

PLATINUM 2007



Interim Review



Johnson Matthey

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*Beads made from a variety
of metals including gold,
platinum and palladium
sold well in China ahead of
the Chinese Year of the Pig.*

PLATINUM 2007 Interim Review

by David Jollie

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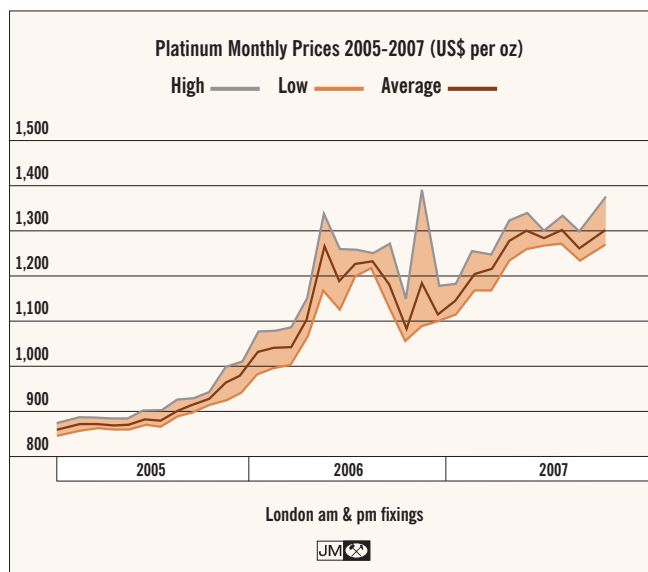
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SUMMARY & OUTLOOK

PLATINUM

Demand for platinum is expected to grow by 2.9 per cent to a record 6.93 million ounces in 2007. Once again, the driving force behind this is the use of platinum in autocatalysts, particularly those fitted to diesel vehicles. Altogether, the automotive sector will use 4.24 million ounces this year, a rise of 2.3 per cent. Industrial demand for platinum will grow to 1.91 million ounces, in spite of record high prices. Demand for new metal from the jewellery sector will fall slightly, to 1.60 million ounces, despite modest growth in metal purchases in China and Europe. Supply will fall, rather than rising as had previously been expected, to 6.66 million ounces due to a combination of industrial action, safety-related stoppages and other problems at South African mines. Overall, therefore, the platinum market is set to fall back into a deficit of 265,000 oz for the year.

Movements in the platinum price were greatly affected by fluctuations in the value of the dollar. This weakened against most major currencies in the first nine months of 2007 and encouraged many commodity prices to continue climbing. The precious metals, including platinum, outperformed base metals for much of this period. Platinum eventually rose to a new peak of \$1,454 on October 19th, having started the year at \$1,136.



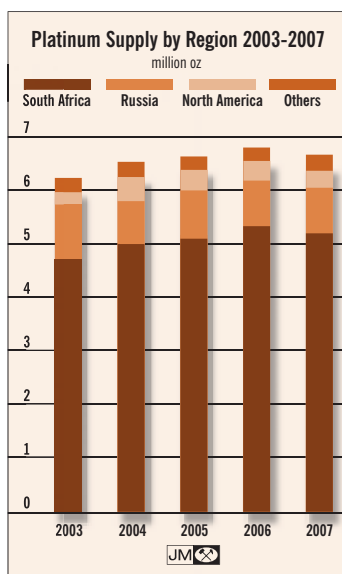
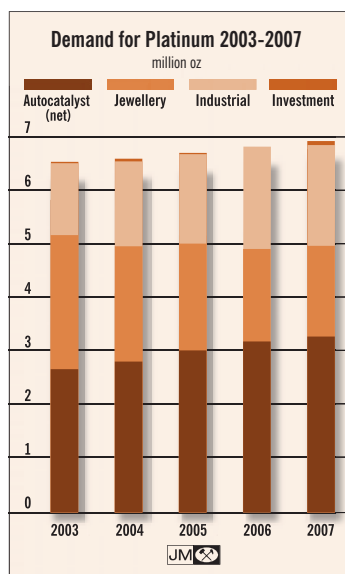
Supply

Global platinum supplies are set to fall by 2.0 per cent in 2007 to 6.66 million ounces. Sales of platinum from South Africa will drop to an expected 5.22 million ounces, 70,000 oz below last year's figure. Russian supplies will decrease compared to 2006 with output falling at Norilsk and at the alluvial operations. North American platinum supplies will fall but output of platinum from Zimbabwe and elsewhere is expected to rise marginally.

South African production will be lower than expected at the three major producers. Wage negotiations in mid-

year were protracted but led to relatively little industrial action. However, safety concerns led to rolling shutdowns at Anglo Platinum's operations. Lonmin's output will fall due to the closure of its No. 1 furnace early in 2007 for a rebuild: it supplied just under 800,000 oz of platinum in its financial year. We expect some of the remaining backlog to be refined in the final quarter of this calendar year. At Implats, first half output fell 5 per cent. A short-lived strike in August 2007 will also impact upon production from the lease area, which should fall compared to 2006.

Increasing metal supplies from the smaller producers will offset some of this poor performance: Aquarius and ARM are ramping up production at mines including Everest and Two Rivers and will produce more pgm this year.



Russian platinum supplies are expected to fall to 820,000 oz with a decrease in production at Norilsk Nickel partly responsible. However, the flow of this Russian material onto the global market has been anything but predictable. The failure to sign a new decree governing platinum exports into law, coupled with ongoing problems in designing a system to issue export licences, had a highly disruptive effect in the first few months of 2007. Although some metal was doubtless exported in 2006 to meet contractual requirements in the early part of the year, there were no shipments for more than four months. Russian platinum supplies did finally resume in May and we believe that exports will be similar to the level of primary production for the year as a whole.

Demand

The autocatalyst sector continues to dominate platinum usage. With global light duty vehicle production set to exceed 70 million units for the first time this year, demand is set to climb to a weighty 4.24 million ounces.

Although palladium is being used to replace a portion of the platinum in many catalyst formulations, and pgm loadings are being reduced by thrifting, the market share of light duty diesel cars and trucks in the European market is growing. These all use platinum-only or platinum-rich catalyst technology and technological limitations mean that it is unlikely that more than a quarter to a third of the platinum in an individual catalyst can be displaced by palladium. In the gasoline sector, it is possible to replace all of the platinum in many autocatalysts with palladium. Consequently, the impact of replacing platinum by palladium is much greater in the gasoline sector.

However, platinum demand is being boosted by the growing proportion of vehicles with diesel particulate filters – more than 85 per cent of all diesel cars sold in Germany, for example. New emissions legislation for heavy duty diesel vehicles has recently been introduced in Europe and North America, increasing the number of platinum-based catalysts and filters used in this market. When the effects of these trends are added together, they more than outweigh the impact of thrifting and introduction of palladium into diesel and gasoline catalysts in 2007.

The amount of platinum reclaimed from scrapped autocatalysts will also rise, to 885,000 oz this year. More higher-loaded catalytic converters will be processed in Europe as a result of the increased use of platinum on diesel catalysts at the end of the last decade. Autocatalyst platinum recovery is expected to be flat elsewhere.

Demand from jewellery manufacturers for new metal is forecast to fall by 25,000 oz to 1.60 million ounces this year. Gross manufacturing demand, including the use of scrap, will be several hundred thousand ounces higher: recycling of old jewellery traded-in by consumers and of poorly-selling retail stocks will once again be substantial in Asia.

In China, the rise in the price of platinum has not constrained jewellery demand for new metal, which should rise slightly to 780,000 oz. Strong economic growth is boosting sales of consumer goods including jewellery. Chinese consumer purchases of platinum are above the level of manufacturing demand for new metal, as recycling of jewellery is still significant. However, we believe that industry stocks are close to their minimum working level and that reduction of unsold inventory will be less important this year than in 2006.

European jewellery sales have been fairly strong with the UK and Swiss markets performing well. Sales in North America have been negatively affected by the high platinum price and strong competition for disposable income.

In Japan, jewellery demand will weaken again in 2007 to 305,000 oz. A falling number of weddings meant platinum demand was always likely to drop. The continued high level of recycling of old jewellery is more significant. A high metal price has encouraged many companies to apply for antiques dealer licences to allow collection of this material for refining or resale. Our headline demand figure is therefore well below the level of manufacturing.

Industrial purchases of platinum are expected to rise by 40,000 oz to 1.91 million ounces. Demand will grow in several sectors including chemicals and petroleum refining with economic growth in China and India an important driving force.

Platinum Supply and Demand '000 oz			
		2006	2007
Supply			
South Africa		5,290	5,220
Russia		890	820
North America		345	340
Others		270	280
Total Supply		6,795	6,660
Demand			
Autocatalyst:	gross	4,140	4,235
	recovery	(855)	(885)
Jewellery		1,620	1,595
Industrial		1,865	1,905
Investment		(40)	75
Total Demand		6,730	6,925
Movements in Stocks		65	(265)



Growing production of computers and IT equipment will raise platinum purchases by the electronics industry, as hard disk shipments rise. Some price sensitivity is evident: for example, dental demand will fall.

Investment demand will be positive in 2007 even after net sales back to the market of large bars in Japan. The major cause is the launch of two exchange traded funds, or ETFs, in Europe in April and May. These funds are 100 per cent backed by allocated physical metal and therefore contribute toward demand. Their combined size at the end of September was 60,000 oz. Investors include pension funds and high net worth individuals rather than traditional investors in platinum. There is no evidence of ETFs displacing other platinum investment demand.

Outlook

Many of the trends in platinum demand for this year are likely to continue into 2008 and beyond, although the current high price of platinum will have a negative impact on some sectors.

In the automotive market, heavy duty diesel is likely to remain a strong driving force for increased platinum uptake in the short to medium term. These vehicles have only recently started to have catalysts fitted and this market is in its infancy. As legislation tightens – the next stage of European regulations will come into force at the end of 2008 and US rules will tighten in 2010 – a greater amount of platinum will be used per vehicle.

In the light duty diesel sector, rising fitment of diesel particulate filters (DPFs) to cars will boost European platinum demand. At the same time, the average palladium content of a diesel catalyst or DPF will grow as car makers seek to limit their precious metal costs. The replacement of platinum by palladium in gasoline catalyst formulations will continue into 2008. However, some support for platinum demand will come from rising vehicle manufacturing (and thus growing production of formulations which already use platinum) in China and India.

The cost of platinum and the wide price differential between platinum and gold continue to be a challenge for jewellery manufacturers and retailers. Large amounts of recycling of old jewellery in China and in Japan are likely to continue. Demand has nonetheless been remarkably resilient, even growing in some markets in 2007, and strong consumer interest in platinum is still evident.

Buying interest in ETFs has been lower than expected. We currently forecast that roughly 70,000 oz of metal will be held in these funds by the end of this year. Some growth in demand from ETFs can be expected next year as many of their investors have long term strategies which call for a high weighting of hard commodities. Currently, we see little sign of the launch of ETFs in Japan or, critically, in North America.

On the supply side, sales of platinum should grow in 2008 as the expansion programme of recent years continues in South Africa. Lonmin will benefit as it processes the remaining backlog caused by its smelter problems. Anglo Platinum's output should rise due to expansion at PPRust. The junior mining houses will increase their output, with metal produced from operations such as Xstrata's new Elandsfontein mine. However, recent safety-related stoppages and the continuing difficulty of hiring skilled personnel to meet expansion requirements suggest that South African production targets will remain challenging. Assuming that there are no problems in issuing export licences, the key aspect to Russian supply in 2008 will be whether Norilsk can raise production of platinum that will offset an expected fall in alluvial production and rising domestic demand.

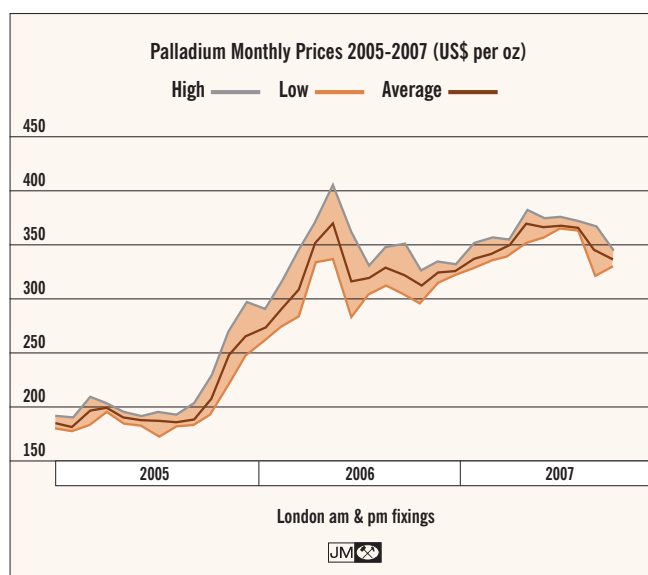
The movements in the platinum price during the first nine months of 2007 reflected the growing tightness of this market. Months of relative calm were followed by spells of high volatility linked to the wider economic climate and issues relating to platinum supply. The sub-prime mortgage crisis rumbles on and is contributing to weakness in the dollar, supporting precious metals prices. As long as there is no marked deterioration in the global economy, this pattern is likely to continue over the next six months. If South African expansion proceeds according to plan, some softening of the price is possible. However, strong physical purchasing has been seen in Asia whenever the price has fallen and should support platinum at \$1,350.

On the upside, it seems increasingly likely that platinum's stronger than expected fundamentals and support from a buoyant gold price could see platinum challenge the \$1,500 barrier. Platinum could trade as high as \$1,575 in the next six months particularly if the US Dollar continues to slide.

PALLADIUM

Palladium demand is forecast to rise by 135,000 oz, or 2.1 per cent, in 2007 to a total of 6.61 million ounces. The automotive industry will consume 4.38 million ounces, a substantial increase on the previous year's figure. The electronics sector too will take more metal – 1.10 million ounces in total. In the jewellery market, continued product development in Europe and North America will not compensate for a weaker performance in China, and new metal purchases will drop from last year's 995,000 oz to 745,000 oz this year. Global palladium supply will also be higher than in 2006 at 8.32 million ounces. Russian supplies including sales from the shipments made from Russia to Switzerland in December 2006 should rise from 3.90 to 4.24 million ounces. South African palladium production is forecast to fall 110,000 oz to 2.80 million ounces. Overall, therefore, the palladium market will show another very hefty fundamental surplus of 1.72 million ounces, the fifth consecutive annual surplus in excess of one million ounces.

This excess metal has been bought by a range of investors including hedge funds and, to a lesser extent, investors in the new exchange traded funds (ETFs). As a result, the price performance of palladium has been stronger than would be predicted on the basis of market fundamentals and it even rose by a greater percentage than did platinum over the first nine months of 2007.



Supply

Global supply of palladium will rise by 260,000 oz this year to reach 8.32 million ounces. Palladium supplies from Russia should rise to 4.24 million ounces even though primary production will decline. Norilsk Nickel is expected to produce 3.0 million ounces of palladium from its Russian mines this year, slightly below last year's figure. The final 63,000 oz of palladium from the Stillwater deal was sold in 2006. The very large exports of palladium from Russia to Switzerland at the end of 2006 have now, we judge, mainly been sold to hedge funds and we have counted these as 2007 supplies. We have seen no signs, as yet, to indicate that another substantial sale of state stocks is likely to take place in the remainder of this year and exclude this possibility from our forecasts.

South African supplies of palladium are forecast to fall by 3.8 per cent to 2.80 million ounces in 2007. The expansion plans at almost every mining company were previously expected to lead to much stronger production of this by-product metal. However, interruptions to mining in the form of strikes and temporary safety closures – and to refining in the shape of Lonmin's temporary smelter closure – have had a significant negative effect.

Supplies from Anglo Platinum are likely to fall as a result of some strike action and the rolling closure of its operations to implement safety training. Impala's output is expected to fall due to lower grades and recoveries related to changes in the ore mix from its lease area. Lonmin's production will fall too, with some of the metal mined this year likely to be sold in the next calendar year following delays in processing caused by its smelter rebuild. Northam's output will also decrease due to difficult geological conditions on the Merensky Reef. At Aquarius and ARM, however, palladium output will rise as the amount of ore mined by each company increases.

Sales of palladium from North America and elsewhere should grow slightly to 1.29 million ounces this year. Although there was disruption at Stillwater earlier in the year due to industrial unrest, the resulting fall in output there was offset by growth in production at North American Palladium.

Demand

The automotive sector is expected to purchase 4.38 million ounces of palladium in 2007, a six-year high. Although vehicle production in Europe, Japan and North America is fairly static, there is good growth in the Rest of the World region, particularly in Asia, adding to the number of autocatalysts being produced. Demand for palladium is also continuing to increase as a result of the wide price differential between palladium and platinum.

Auto makers are still switching their catalyst requirements to palladium from platinum on many vehicles. In the gasoline sector, this trend is well-established and average palladium use across these catalysts is roughly three times that of platinum with many catalysts containing no platinum at all. In diesel catalysts, however, there has been much less replacement of platinum to date. All formulations still use more platinum than palladium. Nonetheless, the amount of palladium used in diesel catalysts will more than double from 2006 and will be now in excess of 200,000 oz. Recycling of spent autocatalysts will contribute 945,000 oz of secondary metal.

In the jewellery trade, palladium is likely to have a very mixed year, with global demand for new metal falling 250,000 oz to a 2007 total of 745,000 oz. Palladium jewellery is still in an early stage of its product life cycle but it is moving quickly through that cycle toward maturity. Issues such as stock-build, consumer product acceptance and brand identity are all less well-resolved than for other, more mature, jewellery products.

Chinese demand for new metal will fall substantially this year: we believe that a good proportion of the higher levels of Chinese palladium imports observed from the last quarter of 2006 until the present have been absorbed by automotive and industrial customers and even possibly by informal investment. Manufacturers report that recycling of palladium jewellery, largely in the form of unsold stock, is still at high levels, but demand for new metal has also been offset by palladium from other, industrial, sources of scrap.

Retail sales have not been universally healthy. Our visits to China indicate wide differences in the availability and turnover of palladium jewellery across the country. Most generic promotion of palladium jewellery has been in Beijing and Shanghai, where its availability and popularity remain very limited. Issues relating to quality, or at least to perceived quality, and the lack of a distinctive brand identity have been detrimental to this market.

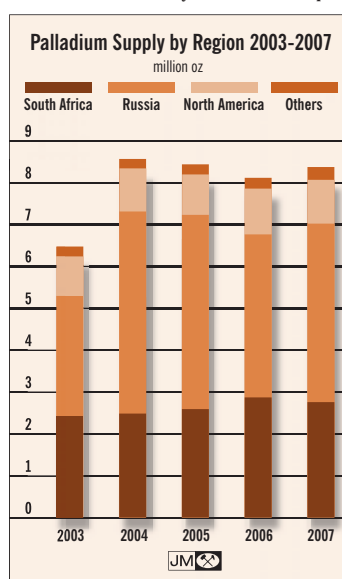
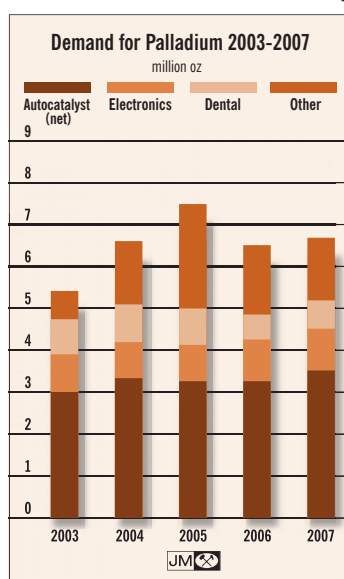
In Europe and North America, the launch of experimental ranges of palladium jewellery has met with a degree of success, particularly in the form of men's rings. As a result, demand will rise in 2007 to a combined total of 95,000 oz and is likely to rise again in 2008.

Demand for palladium from the electronics sector is set to grow again in 2007, to 1.10 million ounces. Thrifting or substitution of palladium from multi-layer ceramic capacitors, or MLCC, is still occurring. The average size

of a capacitor is also decreasing. However, with production of consumer electronics buoyant, palladium purchases will tread water this year. Growth from other electronics subsectors such as plating will drive a modest rise in total demand.

In the dental sector, palladium purchases will fall marginally this year. More importantly, there is evidence of more recycling of dental production scrap than had previously been thought, leading us to downgrade our demand figure for 2006.

Finally, investment demand will be in the region of 250,000 oz. There has been little demand for palladium coins this year and there have been net sales by investors of small bars for remelting. Such physical products seem to have lost the attraction that they briefly held. However, the introduction of two exchange traded funds is



expected to create demand of 270,000 oz. ETFs have mainly attracted a different type of investor, such as pension funds which have, in some countries, been banned from holding commodities directly. Many such investors have long term horizons and might be expected to maintain their investments for a number of years.

Outlook

Although global economic prospects for 2008 are currently somewhat unclear, it seems likely that palladium demand will continue to rise.

At anything close to current price levels, palladium remains an attractive catalytic metal for the car companies. The process of replacing platinum in gasoline catalysts has already been underway for several years. Palladium demand is likely to rise again in 2008 due to this switching process. However, the rate of this change will decrease as the process will then be nearly complete – although some platinum will still be used.

Palladium is less widely used in catalysts and filters on diesel vehicles. Auto makers are now switching their development focus to these catalysts and more palladium will be used in the next few years. It currently seems unlikely that more than a quarter to a third of the platinum will be replaced, placing an upper limit on the growth in demand for this application.

Some prospects for growth in palladium jewellery demand still exist in all markets. Although the amount of recycled, secondary, metal being processed into new jewellery in China is high at the moment, we expect it to decrease as the original 95 per cent purity stock that is being re-manufactured is exhausted. The market is still in its development phase and, with continued marketing, retail sales could yet grow in the short to medium term. Both of these possible developments have the potential to reinvigorate manufacturing demand for new metal. Purchases of palladium are almost certain to rise in Europe and North America as more companies start to work with this metal.

The electronics market could show limited growth next year. Thrifting and substitution of palladium will continue, not least in multi-layer ceramic capacitors. However, sales of computers and electronic equipment are likely to grow, balancing the trend towards reduction of the precious metal content. In the dental sector, we expect to see a continuation in the slow decline of palladium used in Japan and elsewhere under the pressure of decreasing levels of dental treatment and the use of new materials technology.

The market for physical investment in palladium is likely to consolidate. Although there appears to be little sustained interest in products such as coins and small investment bars from retail consumers, ETFs should ensure a positive net demand. If the publicly-stated intentions of some of the investors in such funds remain true, demand should again exceed 200,000 oz in 2008.

On the supply side, Russian primary output, mainly from Norilsk Nickel, is likely to remain close to the 3 million ounce level. However, one question that cannot be answered is the likelihood of substantial exports of palladium from Russian stocks at the end of this year. The timings of these shipments are impossible to predict and if large volumes are exported again, this would boost supplies further beyond production volumes. Sales of metal from South Africa are likely to increase in 2008, in line with greater production.

The significant supply-demand surplus in the palladium market means that there is little support for the price from its fundamentals. Once again the behaviour and sentiment of fund investors are likely to determine the direction of the palladium price. Substantial long speculative positions on NYMEX point to a belief among some investors that palladium is undervalued. At the most basic level, it may even be the case that palladium is simply viewed as cheap compared to its historical peak. In the absence of a widespread sell-off in the commodity sector, it seems likely that investment activity will prevent the price from falling below \$320 in the next six months. Fund buying could raise the price to \$420 over the same period, particularly if platinum and gold prices rise.

Palladium Supply and Demand '000 oz			
		2006	2007
Supply			
South Africa		2,905	2,795
Russia		3,900	4,240
North America		985	1,000
Others		270	285
Total Supply		8,060	8,320
Demand			
Autocatalyst:	gross	4,040	4,380
	recovery	(800)	(945)
Dental		620	620
Electronics		1,060	1,100
Jewellery		995	745
Other (including chemical)		555	705
Total Demand		6,470	6,605
Movements in Stocks		1,590	1,715



OTHER PGM

Rhodium

Net demand for rhodium should fall by 33,000 oz in 2007, to 808,000 oz. The automotive industry remains the key sector. However, car makers are set to purchase a little less of this metal – a gross 861,000 oz – than in 2006, with lower purchases for inventory largely responsible. Demand in the electrical and electrochemical sectors remains strong. However, there have been signs of price sensitivity, for instance in the glass industry, where rhodium purchases will fall as companies minimise their usage of this metal.

Rhodium exhibited a strong price performance throughout the first nine months of the year, spending much of this time above \$6,000. A lack of rhodium supply from Russia in the first few months of the year due to confusion over new export regulations supported the price. Later on, disappointing South African production figures

provided a boost, carrying the price to \$6,125 at the end of September. Volatility remained high as the market moved through cycles of excess bids and then excess offers, although it was lower than in the same period in 2006.

In the automotive industry, purchases of rhodium should rise in China, North America and the Rest of the World region. In China and the Rest of the World, this largely reflects increased vehicle production figures with average rhodium loadings little changed. In North America, the picture is more complex with the effect of a fall in the number of light duty vehicles produced outweighed by extra demand from the heavy duty diesel sector where a small amount of rhodium is used. We forecast that Japanese purchases of rhodium will decrease as less metal is purchased for the car makers' inventories this year.

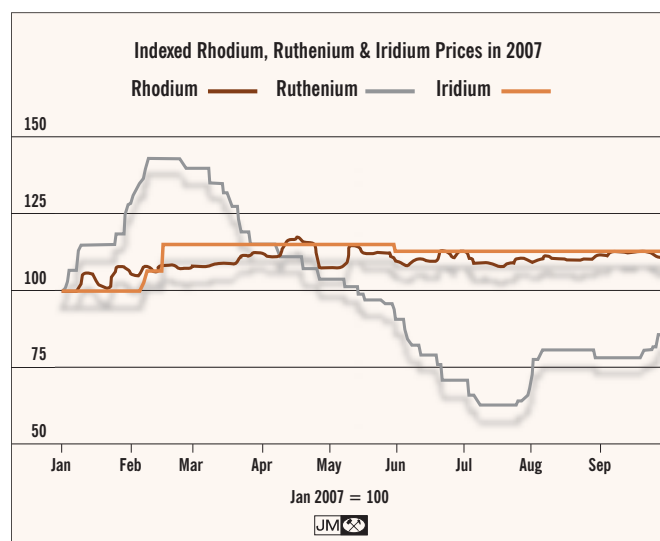
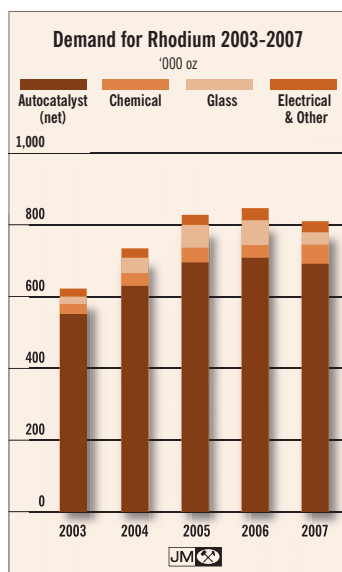
Only in Europe is the amount of rhodium actually used on vehicles expected to fall. After the introduction of new light duty emissions rules (Euro 4) in 2005 and 2006, this year has provided an opportunity for auto makers to thrift rhodium from their formulations. This thrifting is likely to continue in 2008. There is, however, no sign that rhodium has been eliminated from any catalysts as it is vital for control of nitrogen oxide, or NOx, emissions.

In the glass sector, rhodium demand will fall to 38,000 oz. Price sensitivity will lead to this decrease as glass manufacturers reduce the rhodium content of their alloys. There will also

be less construction of LCD glass factories this year than last, reducing demand in the Rest of the World region.

Rhodium supplies will fall to 804,000 oz in 2007. Primary production will be little changed, either in South Africa or in Russia. Although South African supplies were previously expected to rise this year, numerous disruptions will limit output. Of particular note, Lonmin's smelter problems mean that its rhodium sales will fall although some metal was toll refined. Production of rhodium by Norilsk is likely to be similar to last year but the weighty sales from Russian stocks are unlikely to be repeated in 2007. Export licence problems dogged the market in the early part of this year. However, Norilsk apparently met its contractual requirements, suggesting that some of the extra metal shipped late in 2006 was for this purpose.

Headline rhodium production is set to rise in 2008. The well documented high rhodium content of much of South Africa's UG2 ore is key to this growth. Mine expansion should mean that more of this UG2 will

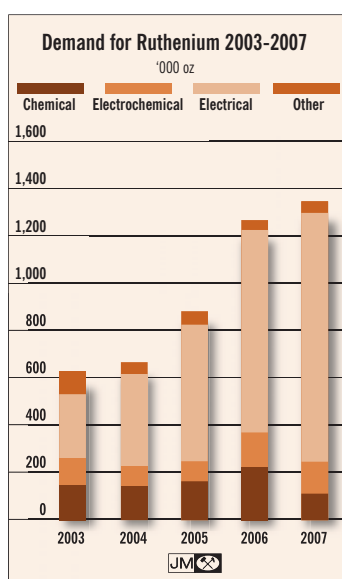


be processed but the ability of the mines to meet their targets will be critical. Moves by the auto makers to thrift rhodium from catalysts should constrain gross demand from that sector. Although rising secondary refining of rhodium from end-of-life catalytic converters will further impact on net autocatalyst demand, overall, we expect the rhodium market to remain close to balance in 2008 with prices likely to remain at an elevated level.

Ruthenium

Ruthenium demand is expected to rise in 2007, from 1.29 million ounces to a heady 1.34 million ounces. The electronics industry is the major user and will take just over a million ounces on its own for use in a range of applications. Some price sensitivity will be seen elsewhere, limiting the overall rise in demand.

2006 saw a substantial deficit in the ruthenium market as hard disk companies fought to build stocks of



ruthenium for use on new perpendicular magnetic recording (PMR) media. This technology has proved to be successful in 2007 and its market share has more than doubled throughout the industry. However, there has been some success in terms of thrift of the already thin metal layers in each individual disk, which has helped restrain demand. Some companies have also been able to prolong the effective commercial life of its longitudinal magnetic recording (LMR) predecessor, slowing the introduction of PMR to a degree and further curtailing the growth in ruthenium requirements.

Additionally, new, incremental refining capacity for spent ruthenium sputtering targets came online earlier this year. This has allowed target manufacturers to focus on reducing the stockpiles of metal waiting to be reprocessed, cutting the requirements of the industry for fresh metal from what might otherwise have been unsustainable levels.

In the chemical sector, ruthenium purchases are likely to fall in 2007, simply reflecting the construction of fewer chemical plants using ruthenium catalysts, particularly in Europe.

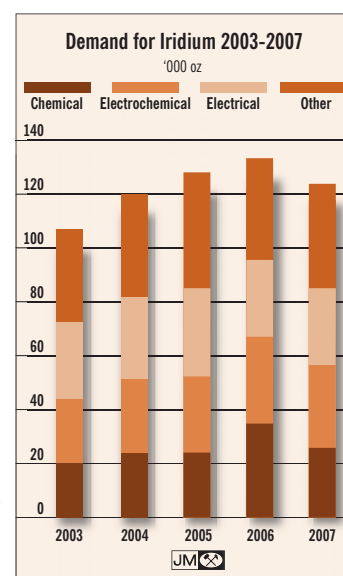
There were signs of price sensitivity in the ruthenium market. One example is the electronic pastes used in the manufacture of plasma display panels (PDP) for televisions. With the ruthenium price high, one major producer of these pastes was able to reduce the amount of this metal in some of its products and to cut the average use of ruthenium in such a panel by up to 80 per cent. Chip resistor makers have also had a significant exposure to the metal price and have announced price rises because of this. While they have not thrifted metal, these price increases could intensify competition for ruthenium resistor technology in the medium term.

The impact of the introduction of PMR hard disks was clearly seen in the dramatic increase in the ruthenium price in late 2006 and early 2007. The rapid build-up of pipeline stocks and spent ruthenium targets awaiting recycling squeezed liquidity severely. As the need to add to pipeline stocks diminished and new refining capacity came onstream, the price fell back to \$380 in the middle of 2007, with liquidation of speculative positions contributing to this easing of pressure. However, the price of ruthenium started rising once more in August, reflecting strong underlying demand for hard disks using this metal.

Iridium

Demand for iridium will fall 9,000 oz from last year to 123,000 oz in 2007.

While some sectors will use more iridium, the chemical industry will purchase less than in 2006 due to the construction of fewer plants which require iridium catalysts. Demand from electronics and other sectors should remain flat at 28,000 oz. Iridium demand is likely to remain relatively stable in 2008. Price movements over the year so far have been limited: iridium rose from \$400 to \$460, before falling back to end September at \$450.



SUPPLIES, MINING & EXPLORATION

SOUTH AFRICA

Expectations of platinum supplies in 2007 have been adjusted sharply downwards since the start of the year, with labour, safety and technical issues affecting output at most major producers. We predict this year's shipments of platinum from South Africa to total 5.2 million ounces, almost unchanged from 2006 but 7 per cent below earlier forecasts. Anglo Platinum and Lonmin have been most affected: both expect to produce significantly less pgm than last year. This will be offset by higher output from a number of ramp-up operations.

Anglo Platinum

In the first half of 2007, refined platinum production at Anglo Platinum fell 11 per cent to 1.19 million ounces, principally due to a build-up of 80,000 oz of unrefined metal in the processing pipeline. In contrast, the company benefited from pgm releases from refinery circuits during 2006, with in-process stocks of platinum dropping by nearly 180,000 oz over the calendar year.

Equivalent refined platinum production was 1.27 million ounces in the first half, with safety issues, strikes and other labour problems eroding expected production increases. Whilst Union Section reported a 7 per cent rise in equivalent refined output and the Mototolo joint venture delivered 43,000 oz of platinum in its first full six months of production, these gains were offset by falls in output from PPRust (due to lower recoveries from oxidised ore from the PPRust North pit) and Modikwa (where three weeks of production were lost due to a strike).

In its interim results, Anglo Platinum reduced its full year forecast for refined production to 2.6-2.65 million ounces of platinum, down from the figure of 2.8-2.9 million ounces predicted by the company in February.

Three major new projects were approved by the board

in the first half of 2007: expansion of the base metals refinery, an ore replacement project at Rustenburg Townlands and a UG2 expansion at Lebowa. The company continues to forecast that its total platinum production will rise at an average rate of

5 per cent annually.

Anglo Platinum announced a major black economic empowerment deal in September 2007. It will sell 51 per cent of Lebowa Platinum and 1 per cent of the Ga-Phasha project to its joint-venture partner Anooraq. Once the transaction is complete, Anooraq will hold an effective 51 per cent of both Lebowa and Ga-Phasha through a newly-created vehicle, Lebowa Holdco. Meanwhile, Mvela Resources will pay R4 billion to purchase an additional stake in Northam, along with Anglo Platinum's interest in the Booyesendal project.

Impala Platinum

At Impala Platinum's lease area, refined platinum output in the first half of 2007 declined by 5 per cent to 510,000 oz, reflecting lower grades and recoveries, and high labour turnover which led to reduced efficiencies. In contrast, sales were up 85,000 oz at 549,000 oz.

The lease area operations milled slightly less ore from January to June than a year before. Shifts in the ore mix also had a negative impact on both grades and recoveries. There was an increase in the proportion of lower-grade UG2 ore, including open-cast ore from which pgm recoveries are typically poor. Meanwhile, a greater use of mechanised mining methods led to additional dilution of Merensky ore with barren rock.

At Marula, production of platinum in concentrate rose by over 50 per cent to 30,000 oz, in line with increases in tonnage and grades as the move to conventional mining methods progresses.

In May 2007, Impala completed the acquisition of African Platinum plc (Afplats) for R4.2 billion, thereby adding a 74 per cent stake in the Leeuwkop project to its portfolio. Development of this project is due to begin during the 2008 financial year. The Impala board also approved further expansions of both smelter and refining capacity which will allow Impala to treat up to 2.8 million ounces of platinum annually by 2010.

Lonmin

Lonmin had a difficult first six months in 2007, with refined production of platinum (including metal toll-refined on its behalf by Impala) falling 11 per cent to 328,000 oz, and sales (including metal sold in concentrate) plunging 19 per cent to 336,000 oz.

PGM Supplies: South Africa
'000 oz

	2006	2007
Platinum	5,290	5,220
Palladium	2,905	2,795
Rhodium	690	695



Platinum sales for the financial year to September 2007 fell below expectations at just under 800,000 oz.

Refined output was affected by a four-month shut down of Lonmin's No. 1 smelter, following the discovery in December 2006 of a leak adjacent to one of the matte tapholes. Following an extensive rebuild, the smelter was restarted in April 2007 and started processing the backlog of concentrate. The company ended its financial year with in-process platinum inventories substantially above normal, but we expect some of this metal to be refined before the end of this calendar year.

At the mines, the Marikana operation was affected by difficult geological conditions. Production of platinum in concentrate fell 9 per cent to 391,000 oz. At Limpopo, a focus on development of future reserves resulted in a 37 per cent fall in production of platinum in concentrate to 17,000 oz in the first half of 2007. In common with most other producers, Lonmin reported that high labour turnover and skills shortages had impacted all of its operations, reducing efficiencies and increasing costs.

Other Producers

At the Northam Platinum mine, difficult geological conditions affected operations during the first half of 2007, with lower tonnage from the Merensky Reef. With grades also lower than in the previous year, production of pgm in concentrate fell 15 per cent to just under 150,000 oz for the January to June period.

Aquarius Platinum's only South African operation not subject to a Pool & Share Agreement with Anglo Platinum is the Everest mine on the Eastern Bushveld. This treated less UG2 ore in the first six months of this year than in the equivalent period of 2006. Average pgm grades were also lower, but the mine benefited from improved recoveries, as more ore was sourced from underground. Production of platinum in concentrate fell slightly to 47,000 oz in the first half but we expect an increase in output for the full year, in line with the ramp-up in underground mining and higher recoveries.

ARM Platinum has stakes in three pgm-producing joint ventures: Two Rivers (with Impala), Modikwa (with Anglo Platinum; see above) and Nkomati Nickel (with Norilsk Nickel, following the latter's acquisition of LionOre in June 2007). The Two Rivers concentrator



was commissioned in August 2006, and a rapid ramp-up saw it operating close to capacity in the first half of this year, yielding 57,000 oz of platinum in concentrate. At Nkomati, sales of pgm in concentrate were 27,000 oz in the first six months of 2007, down 19 per cent on the previous year. A decision to proceed with a large scale expansion at Nkomati was confirmed in September 2007.

The Crocodile River mine, owned by the Toronto-listed company Eastern Platinum (Eastplats), produced 52,000 oz of pgm in the first half of 2007.

South African pgm output will be disappointing in 2007 due to a combination of geological and safety problems, industrial unrest and processing bottlenecks.

RUSSIA

Palladium supplies from Russia are expected to be slightly above the 2006 total at 4.24 million ounces. 1.29 million ounces were shipped from state stocks in late December 2006; in our view, it is unlikely that this metal was sold before the year end and we have therefore included it in our forecast of 2007 supplies. Platinum shipments are expected to drop to 820,000 oz: output is predicted to fall at both Norilsk and the alluvial operations.

Trade data suggests that in the first half of 2007, Russian exports of pgm – particularly platinum – were significantly below 2006 levels. The introduction in

PGM Supplies: Russia '000 oz		
	2006	2007
Platinum	890	820
Palladium	3,900	4,240
Rhodium	95	70

JM

January 2007 of a new law abolishing export quotas resulted in some delays in the issue of export licences for platinum and rhodium (Norilsk's palladium shipments, covered by a 10 year licence, were not affected). There is also evidence that increasing quantities of pgm are exported in the form of chemical salts or other products, and are therefore recorded under different trade categories.

Production of pgm at Norilsk Nickel is expected to decline modestly in 2007. Reporting its third quarter results in October, the company predicted that total pgm output this year would reach 3.05-3.10 million ounces of palladium and 730-740,000 oz platinum; however, these figures include attributable metal from the company's newly acquired Southern African operations. (Norilsk received an 85 per cent share in Tati Nickel and a 50 per cent stake in Nkomati Nickel via its acquisition of LionOre in June 2007.) We estimate platinum output from the Russian operations to be a little over 700,000 oz this year (down from 750,000 oz in 2006). Palladium production will be around 3 million ounces, down from last year's 3.16 million ounces.

At the alluvial operations in the Far East of Russia, we forecast a reduction in output this year: both the Amur and the Koryak operations report declining platinum values at their deposits.

NORTH AMERICA

Supplies of platinum from North America are forecast to fall to 340,000 oz in 2007, principally due to lower output from Stillwater. However, palladium shipments should grow to 1 million ounces, reflecting the first full year of production from a new underground section at North American Palladium. Output of pgm as a by-product of nickel mining in Canada will be similar to last year.

In the first half of 2007, Stillwater Mining Company reported pgm production down 6 per cent to 277,000

PGM Supplies: North America '000 oz		
	2006	2007
Platinum	345	340
Palladium	985	1,000
Rhodium	20	20



oz. This decline was largely due to labour issues: a change in work schedules and negotiations over a new contract had a negative impact on productivity. A new four-year agreement was finally reached in July, but only after a seven-day strike. The

company reduced its forecast of full year pgm output to 555-585,000 oz (compared with previous guidance of 615-645,000 oz).

North American Palladium had a strong first half, with palladium output rising nearly 40 per cent to 145,000 oz. Mill throughput climbed 14 per cent, while average mill head grades rose 19 per cent. This reflects higher production from the new underground section, which contributes ore containing 5.71 grams of palladium per tonne (open pit ore at the Lac des Iles mine typically contains below 2 grams per tonne).

The existing mines at Xstrata's Sudbury site are nearing the end of their life: less mined ore was treated at the Strathcona mill in the first half of 2007 and grades fell too. However, the Raglan mine in Northern Quebec saw a 15 per cent rise in throughput.

In the first half of 2007, CVRD Inco reported a slight drop in the production of platinum from its Canadian operations, to 68,000 oz, while palladium output was up modestly to 100,000 oz. For the full year, we expect pgm production to be similar to that in 2006.

ZIMBABWE

Although rises in production were achieved at both the Ngezi and Mimosa mines in the first half of 2007, the country's economic crisis is clearly having some impact, with Mimosa

reporting delays in its latest incremental expansion. Both companies have experienced some disruption of power supplies, and are investigating the possibility of importing power directly. We expect pgm production this year to be up only slightly compared with 2006.

At Impala's Ngezi Mine, the conversion from open pit to underground mining continued during the first half of 2007. Average head grades increased, reflecting the higher pgm content of the underground ore. Sales of platinum in matte rose 12 per cent, to 50,000 oz.

Mimosa reported production of platinum in concentrate up 10 per cent, at 39,000 oz, in the first half of 2007. However, the Wedza Phase V expansion project – originally scheduled for completion in June – will only be completed in the last quarter of 2007, with the mine citing as reasons a difficult economic climate and concerns over the re-use of old equipment.

PGM Supplies: Zimbabwe and Others '000 oz		
	2006	2007
Platinum	270	280
Palladium	270	285
Rhodium	19	19



PLATINUM

AUTOCATALYST

Autocatalyst demand for platinum is forecast to grow by 2.3 per cent to 4.24 million ounces in 2007. Healthy sales of light duty diesel vehicles in Europe will be responsible for much of this growth. Increasing Asian gasoline vehicle production will also boost platinum demand in 2007, as will growing usage of aftertreatment in the heavy duty sector. However, there will be a minor decrease in platinum used elsewhere due to the switching of platinum to palladium in catalyst formulations.

Europe

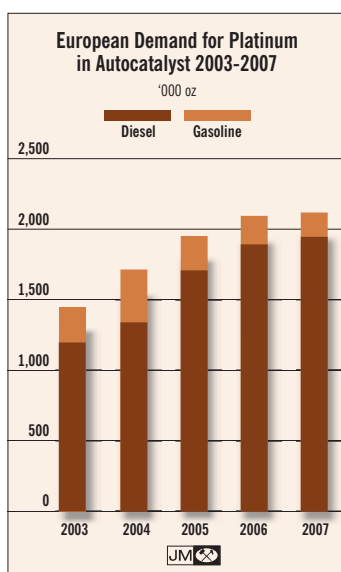
Over 90 per cent of the 2.11 million ounces of platinum used in European autocatalysts this year will be used in diesel vehicles. Although Western European passenger car sales fell one per cent in the first half of 2007, the market share of diesel vehicles continued to grow to 52 per cent of sales. In some national markets, three out of every four cars sold were diesels. With almost all catalysts on these vehicles using platinum-only or platinum-rich technology, demand has risen even in a flat sales environment.

Growth in the use of diesel particulate filters (DPFs) will add to demand. While many cars already meet current Euro 4 emissions limits without such filters, DPFs are widely used in markets such as Germany, due to tax incentives and pressure from environmentally-

conscious customers.

However, the high platinum price has led car makers to try to reduce platinum use. Little scope remains to remove platinum from gasoline, or three-way, catalysts (where a switch to palladium has been underway for some time), so development has focused on introducing palladium into diesel catalysts, limiting the rise in European platinum demand to 10,000 oz. This process of thriftiness and substitution by the introduction of new catalyst technology is expected to continue for the next few years.

Platinum demand from the European autocatalyst sector will exceed two million ounces with heavy duty diesel aftertreatment augmenting light duty diesel demand.



Japan

615,000 oz of platinum are set to be purchased by the Japanese automotive sector in 2007, slightly above the figure for 2006. This marginal increase is the result of opposing trends in catalyst formulation and loadings.

Car makers in Japan have been slower than their peers in other regions in replacing the platinum in their catalysts with palladium. However, the sustained price differential between these metals means that this process is now well underway.

At the same time, these manufacturers have increased catalyst loadings, partly in response to tighter legislation in their export markets and partly due to cautiousness in using high loadings to provide a safety margin in meeting emissions rules in all regions. Despite recent press announcements on possible thriftiness, average loadings have risen, outweighing the negative effect on demand of switching metals.

Looking further forward, there are some signs of increases in diesel car production (for export markets rather than for sale in Japan itself) which would be positive for platinum demand in this region. Platinum use in the heavy duty diesel market will also grow.

North America

North American automotive platinum demand will be virtually flat at 900,000 oz, supported by increased use on medium and heavy duty diesel trucks.

Sales of all vehicles have been relatively poor so far in 2007, with credit restrictions spreading from the sub-prime lending crisis. Annual light duty vehicle output is likely to drop by between 1 and 2 per cent to 15.1 million units, with a drop in output from the Big Three only partly offset by a rise in local production from Japanese and European manufacturers.

The negative impact on North American platinum demand of this fall in production will be exacerbated by the continuing switch from platinum-rich to palladium-rich three-way catalysts. In 2006, we estimate that 2.3 grams of palladium were used in this region for

Platinum Demand: Autocatalyst '000 oz		
	2006	2007
Europe	2,095	2,105
Japan	605	615
North America	905	900
Rest of the World		
China	155	210
Other	380	405
Total	4,140	4,235



every gram of platinum across these catalysts. This ratio will shift further toward palladium during 2007, to roughly 3.3 grams per gram of platinum.

The diesel vehicle market has, however, provided a significant bright spot for platinum demand. Use of platinum on filters and catalysts in the medium and heavy duty sectors is growing steadily, driven upward by Tier II and heavy duty vehicle emissions legislation. Of longer term interest, some European automakers have started introducing diesel cars into the USA. While this could boost platinum use in the next decade, it is unlikely to have a major impact in the near term.

China

China is expected to become the largest Asian market for passenger cars in 2007, surpassing Japan, with sales (including imports) likely to rise to 5.4 million units from 4.35 million in 2006. With vehicle production growing too, Chinese autocatalyst platinum purchases are set to climb 55,000 oz to 210,000 oz in 2007.

New emissions rules, based on Euro 3 limits, were scheduled to come into force in July 2007. However, their introduction was delayed by a lack of suitable fuel and is now expected one year later. Even so, it seems that most local and global car makers are fitting Euro 3-compliant exhaust systems, leading to a rise in the average pgm content of new vehicles this year.

Rest of the World

Platinum demand for autocatalysts in the Rest of the World region (excluding China) should expand by 25,000 oz to 405,000 oz in 2007, driven by strong growth in manufacturing in non-traditional areas: Indian light duty vehicle production will rise from 1.7 million units in 2006 to a forecast 1.9 million this year. Production should also climb in South America, with growth in Brazil and Argentina adding further platinum demand.

Autocatalyst Recovery

We forecast that 885,000 oz of platinum will be reclaimed from spent autocatalysts in 2007, 3.5 per cent more than in 2006. Recovery rates continue to grow as a higher percentage of scrapped catalysts are recycled.

High commodity prices provide an incentive for the

recycling industry to maximise collection and processing of spent catalysts in all regions. Most metal will be recovered in North America. However, the amount of platinum refined from end-of-life catalysts in Europe should increase more quickly, reflecting the rise in platinum loadings on European diesel vehicles sold at the end of the last millennium, which are now being scrapped in significant numbers.

Platinum Demand: Autocatalyst Recovery '000 oz		
	2006	2007
Europe	(185)	(215)
Japan	(35)	(35)
North America	(575)	(575)
Rest of the World	(60)	(60)
Total	(855)	(885)

JEWELLERY

Net global jewellery demand for platinum is forecast to fall marginally, by 25,000 oz, to 1.60 million ounces. As in 2006, strong and volatile platinum prices have been a challenge to jewellery manufacturers and retailers alike. Although consumer purchasing remains solid, considerable stock rationalisation has been reported throughout the trade. Recycling of used jewellery in Asia is also substantial, leading to headline demand figures which are well below the rate of manufacturing output.

Europe

Platinum jewellery demand is likely to grow by 15,000 oz in Europe, to 205,000 oz. Jewellery production has been healthy so far in 2007 and retail sales have risen.

While there is talk in the press of a fashion trend towards yellow gold, platinum has maintained its popularity as a result of its positioning in the bridal market. However, the high price of platinum means that it has lost ground at the lower end of the market. Some manufacturers have responded to this by reducing the average weight of an item of platinum jewellery. UK hallmarking statistics, for instance, show growth in the number of platinum pieces hallmarked but a flat trend in the total weight of metal used.

The German retail market has shown a more muted performance this year after signs of recovery in 2006. The Swiss watch industry is having a good year with platinum uptake expected to rise there as a result of higher-weight pieces.

Japan

Net platinum consumption for Japanese jewellery manufacturing has continued its long term decline and is expected to fall 15 per cent to 305,000 oz. Much of this drop is due to the recycling of old jewellery.

As in many other countries, platinum retains its strong popularity in the bridal market. Whilst the average retail price of platinum wedding rings in department stores has risen by nearly 40 per cent in the last three years, this has had little impact on platinum's dominant market share.

With Japan's population ageing, however, the number of weddings is falling, leading the industry to look at other market segments. One campaign this year has targeted platinum jewellery sales at the post-war generation which is approaching retirement with some early signs of success from this promotion.

While the impact of high prices on the bridal segment has been limited, it is more evident elsewhere. At the fashion end of the market, white gold has captured sales from platinum. The major factor in the fall in demand for new metal, however, is still the recycling of second-hand jewellery. A high platinum price was sufficient incentive to increase the level of buying back and refining of old jewellery. Pieces of all ages are returning to the market with most being recycled. Interestingly, some older jewellery is resold to consumers, demonstrating a strong residual appetite for platinum.

North America

The North American platinum jewellery market is expected to weaken in 2007, with net fabrication demand falling to 235,000 oz for the year.

Retail sales have been affected by a sustained high metal price. However, in the all-important bridal sector, sales of men's wedding bands are weaker than in 2006. Customers often approach purchasing of wedding and engagement rings with a total overall budget. Men's rings can be something of an afterthought and some sales have therefore moved to cheaper materials or simply not been made at all.

The USA has also imported more finished pieces from lower-cost manufacturing centres, particularly in Asia. The demand figure we report, which represents North American manufacturing, has therefore fallen.

China

After several years of falling demand, we expect Chinese jewellery sector purchases to rise marginally, by 20,000 oz, to 780,000 oz this year. The volume of platinum traded on the Shanghai Gold Exchange (SGE) is set to increase compared to 2006: August 2007 saw record amounts traded although volumes sold since have been lower due to higher prices. The bulk of this metal is destined for use in the jewellery trade and this reflects steady domestic market conditions.

As we previously reported, the decline last year in fresh demand for metal was largely due to increased levels of recycling brought about by a high metal price, with retailers returning poor-selling stock to manufacturers and some consumers trading-in old pieces for new. However, although the platinum price has been even higher in the first nine months of 2007 than in 2006, this has had no further impact on recycling levels – the economic incentive to recycle was apparently already great enough at the earlier prices and recycling levels may have peaked.

Growing consumer demand is therefore set to drive the figure for net demand higher. Retailers have reported steady or increased levels of consumer purchasing across the country compared to 2006. This is reflected, to some extent, in a rise in the volume of manufacturing in the Shenzhen area and elsewhere.

Chinese economic factors have also been important. When high GDP growth and a strengthening currency are factored in, the affordability of platinum and other jewellery has improved in real terms. Both the total Chinese jewellery market and the volume of platinum sold have risen accordingly as platinum retains its cachet as the metal of choice for many consumers.

Rest of the World

Platinum demand for jewellery manufacturing in the Rest of the World region will remain flat at 70,000 oz following last year's fall in demand. Most jewellery made in this region is for export to Japan and North America, both of which have had a challenging year.

Platinum Demand: Jewellery '000 oz		
	2006	2007
Europe	190	205
Japan	360	305
North America	240	235
Rest of the World		
China	760	780
Other	70	70
Total	1,620	1,595
JMI 		

INDUSTRIAL

Industrial demand for platinum is forecast to grow by 40,000 oz to 1.91 million ounces. Demand from each of the chemical, electrical and petroleum refining sectors is expected to rise, but net platinum purchases by the glass industry should fall.

Platinum Demand: Industrial '000 oz		
	2006	2007
Chemical	380	395
Electrical	400	435
Glass	410	355
Petroleum	185	230
Other	490	490
Total	1,865	1,905



In the chemical sector, purchases are set to grow by 3.9 per cent to 395,000 oz, with global economic growth driving demand for many bulk chemicals which need platinum-based catalysts for their manufacture.

Increasing requirements for explosives and for fertilisers – partly driven by rocketing demand for biofuels – means that nitric acid production is rising,

boosting demand for platinum in catalyst gauzes.

However, high platinum prices have led companies to examine thrifting of the precious metal content of many catalysts – sometimes successfully. In August, Bluestar Silicones launched a new solventless system for the manufacture of pressure-release silicones. Although platinum is still used in this new system, it is at a lower level than before, making the process more economically attractive. Platinum demand is likely to remain stable at best in this segment as a result.

Platinum uptake in the electrical sector will rise to 435,000 oz in 2007. The use of platinum in hard disks continues to be the main driving force. Flash memory, which does not use pgms, is providing competition for hard disks. However, with growth of more than 10 per cent expected in PC shipments this year, hard disk production and platinum demand will both increase.

Platinum purchases for petroleum refining are also forecast to rise this year, to a total of 230,000 oz. High oil prices have stimulated the construction of more refining capacity in South Asia and other locations.

While production facilities for cathode ray tube, or CRT, glass are being closed, manufacturers of glass for LCD and plasma televisions will continue to expand their production capacity in Asia in 2007, albeit at a slower rate than before. This industry is subject to extremely short term cyclicity and, despite apparent overcapacity earlier this year, the continuing battle for

market share has encouraged capital spending on new factories. However, fewer new facilities are likely to be built in 2007 than in 2006. Total glass industry demand will fall from 410,000 oz to 355,000 oz.

Demand for platinum for use in dental treatment is showing some price sensitivity and should fall 4.7 per cent to 110,000 oz this year. Other smaller applications will lead to further platinum demand of 380,000 oz.

INVESTMENT

Following net disinvestment of platinum in 2006, the investment sector is set to show a positive demand of 75,000 oz this year. Combined sales of coins (such as the American Eagle) and large bars may provide a net positive contribution but, of greater importance, exchange traded funds could contain 70,000 oz of platinum by the end of 2007.

During the first eight months of 2007, Japanese investors continued to sell large platinum bars back to the market, but – despite record Yen prices – at a much lower rate than the previous year. There was significant disinvestment from January to April, as the price soared to over ¥5,000 per gram. Purchases of new metal were stimulated in July and August as the price slid to a low of ¥4,550. We expect net sales of large bars back to the Japanese market to total 20,000 oz this year, lower than the 65,000 oz which returned in 2006.

The most important development in the investment sector, however, was the launch of two exchange traded funds (ETFs), in April and May of this year respectively. Investments are held in the form of physical, allocated platinum, meaning that they contribute to demand. This marks the first time such products have been offered to investors and this segment of demand is therefore entirely new to the platinum market this year.

These funds already held 55,000 oz of metal by the start of July. Investment flows have been solid if unspectacular since then. At the end of September, these ETFs had just under 60,000 oz of platinum between them. (More information on ETFs can be found on page 27.)

Platinum Demand: Investment '000 oz		
	2006	2007
Europe	0	70
Japan	(65)	(20)
North America	20	20
Rest of the World	5	5
Total	(40)	75



PALLADIUM

AUTOCATALYST

The sustained price differential between platinum and palladium has ensured that the process of switching production to the cheaper metal, both in gasoline and in diesel autocatalysts, has continued this year. Increased Asian vehicle production will also help demand from this sector to rise 8.4 per cent to 4.38 million ounces in 2007.

Europe

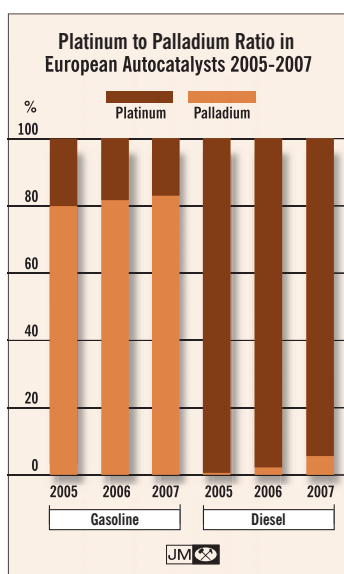
In Europe, autocatalyst palladium demand is set to be slightly higher in 2007 than in the previous year, at 895,000 oz. With little growth in the number of vehicles made – full year sales of passenger cars should be practically level with 2006 at 15 million units this year – what growth there has been in palladium usage is mainly due to it replacing platinum in some diesel catalyst formulations.

Few European auto makers use much platinum in their three-way (gasoline) catalysts, typically preferring palladium-rhodium formulations instead. This was already the case in 2006 so the number of catalysts in which platinum will be replaced by palladium this year will be relatively limited. In fact, with no new legislation to focus development efforts on, cost reduction programmes have been able to achieve a decrease in the average palladium loadings of gasoline vehicles.

Since 2005, though, these same companies have

been moving to introduce palladium into some of their diesel catalytic converters in an attempt to replace a proportion of the platinum used. Currently, these converters use about three times as much platinum as palladium. These platinum-palladium diesel catalysts were not especially widespread in 2006 but have been fitted to many more models already this year. With the diesel engine's market share growing too, palladium usage on diesel engines is certain to increase, outweighing a drop in gasoline palladium usage.

Although increasing amounts of palladium are being used in diesel catalysts, much more is employed in gasoline exhaust aftertreatment.



Japan

Use of palladium in autocatalysts in Japan is expected to rise by 6 per cent in 2007 to 840,000 oz. As previously reported, the Japanese car makers were initially slower than those elsewhere at switching from platinum-based catalyst technology to palladium formulations. However, they are now following other manufacturers in this process and average palladium loadings per vehicle should rise in 2007. Palladium purchases will be further boosted by a 2 per cent rise in domestic light duty vehicle production.

Although there were announcements in 2007 by Mazda and Nissan of their ability to reduce platinum group metal loadings on autocatalysts, there is no evidence of a breakthrough in thrifting. Adding weight to this view, these catalysts will not be introduced on any vehicles in the near term. They will therefore not affect palladium or other pgm demand at all on that timescale. In fact, with production set to rise again in 2008, palladium demand could well grow instead.

North America

North American purchases of palladium should rise 170,000 oz to 1.64 million ounces in 2007. The ongoing tightening of Federal Tier II legislation and the process of replacing platinum catalysts by palladium ones have tended to raise the precious metal content of a typical car or truck. However, US light duty vehicle production is expected to fall by 1.5 per cent to 15 million units this year, which will constrain some of the growth in demand.

Palladium has, though, made inroads into the North American diesel market. Just as in Europe, palladium is being used in place of up to a third of the platinum in some diesel aftertreatment – both for light duty and heavy duty vehicles. Recent legislation has driven catalyst fitment on all sizes of diesel vehicle. With the number of such catalysts rising quickly and the average palladium content growing as well, demand for this metal from the relatively small North

Palladium Demand: Autocatalyst '000 oz		
	2006	2007
Europe	880	895
Japan	795	840
North America	1,470	1,640
Rest of the World		
China	220	270
Other	675	735
Total	4,040	4,380

American diesel market is expected to grow healthily in 2007 and 2008.

China

Continued fast economic growth in China has been reflected in annual increases of more than 10 per cent in automotive sales. With domestic car production expected to rise at a similar rate in 2007 to 5.3 million units, demand for palladium is forecast to grow another 23 per cent to 270,000 oz.

In the short term, 2007 was scheduled to see the implementation of new nationwide legislation in the form of Euro 3 rules. However, due to concern over the availability of sufficient quality fuel, it now appears likely that these rules will come into force in July 2008.

We believe, though, that the majority of manufacturers will still fit Euro 3 compliant catalysts to their vehicles this year. Any cars sold in Beijing and Shanghai already have to meet these emissions rules and most car makers have chosen to fit one catalyst formulation for all domestic sales of a specific model. Catalyst loadings are therefore rising in 2007. In the longer term, however, this delay in enforcing the Euro 3 standards could lead to knock-on delays in moving to yet stricter emissions rules in the future.

Rest of the World

Palladium demand for autocatalysts from the Rest of the World region is expected to rise to 735,000 oz in 2007, 9 per cent more than in 2006. Many of the catalysts fitted to vehicles are based on technology that has previously been in use in Europe. These have typically already been optimised in terms of lowest cost by the implementation of thrifting or the use of cheaper palladium instead of platinum. Growth in gasoline vehicle production in these second tier markets is therefore translating directly into increased demand for palladium.

Autocatalyst Recovery

The global weight of palladium recovered from scrap autocatalysts in 2007 will increase to 945,000 oz. This represents forecast growth of 18 per cent since 2006.

The bulk of the metal recovered (560,000 oz) will

come from end-of-life vehicles in North America. In this market, an efficient and widespread collection system for spent autocatalysts has been in place for some time. The increase in palladium recovered therefore reflects the increasing amounts of this metal used on new autocatalysts at the end of the last century in this market.

The weight of palladium reclaimed in Europe will also grow but at a faster rate. The collection system is improving in terms of efficiency and the average palladium loading of an end-of-life catalyst has risen over recent years. The increase in metal returned is therefore forecast to be 34 per cent this year.

DENTAL

The dental sector is set to consume 620,000 oz of palladium in this calendar year, the same as in 2006. Much of this demand will occur in Japan where palladium finds wide use in the so-called Kinpala alloy. The American dental sector will use significant amounts of palladium too.

Although the average prices of palladium and of the other precious metal components used in this alloy were higher in the first nine months of 2007 than in 2006, volatility was, in general, lower. This meant that the Japanese government subsidy which is changed periodically to account for material costs kept closely in step with the Kinpala price. There was therefore little price disincentive for the use of this alloy in state-funded treatment, unlike in some previous years.

However, other materials have started to erode the market share of this alloy. In particular, resin systems have had some success. The cost of dental treatment is also rising, with a resultant drop in the number of visits to dentists. Together, these trends are likely to continue to depress dental demand in the near future.

One aspect of note in this market is that we believe that the level of recycling is greater

Palladium Demand: Autocatalyst Recovery '000 oz		
	2006	2007
Europe	(220)	(295)
Japan	(30)	(35)
North America	(500)	(560)
Rest of the World	(50)	(55)
Total	(800)	(945)
JMI		

Palladium Demand: Dental '000 oz		
	2006	2007
Europe	75	70
Japan	270	265
North America	260	265
Rest of the World	15	20
Total	620	620
JMI		

than previously thought. Quite large amounts of metal are produced as scrap in the manufacturing process for Kinpala bridgework. The rise in the palladium price has encouraged more aggressive activity from collectors and refiners and the recycling system has become more efficient.

ELECTRONICS

Palladium uptake from the electronics industry will grow for a sixth successive year. While demand from this sector is still well below its historical peak, it should climb to 1.10 million ounces in 2007, a rise of 40,000 oz over the 2006 figure. Much of the driving force for this growth is due to strong computer sales, with 11 per cent more units likely to be shipped in 2007 than the year before.

Palladium Demand: Electronics '000 oz		
	2006	2007
Europe	105	145
Japan	275	260
North America	190	200
Rest of the World	490	495
Total	1,060	1,100

The use of palladium in multi-layer ceramic capacitors, or MLCC, remains the cornerstone of this electronics demand. These are used in large numbers in almost every device. However, palladium usage in MLCC will remain flat. While shipments of IT equipment and other electronic goods are booming,

there is still ongoing slow substitution of nickel for palladium by some capacitor manufacturers. More importantly, the average size of a MLCC is decreasing. Two years ago, only 8 per cent were the ultrasmall 0201 size – 0.6mm by 0.3mm – or smaller, a figure which is expected to exceed 20 per cent this year.

Although MLCC palladium demand is likely to be steady, there will be modest growth in other applications such as plating. Use in leadframes is also forecast to increase, in line with sales of silicon chips.

JEWELLERY

Global demand for palladium from the jewellery trade is forecast to reach 745,000 oz in 2007, substantially below the previous year's level of 995,000 oz. Once more, the picture is highly dependent on the region of demand. New metal requirements are set to rise in Europe and North America. However, demand will be lower in Asia,

with a hefty decline in China.

Purchases of new palladium metal by Chinese jewellery manufacturers are forecast to plummet in 2007, from 760,000 oz to 500,000 oz, with recycled metal from a variety of sources playing an important part in this fall. While palladium imports into China have risen, much of this metal has been destined for the autocatalyst, electronics and other industrial sectors.

Palladium Demand: Jewellery '000 oz		
	2006	2007
Europe	40	45
Japan	130	125
North America	40	50
Rest of the World		
China	760	500
Other	25	25
Total	995	745

Palladium is being recycled from scrap generated by these industries and from old jewellery. Although much Pd950 jewellery (95 per cent alloy) has already been returned by retailers for refining and re-manufacture into Pd990 (99 per cent palladium), this scrap material from jewellery retailers continues to flow back and impact on demand for new metal. By comparison, consumer recycling of used palladium jewellery is less important. High precious metal prices – gold and platinum in particular – have also encouraged careful stock control throughout the jewellery trade. These trends will greatly depress palladium purchases.

At the retail level, there is competition between palladium and both platinum and white gold. Similar rhodium-plated designs can be seen in all three metals although they are often sold from different counters or concessions in a single store. However, palladium has had limited market promotion outside Beijing and Shanghai – where it has not sold well to date – and consumer sales do not seem to be developing as quickly as had been expected.

The picture is mixed across the country. Neighbouring cities can have very different attitudes to palladium. Pd950 is still stocked in some locations and Pd990 at others. Many retailers are unsure about the benefits of selling palladium jewellery too. Nonetheless, very large stocks can be seen in many stores.

In Europe, demand for palladium from the jewellery trade is likely to rise by 12.5 per cent to 45,000 oz. Perhaps two thirds of this metal is used as a component in white gold alloys, a market which is growing as a result of both the popularity of white metals in general and of European anti-nickel legislation.

However, a number of manufacturers have

introduced palladium jewellery this year, leading to much of the growth in European demand. Palladium does not have a clear, unique market positioning at present and product ranges are experimental. Continued growth from this low level of demand can be expected over the next two to three years if more manufacturers decide to work with this material. However, the delay in the proposed introduction date for a palladium hallmark in the UK from 2008 to 2009 could set this specific market back.

In North America, we believe that palladium demand from jewellery manufacturers will rise to 50,000 oz in 2007. A period of relative price stability for the precious metals in the first half of the year removed some of the stimulus for using palladium as a new, intermediate-price material. However, as palladium products, particularly men's rings, are more widely trialled, sales are expected to rise.

Japanese palladium demand for jewellery is due to its use in white gold and platinum alloys. With lower platinum demand and the trend from 18 carat to lower carat (and lower percentage palladium) white gold products, palladium demand will drop slightly here.

CHEMICAL

Chemical sector demand for palladium is forecast to total 355,000 oz for 2007. Although commodity chemicals have experienced growing demand, some sectors will see less construction of plants this year than in 2006. Palladium demand will therefore fall 16.5 per cent from last year's levels.

Demand for purified terephthalic acid (PTA) is rising. Palladium is used in the purification process for this product and increased production should equate to enhanced demand for palladium from new charges and top-ups of existing catalyst.

Palladium Demand: Chemical '000 oz		
	2006	2007
Europe	165	90
Japan	25	25
North America	80	80
Rest of the World	155	160
Total	425	355
JPM		

Environmental concerns are also proving to be positive for chemical sector demand for palladium. This metal is used as the catalyst in the anthraquinone process which is a clean method of manufacturing hydrogen peroxide. This is a key input into the manufacture of polyurethane compounds, demand for which



is growing, driving palladium purchases higher. However, palladium demand for other chemical processes is scheduled to fall.

OTHER

Due to the introduction of exchange traded funds (ETFs), demand for palladium physical investment products will increase substantially from 50,000 oz to 250,000 oz. ETFs had already accounted for demand of 255,000 oz by the end of September. However, this has been offset by weak demand for palladium bars and coins, with some bars being returned to the market and melted down. Palladium demand in other applications, excluding investment, should reach 100,000 oz in 2007.

Two ETFs based on palladium were launched in Europe in the first half of the year. The opening volume in the Swiss palladium fund was high due to a weighty purchase by a large Swiss pension fund. Ongoing investments since then have been rather lower and there have been some sales of ETF shares, suggesting that the combined position at the end of the year will not be greatly higher than at the end of September.

Palladium purchases for jewellery manufacture are expected to grow this year in Europe and North America as more companies start to experiment with this material.

Palladium Demand: Other '000 oz		
	2006	2007
Europe	20	290
Japan	5	15
North America	85	20
Rest of the World	20	25
Total	130	350
JPM		


OTHER PLATINUM GROUP METALS

RHODIUM

Net demand for rhodium is forecast to fall by 3.9 per cent to 808,000 oz in 2007. The weight of metal used in the autocatalyst sector will decline for the first time since 2002, under the pressure of high prices and limited growth in automobile production in many regions. Rhodium use in the glass sector is likely to fall. However, rhodium supplies will also decrease in 2007 with lower shipments from Russia and weaker production in South Africa. The rhodium market should therefore be close to balance, with a deficit of only 4,000 oz.

Autocatalyst

Global light duty vehicle production is predicted to rise from 66.1 million units in 2006 to 70.0 million this year,

Rhodium Supply and Demand '000 oz			
		2006	2007
Supply			
South Africa		690	695
Russia		95	70
North America		20	20
Others		19	19
Total Supply		824	804
Demand			
Autocatalyst:	gross	867	861
	recovery	(169)	(179)
Chemical		48	55
Electrical		9	10
Glass		65	38
Other		21	23
Total Demand		841	808
Movements in Stocks		(17)	(4)
			

with most growth in Asia. However, despite this, gross autocatalyst rhodium demand is forecast to fall 6,000 oz, to a total of 861,000 oz. This represents 87 per cent of gross demand for rhodium from all applications. Rhodium use in the North American market will be stable at 289,000 oz in 2007. So far, high oil prices have had relatively little effect on the purchasing habits of consumers. As a result, output of large-engined light trucks and SUVs has held up well and average catalyst size and rhodium content have changed little. Rhodium demand in Japan is expected to fall to 243,000 oz in 2007, principally because purchases of rhodium for inventory are expected to decline. While Japanese automotive sales are set to decrease by several per cent, a greater proportion of production will be for export to other countries. These vehicles tend to have higher-loaded catalysts than those used in the domestic market, roughly balancing the impact of the decline in vehicle output on rhodium use.

In response to high rhodium prices, some European

companies have taken the opportunity of a lull between rounds of emissions legislation to work on thrifting (or reduction) of metal loadings, with a strong focus on minimising rhodium usage in gasoline or three-way catalysts. The effect of this process is a drop in average rhodium loadings at some companies but not the elimination of rhodium from any gasoline catalysts.

In Europe, the market share of diesel vehicles continues to expand. Their catalysts use little if any rhodium, so the increase in their production further lowers the average rhodium content of each new car. European rhodium purchases should fall as a result, dipping 15,000 oz lower to 150,000 oz in 2007. Demand for rhodium in the Rest of the World region will rise due to an expansion in vehicle production.

Rhodium recovery from spent autocatalysts remains important in helping to balance supply and demand. Rhodium volumes will rise 10,000 oz this year to 179,000 oz. This reflects the rising rhodium content in scrapped autocatalysts and a recycling industry which is continually increasing in efficiency. The weight of rhodium reclaimed will rise in every region.

Other Demand

The glass industry is still expanding its production capacity for LCD glass as the battle for market share continues. However, the rate of expansion is lower than in 2006. This construction of fewer furnaces means that rhodium purchases for this sector will fall, particularly in Japan and the Rest of the World region. Elsewhere in the glass sector, the high rhodium price has encouraged the use of lower rhodium content alloys where possible. Net glass sector demand will fall by more than 40 per cent to a 2007 total of 38,000 oz.

Rhodium demand will grow to 55,000 oz in the chemical sector. The market for oxo-alcohols, plasticisers and many other chemicals is healthy and should boost demand. However, the significant construction of new capacity for acetic acid in 2006 was not repeated in 2007. All other applications of rhodium should contribute 33,000 oz of demand this year.

Supplies

Rhodium supplies are expected to drop by 2.4 per cent to 804,000 oz in 2007. While South African supplies had

been expected to rise strongly, interruptions to mining arising from accidents and strikes, amongst other issues, curtailed output. Supplies from this country will grow by only 5,000 oz to 695,000 oz.

Output of pgm from Norilsk is expected to be similar to last year and at present we do not expect that last year's shipments of rhodium from stocks will be repeated. The interruption to Russian exports due to regulatory problems in early 2007 should not affect the level of Russian supplies for the whole year. These should be higher in the second half of the year than the first, at 70,000 oz in total.


RUTHENIUM & IRIIDIUM

Demand

Demand for ruthenium is expected to rise by 4.1 per cent to a new peak of 1.34 million ounces in 2007. Purchases by the electronics industry will grow again, even though price sensitivity is apparent in some applications. Iridium demand will fall by 9,000 oz to 123,000 oz.

Net purchases of ruthenium by the electronics industry for all applications are forecast to rise by 18 per cent to 1.03 million ounces this year. Ruthenium is an essential material in the manufacture of a new type of hard disks which use perpendicular magnetic recording, or PMR. These first took significant market share last year. 2007 has seen continued growth with almost 40 per cent of production now being PMR technology, compared to 15 per cent in 2006.

However, while PMR technology has proved successful, its introduction has been delayed at some companies which have been able to extend the commercial life of older linear magnetic recording technology. Hard disk manufacturers have also worked

Ruthenium Demand by Application '000 oz		
	2006	2007
Chemical	223	103
Electrochemical	138	144
Electrical	876	1,034
Other	54	63
Total Demand	1,291	1,344
JMI 		

to minimise ruthenium content and these two factors have limited the rate of increase of ruthenium demand. Nevertheless, it will still increase by more than half compared to 2006.


Equally importantly, global refining capacity to process scrap material from this industry has increased this year. The backlog

of metal waiting to be refined and remanufactured into sputtering targets has declined and recycled material will supply a greater proportion of demand for ruthenium in hard disks this year.

The high ruthenium price will have a negative impact on demand in some other sectors. As ruthenium has traditionally been one of the cheapest platinum group metals, its cost has often been included in product prices rather than being priced separately. Some industries have therefore been exposed to price movements and have been forced either to change their pricing model or reduce their use of ruthenium. This is not possible in every sector but one example is the thrifting of the ruthenium paste used in the manufacture of flat screen plasma display panels, where consumption could fall by 80 per cent.

In the chemical sector, ruthenium demand will fall by over half to 103,000 oz. Ruthenium is used as a catalyst in a number of chemical processes. The construction of a single new world-scale facility typically requires a catalyst charge of tens of thousands of ounces. A fall in the number of factories built in 2007 will therefore cut demand from this segment. Demand for electrochemical and other uses of ruthenium should grow to 207,000 oz.

After rising last year, iridium demand is likely to fall back in 2007. Iridium's price has been less volatile than that of the other pgms. Applications such as spark plugs will take more of this metal at a forecast 19,000 oz for the year. However, purchases of iridium for chemical end-uses will fall.

Iridium Demand by Application '000 oz		
	2006	2007
Chemical	34	24
Electrochemical	34	34
Electrical	28	28
Other	36	37
Total Demand	132	123
JMI 		

Supplies

Supplies of ruthenium and iridium are both forecast to fall slightly in 2007. The average concentration of these metals in the ore mined in South Africa is rising as new mines are developed. However, the challenges faced by the South African mining sector this year will hold the level of supplies back. Ruthenium supplies both last year and this have been above the level of production with the result that we expect only a modest deficit in 2007. The iridium market will be in surplus on the same timescale.

PRICES & FUTURES MARKETS

PLATINUM

Platinum traded at an average price of \$1,256 during the first nine months of 2007, almost 10 per cent higher than in the same period of 2006. Its peak was \$1,377 at the end of September. However, in volatility terms, the platinum market was relatively calm compared to the previous year.

Concern over platinum supplies, in the form of smelter problems at Lonmin, Russian export licence delays, and protracted wage negotiations in South Africa supported the price. Eventually, these combined with a weak dollar to push platinum to its September peak. Once the price rose above \$1,200 in February, it rarely dropped below that level.

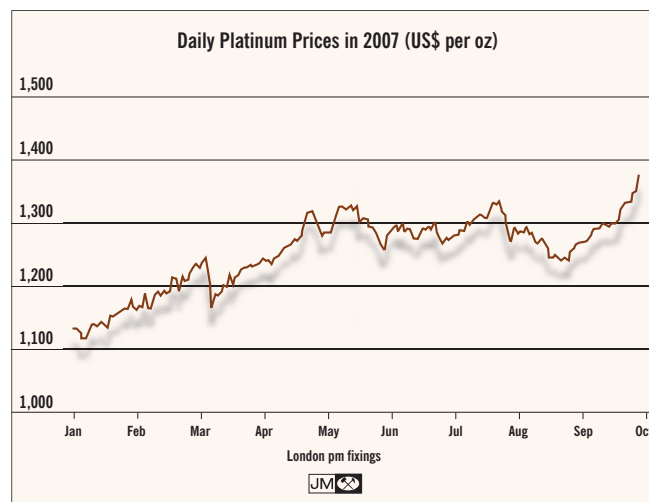
Platinum started **January** at \$1,136 and softened to a low for the first nine months of 2007 of \$1,112 on the 8th. News emerged of lengthy delays in the implementation of new Russian regulations which were intended to simplify the export of pgms. With platinum shipments from that source temporarily suspended, Chinese demand drove prices up. News that Lonmin was to close its No. 1 furnace at Marikana for a rebuild helped the price to a month-end \$1,169.

The price kept climbing in **February**, rising almost 5 per cent during the month. The announcement of a strike at Implats caused some market jitters although it ended quickly. Delays in the rebuild of Lonmin's furnace saw platinum firm further. Heavy buying on TOCOM on the 26th took platinum to a record ¥4,748 per gram and a fix of \$1,242. A sudden fall on the Shanghai stock market pummelled gold prices but left platinum unaffected, supported by supply concerns.

The growing problems in the US sub-prime mortgage

sector came into global focus in early **March**. Many funds reacted nervously and sold commodities to offset losses in the equity markets. Gold fell sharply and platinum followed, losing \$45 between the afternoons of the 1st and the 2nd, and falling to a monthly low of \$1,165 on the 5th.

At this point, short-covering helped the price rebound. Additional upward pressure came from tight availability of



platinum sponge (much had been converted into ingot following November 2006's price spike) and the price bounced back over \$1,200 in New York on the 8th. It did not fall back below this level. Supported by a lack of Russian exports and the scarcity of sponge, platinum climbed to end March one dollar up overall, at \$1,244.

April started with rumours of the launch of an exchange traded fund (ETF) in platinum. Physical buying in response to this took the price up to \$1,251 before Easter. As platinum escaped from its previous range, investors pushed it up to \$1,269 on the 13th. Late that day, the Zürcher Kantonalbank (ZKB) announced that it would indeed launch a platinum ETF. Platinum rose to \$1,282 the following day before Norilsk Nickel revealed that it was meeting its commitments for platinum supply despite lacking an export licence.

Net long NYMEX speculative positions climbed 77,000 oz in a week. Lease rates failed to tighten as had been expected, and the price retreated to \$1,268. Buying on TOCOM provided support as the price rose above ¥5,000 per gram. On the 19th, news emerged of the forthcoming launch of a second platinum ETF in London. Platinum shot to a monthly high of \$1,325 on the 24th as trading started in the first ETF to launch.

The restart of Lonmin's furnace drove platinum down. Good buying on the Shanghai Gold Exchange (SGE) was seen, even above \$1,300, but a rallying dollar led to fund sell-offs: platinum ended April at \$1,286.

Platinum immediately started firming in **May**, as NYMEX positions rose strongly, negating the closure of the Chinese and Japanese markets for Golden Week. When trading reopened in Asia, the price leapt

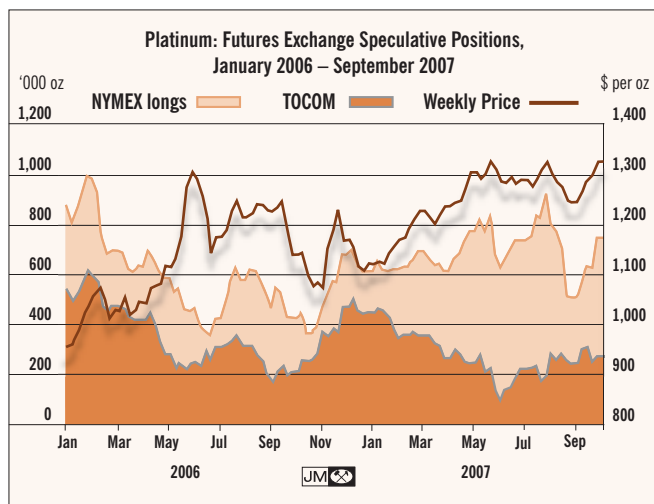
The platinum price grew by almost 10 per cent in the first nine months of 2007 to a peak of \$1,377 at the end of September.

Average PGM Prices
in \$ per oz (Jan-Sep)

	2006	2007	Change
Platinum	1,146.86	1,256.47	10%
Palladium	319.64	353.00	10%
Rhodium	4,401.20	6,069.14	38%
Ruthenium	153.17	601.97	293%
Iridium	333.04	445.96	34%

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





Net long speculative futures positions on NYMEX and TOCOM showed significant growth in April and early May in expectation of the launch of two exchange traded funds.

to \$1,331 on the 8th. Strikes at Aquarius's Kroondal and Marikana properties and a continued lack of Russian metal helped platinum to a high of \$1,336 on the 9th.

The dollar paused in its decline and put pressure on platinum just as ZKB launched its ETF. The price reached \$1,336 again on the 14th before retreating under fund sales, although net long NYMEX positions continued to increase. The strengthening dollar took the floor from under the platinum price which fell before finding support near \$1,300 on the 17th. Lower than feared trading in the two ETFs drove sell-offs of futures positions. Further dollar strength depressed commodity prices. Selling on TOCOM added a final touch and platinum fell to \$1,257 on the 30th.

Awareness of potential supply disruptions from South Africa then surfaced with the news that the National Union of Mineworkers, or NUM, had rejected a pay offer from Anglo Platinum. This caught the market unprepared: short-covering forced the price back close to \$1,300. Producer dehedging in gold then helped lift platinum over this mark on the 7th of June.

While there was much speculation over the progress of South African wage talks given the tight platinum market, movements in the price mainly related to those of gold and the dollar. Platinum softened to \$1,266 on the 27th, which brought out purchasing on the SGE, with 164 kg snatched up that day.

Platinum reached a record average monthly price in July. A weakening dollar and the possibility of South African strikes were both bullish signals and funds bought accordingly before encountering resistance near \$1,300 on NYMEX ahead of US Independence

Day. When New York reopened, the October contract moved serenely above the \$1,300 mark.

The sub-prime mortgage contagion reappeared and weakened the dollar. The NUM and the Solidarity union declared disputes against Anglo Platinum but, more importantly, both Anglo Platinum and Lonmin cut full year sales forecasts substantially.

TOCOM buying on the 13th moved platinum to a new record high of ¥5,127 per gram in the far-dated June 2008 contract. More futures buying took platinum to a monthly high of \$1,333 in London on the 24th as NYMEX positions peaked at their highest for 10 years.

Nissan then announced that it could reduce metal loadings in some of its catalysts. Funds took this opportunity to realise profits and platinum lurched lower to \$1,284 on the 27th. A remarkable 278 kg of platinum changed hands on the SGE in one day in response, the start of a prolonged spell of buying.

Platinum crept higher to an early-August peak of \$1,296 before the sub-prime crisis returned to disturb the market. As equity prices fell, funds sold off commodities. While there was support for the price from short-lived strikes at several mines, macroeconomics were now dominant. Amidst the deepening gloom, the European Central Bank injected €100 billion into the banking system, driving the Euro lower and cutting precious metal prices.

These fund sales of platinum, including a reduction of 156,000 oz in a week on NYMEX, outweighed very healthy Chinese physical purchasing and the price spiralled down to a monthly low of \$1,237 on the 22nd. Slowly, though, the selling pressure disappeared and platinum ended the month strongly at \$1,268.

Poor US payroll data sent the dollar to a 15 year low in September and helped platinum to \$1,295 on the 10th. It edged over \$1,300 before the US Federal Reserve's decision to cut interest rates by more than expected depressed the dollar and boosted precious metal prices. Gold neared a 28 year peak: platinum rose too, to fix at \$1,307 on the 19th. Support was firm at \$1,300 and platinum rose to \$1,336 on the 21st.

More negative US housing data came out on the 27th and the dollar fell. Platinum lease rates inched higher, reflecting nervousness about metal availability. In the perfect storm of disappointing supply, strong demand, high oil prices and a weak dollar, platinum climbed to fix at \$1,377 on the last trading day of September.

PALLADIUM

The palladium market was quiet in the first three quarters of 2007 compared to last year. The price averaged \$353, 10 per cent more than in the same period in 2006. Price movements largely followed those of platinum and gold rather than being influenced by palladium's own fundamentals.

Continued activity from institutional and fund investors drove the price. Palladium started the year at \$332 and did not stray too far, peaking at \$382 in April and falling no lower than August's \$320. \$343.75 was the final fix of this period, 3.5 per cent above where it started the year.

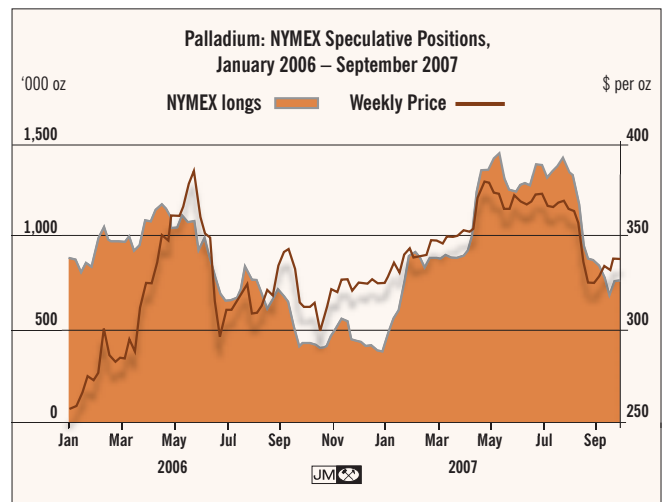
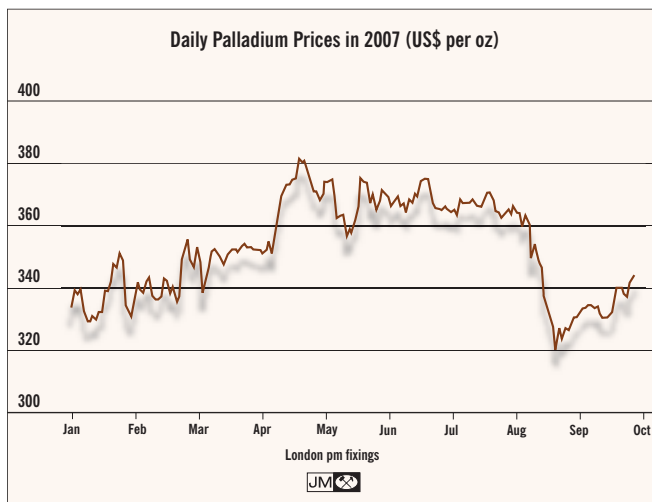
A rising platinum price influenced palladium in **January**. Palladium began the year at \$332 and started climbing, driven by speculators and investors, particularly on the futures exchanges. It reached \$343 on the 5th. The realisation that palladium exports from Russia were unaffected by export licence issues caused a change in sentiment, and palladium fell back to the month's low of \$328 on the 11th.

Palladium rose to \$351 on the 25th but no sooner had it reached this important psychological point than profit-taking reappeared. The price dropped back to end January at \$331 under heavy selling on NYMEX.

The link between the platinum and palladium prices was cut at the start of **February**. The market surplus of palladium meant that investor interest in that metal was much lower. As platinum forged ahead, palladium settled into a narrow range, \$5 either side of \$340.

Good purchasing on TOCOM on the 22nd and

The palladium price was supported by a weak dollar but more importantly by significant fund investment.



23rd – driven by a weak dollar and a strong oil price – prompted a move to \$355.25 on the 26th. This attracted technical buying but liquidation of long fund positions followed and palladium closed the month at \$346.

The first effects of the US lending crisis emerged at the start of **March** although palladium dipped only to \$338. The weak dollar provided some encouragement and palladium quietly slipped back above \$350. Unlike before, fund sales did not cap the price here, paving the way for a further firming in **April**. Strong physical demand finally pushed the price over \$360 on the 11th for the first time since June 2006. NYMEX positions rose above one million ounces. However, palladium only reached \$373 on the 12th before hitting resistance.

Energy was injected into the market as ZKB detailed its plans to launch a palladium ETF. Investors responded and the price moved into a new range of \$370-\$380. The continuing growth of net long NYMEX positions and the announcement of a second ETF forced the price up to \$382 on the 20th. This marked its peak for the first nine months of 2007. However, as platinum fell back, palladium dropped too.

The palladium price again lost its link to platinum in **May**. Although platinum rose, palladium did not benefit. However, funds continued to invest. NYMEX net longs peaked at 1.44 million ounces before heavy fund long liquidation – almost a 130,000 oz reduction – followed in the second week of May. Palladium fell to a monthly low of \$356 before rebounding to \$375.50.

A strengthening dollar affected all commodities and a wave of negative sentiment washed over palladium. The price sank and closed the month at \$367, trading

Long futures positions in palladium fell very heavily in August as investors responded to the spreading effects of the US sub-prime mortgage crisis.

largely between \$360 and \$370 for the first half of **June**. Nonetheless, NYMEX positions started to grow again, reaching 1.27 million ounces before investment flows stalled. After palladium reached its low of \$363.50, limited support from strikes in South Africa provided just enough momentum to impel the price to \$375, the month's high, on the 21st. It closed June at \$365.

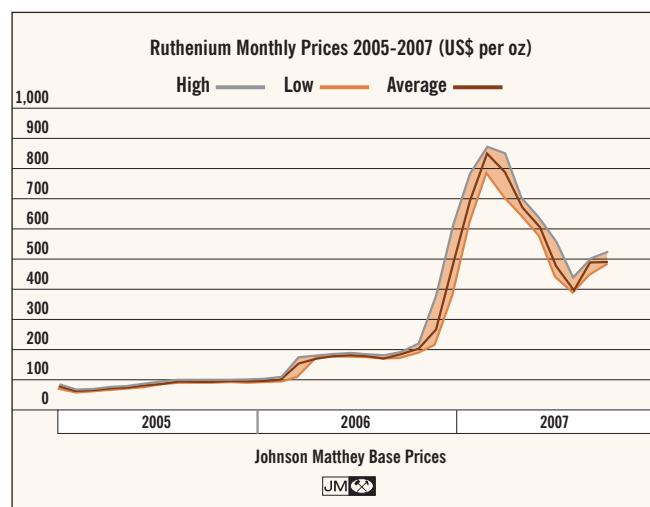
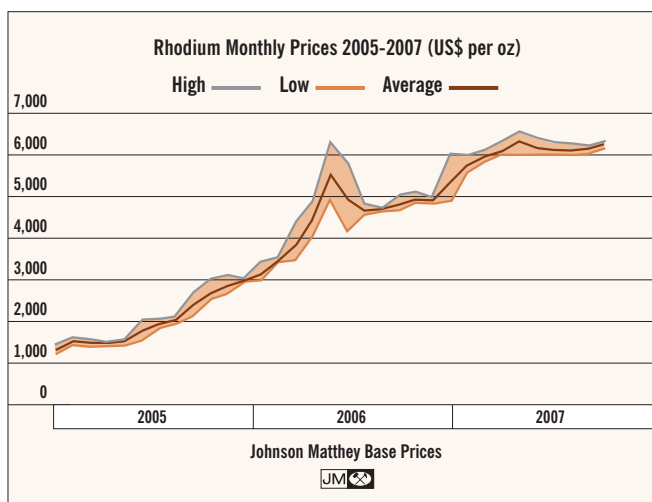
Platinum rose in **July** on concerns over South African supplies. However, this was not reflected in the palladium price which was virtually unchanged, staying almost exclusively between \$360 and \$370 throughout the month. Palladium entered **August** still range-bound but the effects of the sub-prime crisis continued to spread. Investment funds sought to realise money from their palladium positions and sold these off. NYMEX net speculative long positions dropped by more than 500,000 oz over the month.

Palladium initially tracked platinum and gold lower. However, in the growing credit crisis it dropped to \$320. Even when platinum rallied, palladium's oversupply prevented it from climbing back above \$330 until the end of August. The palladium market was little moved by the reduction in US interest rates in **September**. While platinum soared, palladium edged only slightly higher, to end the third quarter at \$343.75.

Tightness in rhodium supply to the market supported the price above \$6,000 for much of the first three quarters of this year.

OTHER PGM

Rhodium spent much of the first nine months of 2007 above \$6,000. It traded at an average price of \$6,069 during this period, compared to \$4,401 for the first nine months of 2006.



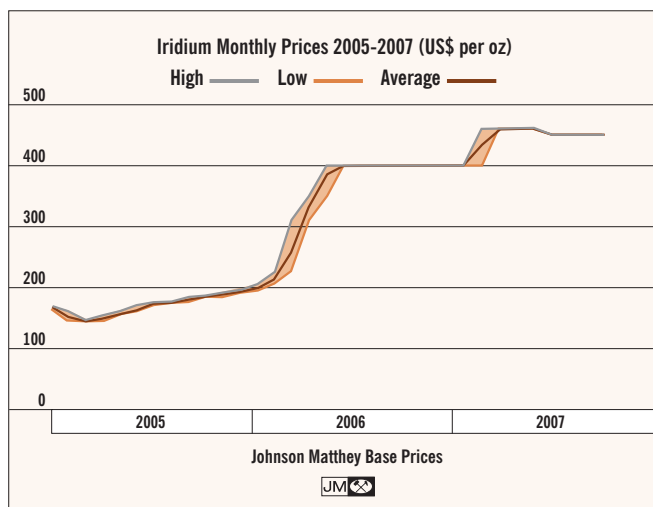
Rhodium started 2007 at \$5,550 and bidding drove it to \$5,875 by **January** 12th. Market offers increased and the price fell to \$5,600 before the cycle repeated. The price fluctuations decreased somewhat but buying took the price to \$6,000 for the first time this year on **February** 8th. Prices were supported by an absence of Russian shipments due to the lack of export licences.

Rhodium stayed close to \$6,000 until mid-**March**. Some market nervousness then appeared on questions of when Russian exports might restart. Rhodium peaked in mid-**April** at \$6,500 under pressure from a continued lack of Russian exports and heavy physical buying. Later, Lonmin restarted its furnace and Norilsk Nickel finally received an export licence. The price retreated to \$5,950 by **May**. Although this licence had been granted, no new metal was seen. The price rose to \$6,350 with the main spur apparently purchasing by an industrial company looking to repay metal leases.

This buying continued in **June**. Lease rates rose, encouraging companies to buy metal rather than lease it. This further reduced metal availability and reinforced the rise in the lease rate. With the price at \$6,250 at the start of **July**, purchasing slowed. The price softened but found support around \$6,100. Buying returned in greater weight in **September**, briefly pushing rhodium to \$6,250 but the last move of this period was a week-long decline in the price to a closing \$6,125.

The ruthenium price started the year at \$610. Although it had already risen by more than 600 per cent in 2006, this momentum continued into 2007. Buying by the electronics industry, supported by speculative interest, moved the price to \$870, the peak so far this

The upward pressure on the ruthenium price lasted until February before physical purchasing dropped off, allowing the price to fall back.



Speculative investment in iridium could do no more than lift the price from an initial \$400 to a peak of \$460.

year, on **February 9th**.

Rumours of sales of ruthenium by speculators calmed the market and the price finally dropped by \$20 on the 26th, the first fall for seven months. The level of industrial buying dropped dramatically, causing the price to subside to its low of the year so far of \$380 in **July**. Later, the market firmed with some small bidding and the price moved back upward quickly, reaching \$490 in early **August**. Serious buying reappeared in late **September**. The price jumped from \$475 to \$520 at the end of the month with consumers displaying a degree of nervousness about potential price rises, rather than the panic seen at the start of the year.

Changes in the iridium price were less dramatic. It started the year at \$400, where it had been since mid-2006. Speculative buying pushed the price to a peak of \$460 in **February** before slowing. The price remained there from **March** to **May** with steady industrial purchasing. It dropped back \$10 in early **June** and remained at \$450 until the end of **September**.

ETFs

Although there was widespread speculation in November 2006 that exchange traded funds (ETFs) based on platinum and other platinum group metals could be launched, the first concrete indications that this would occur came in April 2007.

Two different sets of platinum group metal exchange traded funds were announced within days of each other and were launched in April and May 2007 respectively. Each manager launched a fund in platinum and one

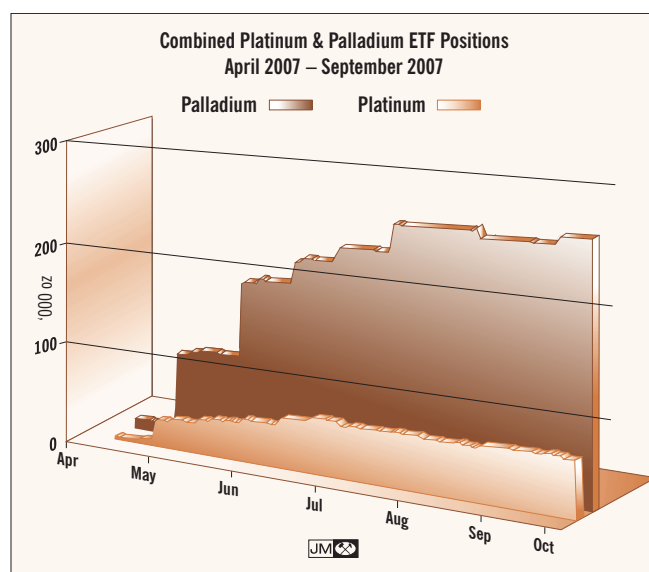
in palladium. None of these funds have any exposure to the minor platinum group metals. They work in a similar way with investors buying metal and swapping it with the ETF provider for shares in the ETF. The funds are therefore 100 per cent backed by physical metal and cannot lend or sell metal themselves.

These funds were intended to contain a combined 150,000 oz of platinum and 400,000 oz of palladium by the end of their first year of trading. The pension fund of Novartis, the Swiss pharmaceutical company, revealed its intentions to invest in the Swiss ETFs, providing some substance to these forecasts.

To date, progress has been quiet and the various ETFs contained a total of 60,000 oz of platinum and 255,000 oz of palladium at the end of September. These volumes were invested without causing undue levels of tightness or volatility, although this had been expected. In fact, volumes of purchases in all funds have been relatively low post-launch and we have even seen some redemptions of metal.

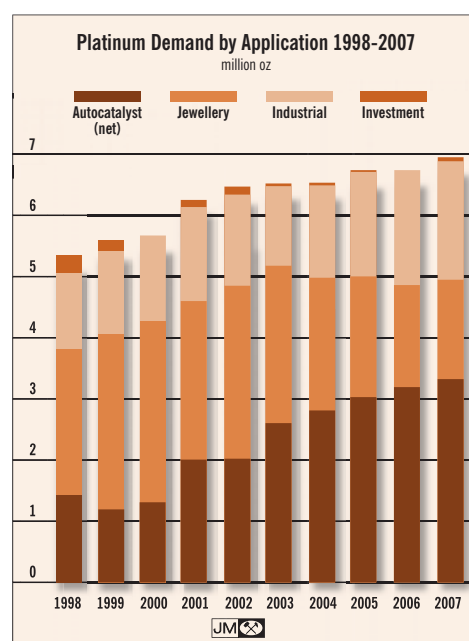
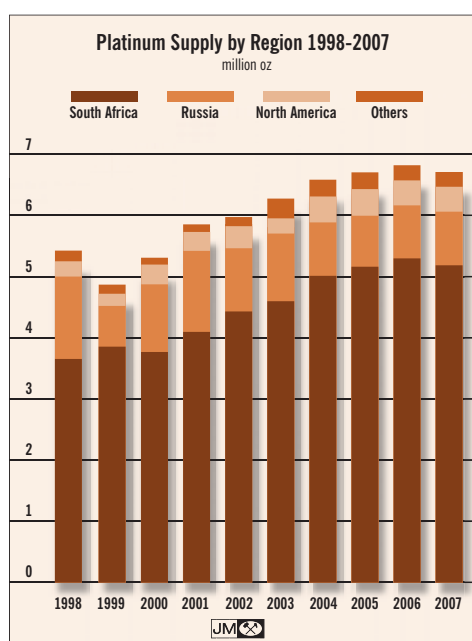
A gold ETF, backed by bonds rather than by physical metal was launched in Japan in the summer of 2007 but investment flows have been disappointing. There is a possibility that a physically-backed gold ETF could also be launched in Japan in 2008. Gold and silver ETFs already exist in the USA. However, there is no indication at the time of writing of any intention to launch a platinum or palladium ETF in these markets. We do not expect to see ETFs launched in either country within the next twelve months.

Combined positions in exchange traded funds at the end of September reached 60,000 oz of platinum and 255,000 oz of palladium.



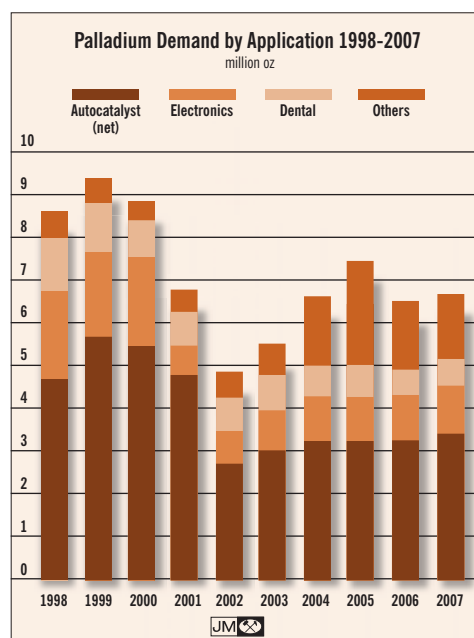
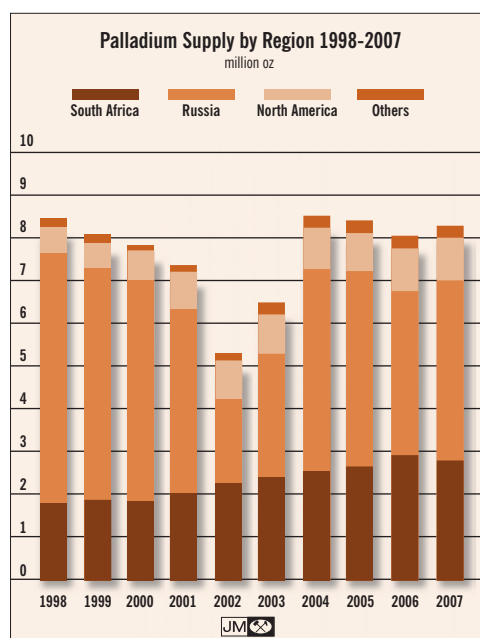
Platinum Supply and Demand										
'000 oz	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Supply										
South Africa	3,680	3,900	3,800	4,100	4,450	4,630	5,010	5,115	5,290	5,220
Russia	1,300	540	1,100	1,300	980	1,050	845	890	890	820
North America	285	270	285	360	390	295	385	365	345	340
Others	135	160	105	100	150	225	250	270	270	280
Total Supply	5,400	4,870	5,290	5,860	5,970	6,200	6,490	6,640	6,795	6,660
Demand by Application										
Autocatalyst: gross	1,800	1,610	1,890	2,520	2,590	3,270	3,490	3,795	4,140	4,235
recovery	(405)	(420)	(470)	(530)	(565)	(645)	(690)	(770)	(855)	(885)
Chemical	280	320	295	290	325	320	325	325	380	395
Electrical	300	370	455	385	315	260	300	360	400	435
Glass	220	200	255	290	235	210	290	360	410	355
Investment: small	210	90	40	50	45	30	30	30	25	25
large	105	90	(100)	40	35	(15)	15	(15)	(65)	50
Jewellery	2,430	2,880	2,830	2,590	2,820	2,510	2,160	1,965	1,620	1,595
Petroleum	125	115	110	130	130	120	150	170	185	230
Other	305	335	375	465	540	470	470	475	490	490
Total Demand	5,370	5,590	5,680	6,230	6,470	6,530	6,540	6,695	6,730	6,925
Movements in Stocks	30	(720)	(390)	(370)	(500)	(330)	(50)	(55)	65	(265)
Average Price (US\$)	372	377	545	529	540	691	846	897	1,143	1,256

JMI



Platinum Demand by Application: Regions										
'000 oz	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Europe										
Autocatalyst: gross	545	560	680	1,060	1,210	1,455	1,680	1,960	2,095	2,105
recovery	(30)	(30)	(40)	(70)	(90)	(115)	(145)	(170)	(185)	(215)
Chemical	60	80	100	105	115	105	115	100	105	110
Electrical	45	70	80	65	40	35	40	40	35	40
Glass	25	20	20	10	10	10	5	10	10	20
Investment: small	5	5	0	0	0	0	0	0	0	0
large	0	0	0	0	0	0	0	0	0	70
Jewellery	160	185	190	170	160	190	195	195	190	205
Petroleum	15	15	15	15	15	15	15	15	15	15
Other	85	90	105	155	190	185	190	175	180	180
Total	910	995	1,150	1,510	1,650	1,880	2,095	2,325	2,445	2,530
Japan										
Autocatalyst: gross	240	250	290	340	430	500	615	600	605	615
recovery	(55)	(60)	(60)	(55)	(55)	(60)	(55)	(35)	(35)	(35)
Chemical	20	20	20	25	30	40	40	50	50	55
Electrical	55	75	90	80	55	40	50	65	65	70
Glass	80	65	65	85	60	85	90	95	100	60
Investment: small	25	20	5	5	5	5	0	0	0	0
large	105	90	(100)	40	35	(15)	15	(15)	(65)	(20)
Jewellery	1,290	1,320	1,060	750	780	660	560	510	360	305
Petroleum	5	5	5	5	5	5	5	5	10	10
Other	30	35	35	35	55	40	40	45	45	45
Total	1,795	1,820	1,410	1,310	1,400	1,300	1,360	1,320	1,135	1,105
North America										
Autocatalyst: gross	775	535	620	795	570	885	800	820	905	900
recovery	(310)	(315)	(350)	(370)	(380)	(420)	(435)	(505)	(575)	(575)
Chemical	80	95	100	100	100	95	90	100	105	100
Electrical	105	120	145	120	100	85	90	95	95	90
Glass	20	25	50	35	30	(30)	(10)	5	10	25
Investment: small	175	60	35	45	40	25	25	25	20	20
Jewellery	270	330	380	280	310	310	290	275	240	235
Petroleum	40	40	35	40	45	40	35	35	40	45
Other	170	190	210	250	265	215	205	220	225	225
Total	1,325	1,080	1,225	1,295	1,080	1,205	1,090	1,070	1,065	1,065
Rest of the World (inc. China)										
Autocatalyst: gross	240	265	300	325	380	430	395	415	535	615
recovery	(10)	(15)	(20)	(35)	(40)	(50)	(55)	(60)	(60)	(60)
Chemical	120	125	75	60	80	80	80	75	120	130
Electrical	95	105	140	120	120	100	120	160	205	235
Glass	95	90	120	160	135	145	205	250	290	250
Investment: small	5	5	0	0	0	0	5	5	5	5
Jewellery	710	1,045	1,200	1,390	1,570	1,350	1,115	985	830	850
Petroleum	65	55	55	70	65	60	95	115	120	160
Other	20	20	25	25	30	30	35	35	40	40
Total	1,340	1,695	1,895	2,115	2,340	2,145	1,995	1,980	2,085	2,225

Palladium Supply and Demand										
'000 oz	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Supply										
South Africa	1,820	1,870	1,860	2,010	2,160	2,320	2,480	2,605	2,905	2,795
Russia	5,800	5,400	5,200	4,340	1,930	2,950	4,800	4,620	3,900	4,240
North America	660	630	635	850	990	935	1,035	910	985	1,000
Others	120	160	105	120	170	245	265	270	270	285
Total Supply	8,400	8,060	7,800	7,320	5,250	6,450	8,580	8,405	8,060	8,320
Demand by Application										
Autocatalyst: gross	4,890	5,880	5,640	5,090	3,050	3,450	3,790	3,865	4,040	4,380
recovery	(175)	(195)	(230)	(280)	(370)	(410)	(530)	(625)	(800)	(945)
Chemical	230	240	255	250	255	265	310	415	425	355
Dental	1,230	1,110	820	725	785	825	850	815	620	620
Electronics	2,075	1,990	2,160	670	760	900	920	970	1,060	1,100
Jewellery	235	235	255	240	270	260	930	1,430	995	745
Other	115	110	60	65	90	140	290	485	130	350
Total Demand	8,600	9,370	8,960	6,760	4,840	5,430	6,560	7,355	6,470	6,605
Movements in Stocks										
	(200)	(1,310)	(1,160)	560	410	1,020	2,020	1,050	1,590	1,715
Average Price (US\$)										
	284	358	681	603	337	201	230	201	320	353
JMI										



Palladium Demand by Application: Regions										
'000 oz	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Europe										
Autocatalyst: gross	1,370	1,530	1,900	1,730	1,370	1,220	1,105	975	880	895
recovery	(5)	(10)	(15)	(30)	(45)	(70)	(110)	(165)	(220)	(295)
Chemical	65	65	95	65	70	65	70	155	165	90
Dental	210	180	100	50	55	70	80	75	75	70
Electronics	270	255	265	35	85	85	115	80	105	145
Jewellery	50	50	45	35	35	35	35	35	40	45
Other	25	25	20	20	15	20	25	20	20	290
Total	1,985	2,095	2,410	1,905	1,585	1,425	1,320	1,175	1,065	1,240
Japan										
Autocatalyst: gross	480	600	510	505	520	550	635	660	795	840
recovery	(50)	(55)	(50)	(40)	(40)	(40)	(40)	(30)	(30)	(35)
Chemical	20	20	20	20	20	25	25	25	25	25
Dental	590	545	470	475	505	515	520	475	270	265
Electronics	1,060	980	990	260	140	225	235	265	275	260
Jewellery	105	105	150	140	165	160	155	145	130	125
Other	10	10	15	10	10	5	10	10	5	15
Total	2,215	2,205	2,105	1,370	1,320	1,440	1,540	1,550	1,470	1,495
North America										
Autocatalyst: gross	2,820	3,490	2,805	2,375	640	1,205	1,445	1,430	1,470	1,640
recovery	(115)	(125)	(155)	(200)	(260)	(270)	(345)	(390)	(500)	(560)
Chemical	70	75	65	75	75	70	85	85	80	80
Dental	390	350	230	190	215	225	235	250	260	265
Electronics	460	405	485	250	210	215	185	195	190	200
Jewellery	10	10	10	10	10	10	10	20	40	50
Other	55	50	5	15	45	95	230	435	85	20
Total	3,690	4,255	3,445	2,705	925	1,540	1,845	2,025	1,625	1,695
Rest of the World (inc. China)										
Autocatalyst: gross	220	260	425	480	520	475	605	800	895	1,005
recovery	(5)	(5)	(10)	(10)	(25)	(30)	(35)	(40)	(50)	(55)
Chemical	75	80	75	90	90	105	130	150	155	160
Dental	40	35	20	10	10	15	15	15	15	20
Electronics	285	350	420	125	325	375	385	430	490	495
Jewellery	70	70	50	55	60	55	730	1,230	785	525
Other	25	25	20	20	20	20	25	20	20	25
Total	710	815	1,000	770	1,000	1,015	1,855	2,605	2,310	2,175
JMC										

Rhodium Supply and Demand										
'000 oz	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Supply										
South Africa	400	410	457	452	490	544	587	627	690	695
Russia	110	65	290	125	90	140	100	90	95	70
North America	16	18	17	23	25	26	17	20	20	20
Others	4	8	3	4	10	14	16	17	19	19
Total Supply	530	501	767	604	615	724	720	754	824	804
Demand by Application										
Autocatalyst: gross	483	509	793	566	599	660	758	829	867	861
recovery	(57)	(65)	(79)	(88)	(99)	(124)	(140)	(137)	(169)	(179)
Chemical	31	34	39	44	39	39	43	48	48	55
Electrical	6	6	7	6	6	6	8	10	9	10
Glass	34	35	42	41	37	26	46	57	65	38
Other	10	9	10	10	10	13	14	20	21	23
Total Demand	507	528	812	579	592	620	729	827	841	808
Movements in Stocks										
	23	(27)	(45)	25	23	104	(9)	(73)	(17)	(4)
Average Price (US\$)										
	617	907	1,998	1,604	838	530	986	2,056	4,552	6,069
JMI										

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 is total purchases by consuming industries less any sales back to the market. Annual totals therefore represent the amount of primary metal that is acquired by consumers in a particular year. We continue to report Russian supply figures net of Russian and ex-CIS states' demand.

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. Exchange traded funds are included in European Investment: large for platinum and Other demand for palladium.

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.

Average price figures for 2007 are for the period January-September.

GLOSSARY

<i>BEE</i>	<i>Black Economic Empowerment</i>	<i>Platreef</i>	<i>A platiniferous ore body in South Africa</i>
<i>CIS</i>	<i>Commonwealth of Independent States</i>	<i>PM</i>	<i>Particulate Matter</i>
<i>CO</i>	<i>Carbon Monoxide</i>	<i>PMR</i>	<i>Perpendicular Magnetic Recording</i>
<i>CSF</i>	<i>Catalysed Soot Filter</i>	<i>ppm</i>	<i>Parts Per Million</i>
<i>DMFC</i>	<i>Direct Methanol Fuel Cell</i>	<i>ppt</i>	<i>Parts Per Thousand</i>
<i>DOC</i>	<i>Diesel Oxidation Catalyst</i>	<i>PTA</i>	<i>Purified Terephthalic Acid</i>
<i>DPF</i>	<i>Diesel Particulate Filter</i>	<i>SCR</i>	<i>Selective Catalytic Reduction</i>
<i>ETF</i>	<i>Exchange Traded Fund</i>	<i>SUV</i>	<i>Sports Utility Vehicle</i>
<i>g</i>	<i>Gram</i>	<i>TOCOM</i>	<i>Tokyo Commodity Exchange</i>
<i>HC</i>	<i>HydroCarbons</i>	<i>ton</i>	<i>Short ton (2,000 pounds or 907 kg)</i>
<i>HDD</i>	<i>Heavy Duty Diesel</i>	<i>tonne</i>	<i>1,000 kg</i>
<i>HIC</i>	<i>Hybrid Integrated Circuit</i>	<i>TWC</i>	<i>Three-Way Catalyst</i>
<i>kg</i>	<i>Kilograms</i>	<i>UG2</i>	<i>A platiniferous ore body in South Africa</i>
<i>LCD</i>	<i>Liquid Crystal Display</i>	<i>ULEV</i>	<i>Ultra Low Emissions Vehicle</i>
<i>Merensky</i>	<i>A platiniferous ore body in South Africa</i>	<i>VAM</i>	<i>Vinyl Acetate Monomer</i>
<i>MLCC</i>	<i>Multi-Layer Ceramic Capacitor</i>		
<i>NOx</i>	<i>Oxides of nitrogen</i>		
<i>NYMEX</i>	<i>New York Mercantile Exchange</i>		
<i>OBD</i>	<i>On-Board Diagnostics</i>		
<i>oz</i>	<i>Ounces troy</i>		
<i>PDP</i>	<i>Plasma Display Panels</i>		
<i>PEMFC</i>	<i>Proton Exchange Membrane Fuel Cell</i>		
<i>PET</i>	<i>PolyEthylene Terephthalate</i>		
<i>pgm</i>	<i>Platinum Group Metal(s)</i>		

NOTE ON PRICES

All prices are quoted per oz unless otherwise stated.

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

PICTURE CREDITS

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