between $860 and $880 until the middle of June. Platinum briefly broke out of this range during the second half of June, surging to hit $900 on the back of substantial fund buying. Further fund-driven rallies then pushed the metal up to $924 in early August and to $930 in September. The buying reflected the ongoing flow of money into the commodities markets as a whole, and gold in particular, as investors sought to diversify their portfolios, achieve higher absolute returns and to hedge against the anticipated weakening of the US dollar.

The platinum price began 2005 weakly, sliding from around $860 at the end of 2004 to $843 on the 5th of **January**. However, good physical demand soon appeared from industrial end users and Chinese jewellery manufacturers, and as the US dollar weakened against the yen significant buying was seen from TOCOM investors. With US-based funds also increasing their long exposure the platinum price rose steadily, ending January trading either side of $870.

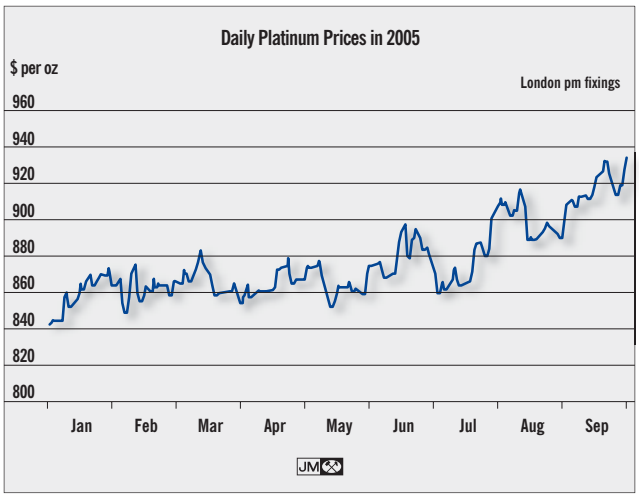
Average PGM Prices in $ per oz

	Jan-Sep 2004	Jan-Sep 2005	Change
Platinum	844.71	877.12	4%
Palladium	237.23	189.00	-20%
Rhodium	878.05	1,779.32	103%
Iridium	185.33	163.25	-12%
Ruthenium	60.40	71.03	18%

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

JM

The rally continued in Asia on the 1st of **February** as a burst of short covering on TOCOM pushed the spot price up to $881. At this level bids for metal were scaled back, with demand from Chinese buyers dwindling as the Chinese New Year holiday approached. At the same time the dollar recovered ground against the yen triggering selling by Japanese investors. As a result, by the 9th of February platinum had dropped to $847.



The platinum price in dollars increased by 9 per cent over the first nine months of the year but climbed by more than 20 per cent in euros and yen due to the relative strength of the US currency.

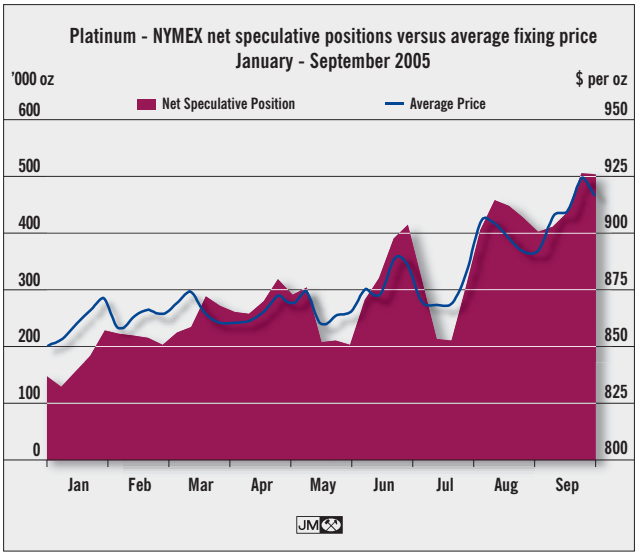
The dip encouraged renewed speculative buying and the price recovered to trade between $856 and $877 through to the end of the month.

The price climbed unevenly during the first half of **March** as funds continued to add to long positions, platinum fixing at $883 on the 16th and 17th. The precious metals markets then reversed direction as the dollar strengthened again and platinum fell to hit $858 on the 23rd. The price subsequently traded quietly between $855 and $865 through to the 19th of **April,** supported by firm physical demand.

Funds then became more active and the platinum price rallied to $880 on the 26th of April. At that point the net speculative position on NYMEX had risen to just over 320,000 oz, up from less than 260,000 oz two weeks earlier. As in March, the move to $880 sparked long-liquidation and the price consequently eased back to end the month at $867.

Additional fund buying took the price up to $881 on the 11th of **May** but once again the move above $880 was swiftly followed by a fall, platinum sliding to $853 on the 16th. The long liquidation was part of a broader sell-off, with gold, base metal and oil prices all dropping as funds continued to trade commodities against the dollar. Bids from end users picked up below $860 and platinum recovered to trade between $858 and $868 from the 18th onwards.

Platinum remained range-bound until the 15th of **June**, when a sudden reversal in the value of the dollar drew a surge of fund buying into the metals and oil markets. Platinum fixed at $877 in London that afternoon, passed $890 on the 17th and reached $900



The net non-commercial position in platinum on NYMEX climbed from around 150,000 oz in January to over 500,000 oz by the end of September, the increased fund investment driving the price upwards.

on the 20th as the dollar weakened. By that stage the net speculative position on NYMEX had leapt to almost 400,000 oz, up from little more than 200,000 oz at the beginning of the month. Platinum slipped back to fix at $879 on the 21st in the face of fund profit taking but then recovered to trade between $880 and $895 for the remainder of June.

Early **July** saw another round of long liquidation in the metals markets as the dollar recovered some ground. As a result, the platinum price dropped back into its previous trading range of $860 to $880. The announcement by the Chinese government of a revaluation of the renminbi on the 21st, however, immediately spurred increased fund buying of commodities, particularly those for which China accounts for a substantial proportion of physical demand. The platinum price moved swiftly above $880 and had reached $898 by the afternoon of the 29th.

The rally continued into the first half of **August**, short-covering by individual investors on TOCOM contributing to the upward momentum. The price moved above $900 on the 1st and hit $914 on the 4th. After a brief round of profit-taking platinum ran up to $924 at the morning fixing on the 12th as the precious metals markets moved up in parallel with a surge in the price of crude oil. At that point the net speculative position on NYMEX had passed 460,000 oz – the highest level for almost six years.

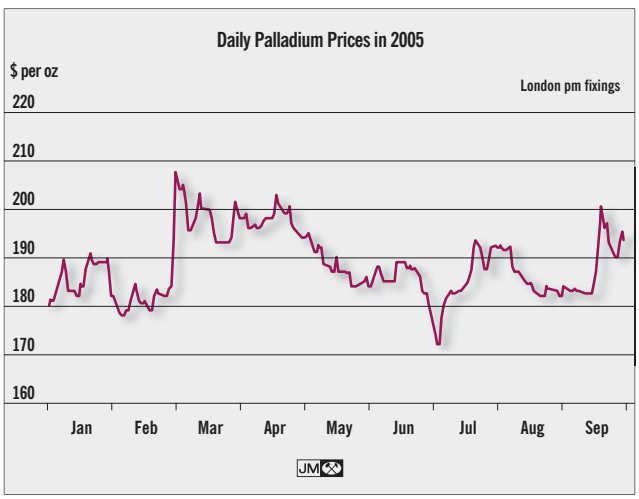
Increased offers of metal then came forward and the rally began to falter, end users being largely absent from the market. Funds started taking profits and by the close of trading on the 16th platinum had retreated to $887. Nevertheless, sentiment remained bullish and platinum continued to trade firmly either side of $890 through to the end of the month.

The crude oil and precious metals markets continued to attract fresh fund investment in **September**. Platinum jumped from $893 on the 1st to $909 the next day as the dollar weakened amid the aftermath of hurricane Katrina. The metal was supported around that level through to the 15th before embarking on another strong rally as the price of gold surged from less than $450 towards $470. Platinum passed $920 on the 19th and hit $930 the following day as short covering on TOCOM intensified. By that stage the net speculative position on NYMEX had soared to just over 507,000 oz, but physical demand, particularly from the Chinese jewellery sector, was minimal. After easing back to $910 on the 28th in the face of profit taking, platinum rebounded to end the third quarter at $929, a rise of nearly 10 per cent from the opening fixing of the year.

PALLADIUM

The palladium price traded calmly between $180 and $200 for the great majority of the first nine months of 2005, despite very substantial fund buying on NYMEX during the first quarter of the year. Physical demand was also firm throughout the period, particularly from Chinese jewellery manufacturers. However, with supply sufficient to meet demand, substantial stocks of metal available

The palladium price was confined to a $20 trading range between $180 and $200 for much of the first nine months of the year.



to the market, lease rates around 1 per cent and rumours of option related selling above $200, no rally lasted for more than a few days.

The palladium market was quiet at the beginning of **January,** holding close to $180 through to the 10th. That afternoon an upturn in fund buying was noted on NYMEX and the price moved up to reach $192 the following day. Demand from industrial end users, however, was light and as increased offers of metal came onto the market the price fell back below $185. A second minor rally was also capped at $192 and palladium ended January at $189.

The palladium price drifted down from an opening fixing of $189.50 on the 1st of **February** to $178 on the 8th, falling in line with the slide in the platinum price. From then on the price was becalmed, trading between $179 and $184 for the remainder of the month.

The spell was broken in early **March** when a rush of fund buying on NYMEX caused a flurry of short covering. Palladium jumped from $184 on the 2nd to $208 on the afternoon of the 4th as a result, with large volumes of metal changing hands across the fixings in London. By the 8th funds had amassed a net long position equivalent to 884,000 oz on NYMEX, an increase of 170,000 oz since the start of the month. However, with plenty of metal on offer the price then slipped back to trade either side of $200 through to the 31st, despite additional fund buying that took the net speculative holding on NYMEX up to almost 1 million oz.

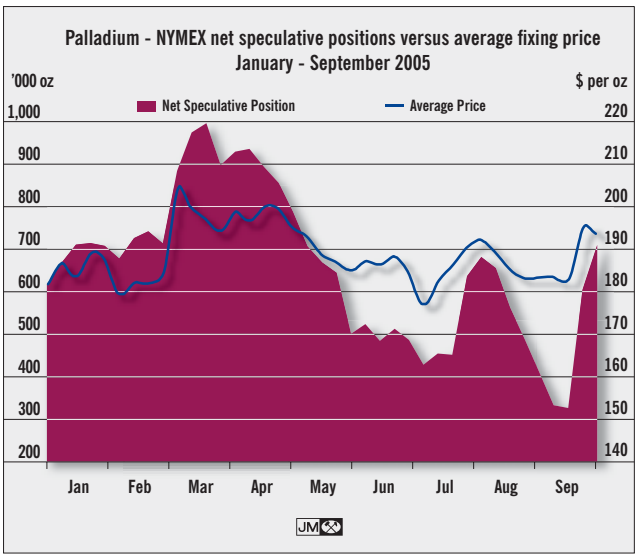
The palladium price slid from over $200 in March to a low of $172 in July as a marked increase in fund short positions on NYMEX reduced the net speculative position by more than half.

Palladium continued to trade steadily in a narrow range either side of $200 throughout **April**, but by early **May** long liquidation on NYMEX had begun to affect the price. Palladium fell back below $190 on the 13th and ended the month at $185. The net speculative position on NYMEX shrank to just over 500,000 oz as long contracts were liquidated and new shorts were initiated. Good physical demand, however, continued to underpin the market, helping to cushion the effects of the fund selling.

The price settled into another narrow trading range in **June**, palladium fixing at $185 on the 1st, edging up to $190.50 on the 7th on the back of strong rallies in platinum and gold, and then meandering back down to settle at $183 on the 30th.

In early **July** the price of palladium slid to $172 as some managed futures funds increased their short positions in an effort to provoke a more concerted sell-off. Other funds, however, saw the dip as a good buying opportunity and with bids from end users also increasing palladium recovered to $180 on the 7th. The price got a further boost from the Chinese currency revaluation on the 21st, moving back above $190 as a large volume of short contracts were covered. Palladium ended the month on a firm note at $192.

Palladium held above $190 throughout the first week of **August**, trading in an exceptionally narrow band between $191.50 and $193. Thereafter, the price subsided once again, despite platinum spiking to over $920. Funds began establishing substantial new short positions from around the 9th onwards and by the 15th palladium had faded to $185. The market then entered another period of very low volatility, the metal drifting between $182 and $185 all the way through to the 15th of **September**. The price then embarked on a brief rally, pulled higher by a sharp upturn in fund buying. However, although the net speculative position on NYMEX more than doubled to 710,000 oz during the last two weeks of the month, after fixing at $202 on the 20th palladium softened once again and ended the third quarter at $194.



OTHER PGM

The upward trend in the rhodium price that was established in 2004 continued throughout the first nine months of 2005, the JM base price climbing from $1,330 to $2,700. Speculative buying contributed to

the rally, but it was primarily driven by tightness in the lending market and strong growth in demand that outpaced supplies.

The prices of ruthenium and iridium also benefited from firm end user demand from March onwards, ruthenium advancing from $55 to $85 and iridium rising from $145 to $185.

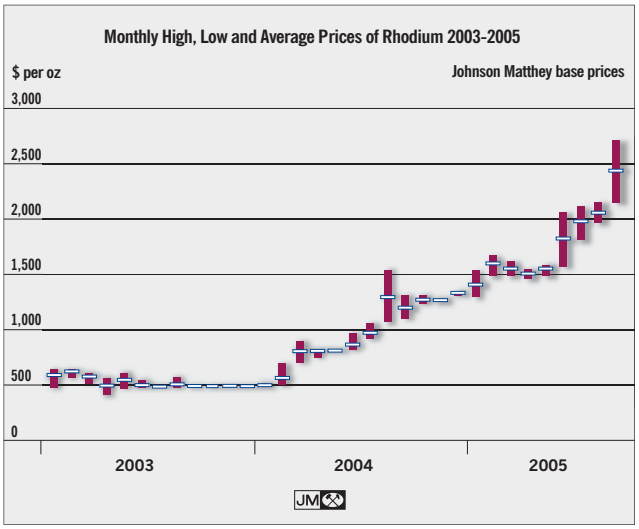
The rhodium market was quiet in early January 2005, the Johnson Matthey base price remaining stable at $1,330. On the 11th the price began moving upwards in response to tightness in the lending market. As short term lease rates climbed above 20 per cent some industrial users sought to buy rhodium and close out leases. With speculators competing for the limited volumes of metal on offer, the price strengthened to $1,665 by the middle of February.

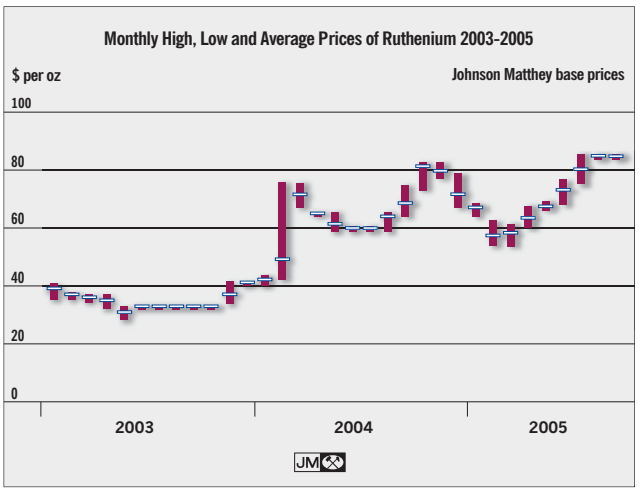
The availability of metal then improved and rhodium fell back to trade between $1,500 and $1,600 all the way through to the end of May. Good physical demand, including some forward buying by end users, provided solid support at the lower end of the price range.

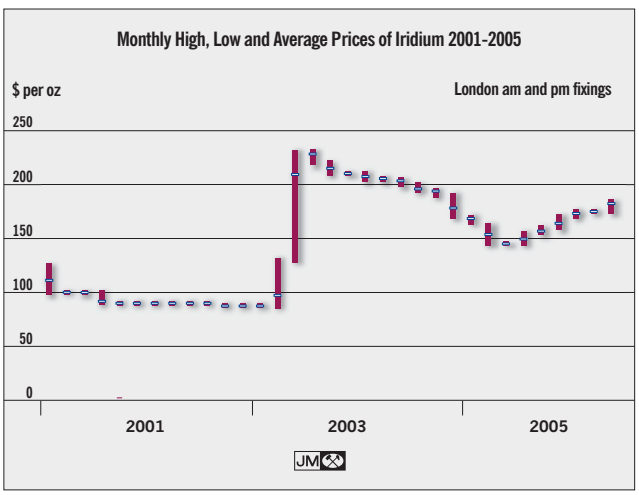
June saw a second, more substantial rally develop as demand from end users once more outweighed the amount of rhodium on offer. As the price began to move up out of its previous range, the scramble to cover near-term requirements intensified. With some consumers also buying metal to help cover future needs the price climbed above $2,000.

After briefly dipping to $1,850 rhodium traded between $2,000 and $2,100 from mid-July to the end of August. However, when more buyers returned to the market in early September the price gained renewed upwards momentum. With very few offers of any significant size to be found the JM base price climbed rapidly, passing $2,500 on the 16th and reaching $2,700 by the end of the month.

Offers of ruthenium outweighed buying interest in early 2005, and the price slipped from $68 to $55 by the middle of February. However, good industrial demand emerged from March onwards, particularly from the electronics sector. As a result the price moved steadily up to reach $85 in August, then held that level throughout September. The iridium market followed a very similar track. The price slipped from $162 at the start of the year to $145 in February, then rallied from early April on the back of firm demand. By the end of September the JM iridium base price had reached $185.

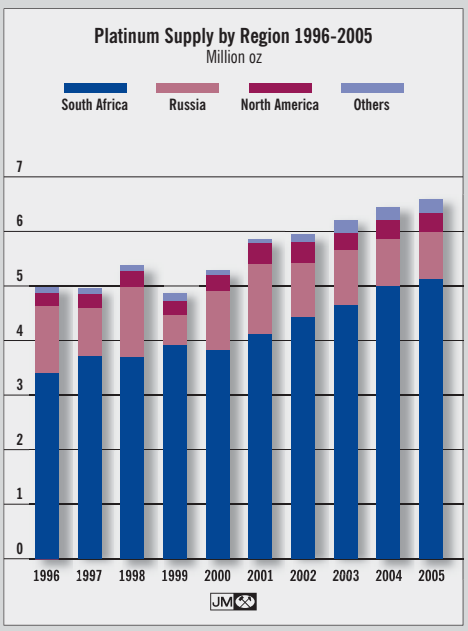


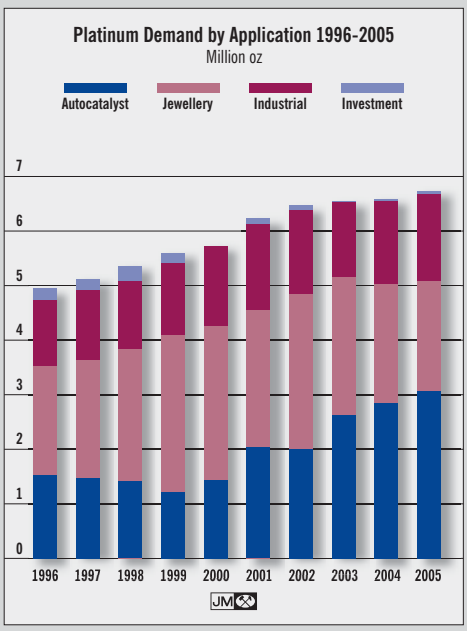




Platinum Supply and Demand

'000 oz		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Supply											
South Africa		3,390	3,700	3,680	3,900	3,800	4,100	4,450	4,630	4,970	5,120
Russia		1,220	900	1,300	540	1,100	1,300	980	1,050	850	860
North America		240	240	285	270	285	360	390	295	385	340
Others		130	120	135	160	105	100	150	225	255	270
Total Supply		**4,980**	**4,960**	**5,400**	**4,870**	**5,290**	**5,860**	**5,970**	**6,200**	**6,460**	**6,590**
Demand											
Autocatalyst:	gross	1,880	1,830	1,800	1,610	1,890	2,520	2,590	3,270	3,560	3,860
	recovery	(350)	(370)	(405)	(420)	(470)	(530)	(565)	(645)	(705)	(800)
Chemical		230	235	280	320	295	290	325	320	325	320
Electrical		275	305	300	370	455	385	315	260	300	355
Glass		255	265	220	200	255	290	235	210	290	315
Investment:	small	110	180	210	90	40	50	45	30	25	20
	large	130	60	105	90	(100)	40	35	(15)	15	(5)
Jewellery		1,990	2,160	2,430	2,880	2,830	2,590	2,820	2,510	2,160	2,020
Petroleum		185	170	125	115	110	130	130	120	150	160
Other		255	295	305	335	375	465	540	470	470	465
Total Demand		**4,960**	**5,130**	**5,370**	**5,590**	**5,680**	**6,230**	**6,470**	**6,530**	**6,590**	**6,710**
Movements in Stocks		**20**	**(170)**	**30**	**(720)**	**(390)**	**(370)**	**(500)**	**(330)**	**(130)**	**(120)**



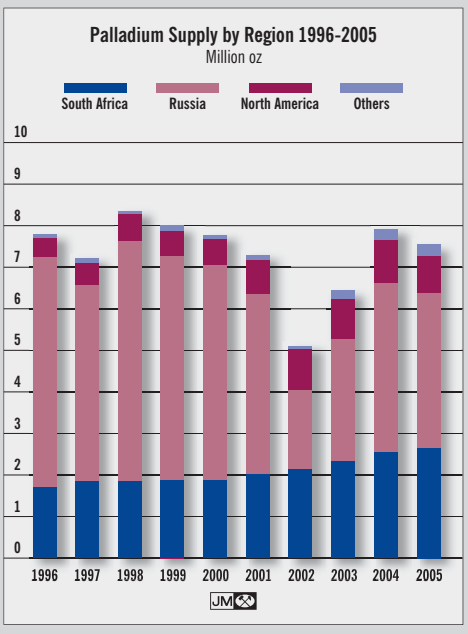


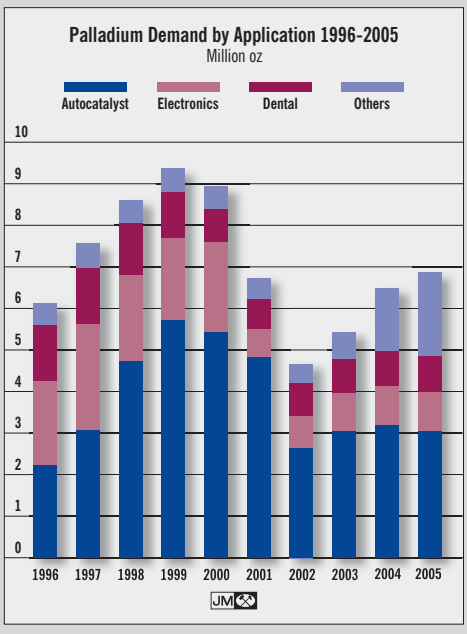
Platinum Demand by Application: Regions

'000 oz	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Europe										
Autocatalyst: gross	515	510	545	560	680	1,060	1,210	1,455	1,680	1,940
recovery	(20)	(25)	(30)	(30)	(40)	(70)	(90)	(115)	(145)	(170)
Chemical	60	70	60	80	100	105	115	105	115	110
Electrical	25	45	45	70	80	65	40	35	40	40
Glass	40	20	25	20	20	10	10	10	5	10
Investment: small	5	5	5	5	0	0	0	0	0	0
Jewellery	125	150	160	185	190	170	160	190	195	195
Petroleum	15	15	15	15	15	15	15	15	15	15
Other	75	85	85	90	105	155	190	190	190	180
Total	**840**	**875**	**910**	**995**	**1,150**	**1,510**	**1,650**	**1,880**	**2,095**	**2,320**
Japan										
Autocatalyst: gross	245	255	240	250	290	340	430	500	605	580
recovery	(50)	(50)	(55)	(60)	(60)	(55)	(55)	(60)	(60)	(60)
Chemical	20	20	20	20	20	25	30	40	40	40
Electrical	45	65	55	75	90	80	55	40	50	55
Glass	80	85	80	65	65	85	60	85	90	80
Investment: small	25	25	25	20	5	5	5	5	5	0
large	130	60	105	90	(100)	40	35	(15)	15	(5)
Jewellery	1,480	1,390	1,290	1,320	1,060	750	780	660	560	550
Petroleum	5	5	5	5	5	5	5	5	5	5
Other	25	30	30	35	35	35	55	40	40	40
Total	**2,005**	**1,885**	**1,795**	**1,820**	**1,410**	**1,310**	**1,400**	**1,300**	**1,350**	**1,285**
North America										
Autocatalyst: gross	850	800	775	535	620	795	570	885	800	820
recovery	(275)	(290)	(310)	(315)	(350)	(370)	(380)	(420)	(440)	(510)
Chemical	80	80	80	95	100	100	100	95	90	100
Electrical	130	100	105	120	145	120	100	85	90	100
Glass	30	45	20	25	50	35	30	(30)	(10)	5
Investment: small	75	145	175	60	35	45	40	25	20	15
Jewellery	90	160	270	330	380	280	310	310	290	260
Petroleum	60	50	40	40	35	40	45	40	35	35
Other	140	160	170	190	210	250	265	215	205	210
Total	**1,180**	**1,250**	**1,325**	**1,080**	**1,225**	**1,295**	**1,080**	**1,205**	**1,080**	**1,035**
Rest of the World (inc. China)										
Autocatalyst: gross	270	265	240	265	300	325	380	430	475	520
recovery	(5)	(5)	(10)	(15)	(20)	(35)	(40)	(50)	(60)	(60)
Chemical	70	65	120	125	75	60	80	80	80	70
Electrical	75	95	95	105	140	120	120	100	120	160
Glass	105	115	95	90	120	160	135	145	205	220
Investment: small	5	5	5	5	0	0	0	0	0	5
Jewellery	295	460	710	1,045	1,200	1,390	1,570	1,350	1,115	1,015
Petroleum	105	100	65	55	55	70	65	60	95	105
Other	15	20	20	20	25	25	30	30	35	35
Total	**935**	**1,120**	**1,340**	**1,695**	**1,895**	**2,115**	**2,340**	**2,145**	**2,065**	**2,070**

Palladium Supply and Demand

'000 oz	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Supply										
South Africa	1,690	1,810	1,820	1,870	1,860	2,010	2,160	2,320	2,510	**2,600**
Russia	5,600	4,800	5,800	5,400	5,200	4,340	1,930	2,950	4,100	**3,730**
North America	455	545	660	630	635	850	990	935	1,035	**925**
Others	95	95	120	160	105	120	170	245	265	**285**
Total Supply	**7,840**	**7,250**	**8,400**	**8,060**	**7,800**	**7,320**	**5,250**	**6,450**	**7,910**	**7,540**
Demand by Application										
Autocatalyst: gross	2,360	3,200	4,890	5,880	5,640	5,090	3,050	3,450	3,720	**3,690**
recovery	(145)	(160)	(175)	(195)	(230)	(280)	(370)	(410)	(535)	**(680)**
Chemical	240	240	230	240	255	250	255	265	310	**320**
Dental	1,320	1,350	1,230	1,110	820	725	785	825	850	**860**
Electronics	2,020	2,550	2,075	1,990	2,160	670	760	900	920	**970**
Jewellery	215	260	235	235	255	230	260	250	920	**1,430**
Other	140	140	115	110	60	65	90	140	295	**300**
Total Demand	**6,150**	**7,580**	**8,600**	**9,370**	**8,960**	**6,750**	**4,830**	**5,420**	**6,480**	**6,890**
Movements in Stocks	**1,690**	**(330)**	**(200)**	**(1,310)**	**(1,160)**	**570**	**420**	**1,030**	**1,430**	**650**





Palladium Demand by Application: Regions

'000 oz	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Europe										
Autocatalyst: gross	860	1,100	1,370	1,530	1,900	1,730	1,370	1,220	1,105	1,005
recovery	(5)	(5)	(5)	(10)	(15)	(30)	(45)	(70)	(110)	(165)
Chemical	65	70	65	65	95	65	70	65	70	70
Dental	255	260	210	180	100	50	55	70	80	75
Electronics	300	340	270	255	265	35	85	85	115	115
Jewellery	30	50	50	50	45	35	35	35	35	35
Other	20	25	25	25	20	20	15	20	25	20
Total	**1,525**	**1,840**	**1,985**	**2,095**	**2,410**	**1,905**	**1,585**	**1,425**	**1,320**	**1,155**
Japan										
Autocatalyst: gross	180	245	480	600	510	505	520	550	635	645
recovery	(30)	(45)	(50)	(55)	(50)	(40)	(40)	(40)	(40)	(40)
Chemical	20	20	20	20	20	20	20	25	25	25
Dental	600	620	590	545	470	475	505	515	520	525
Electronics	990	1,390	1,060	980	990	260	140	225	235	245
Jewellery	115	110	105	105	150	140	165	160	155	160
Other	10	10	10	10	15	10	10	5	10	10
Total	**1,885**	**2,350**	**2,215**	**2,205**	**2,105**	**1,370**	**1,320**	**1,440**	**1,540**	**1,570**
North America										
Autocatalyst: gross	1,230	1,680	2,820	3,490	2,805	2,375	640	1,205	1,445	1,395
recovery	(110)	(105)	(115)	(125)	(155)	(200)	(260)	(270)	(345)	(425)
Chemical	70	70	70	75	65	75	75	70	85	85
Dental	410	415	390	350	230	190	215	225	235	245
Electronics	490	550	460	405	485	250	210	215	185	190
Jewellery	5	10	10	10	10	0	0	0	0	5
Other	90	55	55	50	5	15	45	95	235	250
Total	**2,185**	**2,675**	**3,690**	**4,255**	**3,445**	**2,705**	**925**	**1,540**	**1,840**	**1,745**
Rest of the World (inc. China)										
Autocatalyst: gross	90	175	220	260	425	480	520	475	535	645
recovery	0	(5)	(5)	(5)	(10)	(10)	(25)	(30)	(40)	(50)
Chemical	85	80	75	80	75	90	90	105	130	140
Dental	55	55	40	35	20	10	10	15	15	15
Electronics	240	270	285	350	420	125	325	375	385	420
Jewellery	65	90	70	70	50	55	60	55	730	1,230
Other	20	50	25	25	20	20	20	20	25	20
Total	**555**	**715**	**710**	**815**	**1,000**	**770**	**1,000**	**1,015**	**1,780**	**2,420**

Rhodium Supply and Demand

'000 oz	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Supply										
South Africa	359	377	400	410	457	452	490	544	576	**616**
Russia	110	240	110	65	290	125	90	140	105	**90**
North America	5	16	16	18	17	23	25	26	17	**21**
Others	2	3	4	8	3	4	10	14	16	**17**
Total Supply	**476**	**636**	**530**	**501**	**767**	**604**	**615**	**724**	**714**	**744**
Demand by Application										
Autocatalyst: gross	424	418	483	509	793	566	599	660	758	**820**
recovery	(45)	(49)	(57)	(65)	(79)	(88)	(99)	(124)	(141)	**(150)**
Chemical	21	36	31	34	39	44	39	39	42	**45**
Electrical	9	9	6	6	7	6	6	6	7	**9**
Glass	53	43	34	35	42	41	37	26	47	**50**
Other	9	10	10	9	10	10	10	13	14	**16**
Total Demand	**471**	**467**	**507**	**528**	**812**	**579**	**592**	**620**	**727**	**790**
Movements in Stocks	**5**	**169**	**23**	**(27)**	**(45)**	**25**	**23**	**104**	**(13)**	**(46)**

NOTES TO TABLES

Supply figures are estimates of sales by the mines of primary pgm.

With the exception of the autocatalyst sector, **demand** estimates are net figures, demand in each sector being total purchases by consuming industries less any sales back to the market. Thus, annual totals represent the amount of primary metal that is acquired by consumers in a particular year. We continue to exclude the CIS from our demand estimates.

Movements in stocks in a 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 indicates an increase in stocks; a negative figure indicates a rundown in stocks.

Gross autocatalyst demand is purchases of pgm by the auto industry for manufacture of catalytic converters. **Autocatalyst recovery** is pgm recovered from scrapped catalytic converters and is allocated to the region in which the converter was scrapped.

Investment: small refers to the long-term holding of metal in the form of coins, and bars weighing 10 oz or less. **Investment: large** is in the form of 500 g and 1 kg bars in Japan and includes platinum held on account for subscribers to accumulation plans.

GLOSSARY

g	grams
kg	kilograms
tonne	1,000 kg
tons	short tons (2,000 pounds or 907 kg)
oz	ounces troy
pgm	platinum group metals
ppt	parts per thousand
prices	all prices quoted are per oz unless otherwise stated
R	South African rand
$	US dollars
¥	Japanese yen

BEE	black economic empowerment
CO	carbon monoxide
DPF	diesel particulate filter
HC	hydrocarbons
HIC	hybrid integrated circuit
LCD	liquid crystal display
Merensky, UG2, Platreef	platiniferous orebodies in South Africa
MLCC	multi-layer ceramic capacitor
NOx	oxides of nitrogen
NYMEX	New York Mercantile Exchange
PM	particulate matter
TOCOM	Tokyo Commodity Exchange
ULEV	Ultra Low Emissions Vehicle

PICTURE CREDITS

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Palladium crystals, inside front cover. Eye Of Science / Science Photo Library
Smelter tapping, p9. Anglo Platinum

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