

Europe, Middle East & Africa: Metals & Mining: Precious

Something's got to give: Platinum price needs to support reality

Platinum price to advance past US\$2,800/oz in 2012E

We expect PGM prices to establish new, sustained highs, as the market needs to incentivise investment in new capacity. In our view, the PGM market is likely to enter a multi-year deficit on strong primary demand that is under-supplied due to continuing issues with South African production. We believe PGM prices will be largely driven by “cost push” effects as producers struggle with structural price inflation and shrinking production from current assets. The need to bring near-term mothballed capacity back online and commission expansion projects—both outside today's cost curve—will require prices to move up to support industry returns.

China jewellery and autos to take demand past pre-crisis levels

Demand should return to 2007 levels on increased auto production and sustained jewellery demand as millions of Chinese consumers enter the market for platinum. We expect this in spite of higher prices, as we see the number of potential consumers outweighing the impact of price elasticity.

South African supply issues worse than pre-crisis

In South Africa, issues of cost inflation and supply security from early 2008 have not been addressed. Replacement projects are further away than they were pre-crisis. We expect the following problems to escalate: (1) cost inflation; (2) late projects; (3) power issues and (4) safety related stoppages. We do not see any alternative production closing the gap with demand.

Eastern Platinum our best Buy idea: Low-cost volume growth

We initiate on Eastern Platinum (Eastplats) as Buy and add it to our Conviction List. A low cost position and significant near-term volume growth (with options) make Eastplats stand out among PGM juniors. Major producers bear the brunt of legacy issues, such as high costs from older mines and poor safety records. We increase our price target for Anglo Platinum and upgrade it to Neutral from Sell on cost improvements. We reiterate our Sell rating on Impala Platinum and maintain a Neutral rating on Lonmin, cutting our 12-month price target to 1,950p.

Sustained economic slowdown is the biggest risk to our view

A double dip or sustained slowdown would reduce autos demand and delay the deficit we expect in the platinum market. This would have a negative impact on the price rises that we forecast.

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ACTION

	Old Rating	New Rating	Price	12m price target/ potential upside	Previous
AMSJ.J	Sell	Neutral	R710	R1000 41%	R804
IMPJ.J	Sell	Sell	R191	R230 20%	R221
LML.L	Neutral	Neutral	1439p	1950p 36%	2623p
ELRq.L		Buy*	60p	120p 100%	

* denotes Conviction List membership

Source: Datastream, Goldman Sachs Research estimates.

CHANGES TO EPS ESTIMATES

	Current year		Next financial year		Year end
	New	Old	New	Old	
AMSJ.J	R28.3	R28.0	R52.5	R44.1	Dec
IMPJ.J	R13.26	R14.13	R19.22	R18.58	Jun
LML.L	\$0.66	\$0.98	\$1.04	\$1.72	Sept
ELRq.L	\$0.05		\$0.08		Dec

RELATED RESEARCH

Eastern Platinum (ELRq.L) Buy: Our favoured exposure to rising PGM prices; Conviction Buy

Luxury Goods: A trillion dollar global industry by 2025?; June 2, 2010

Japan: Automobiles: New era of mixed powertrains; May 21, 2010

Coverage view: Attractive

With this report, Eugene King assumes primary coverage of Anglo Platinum, Impala Platinum and Lonmin plc.

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EXPECTED NEWS FLOW/EVENTS

DATE	EVENT
July 22, 2010	Lonmin 2Q 2010 production report
July 26, 2010	Anglo Platinum 1H 2010 results
August 26, 2010	Implats 2010 full-year results

Source: Company data, Goldman Sachs Research estimates

The prices in the body of this report are based on the market close of July 21, 2010.

Platinum price to top US\$2,800/oz on cost, supply issues

We believe that PGM prices will increase and remain at levels well above historical trends. On our calculations, two factors are driving prices higher: (1) continuing cost inflation means that a platinum price of c.US\$2,100/oz will be required by the 85th percentile producer by 2014; and (2) our supply-demand analysis suggests that the market will enter another period of sustained deficit from 2010. We believe that the industry will likely react by bringing back high-cost supply to close the gap, but we see the need for investment in new build capacity. To incentivise new capacity expansion projects in South Africa and Zimbabwe, our analysis suggests that the platinum price needs to rise to US\$2,650/oz by 2014/15 to enable acceptable returns. We see the price spiking in the interim to above US\$2,800 on short-term supply problems. With no realistic alternative scale production outside South Africa or Zimbabwe and with demand growing, we expect prices to move to support the economics of the industry.

Cost inflation requires a platinum price of US\$2,100 for the 85th percentile producer in 2014/15

Unit cost inflation in South Africa's PGM mines ran at c.20% pa in 2005-09, driven by increases in gross costs (labour, explosives, and power) and declining production from ageing mines, where lower grades and great distances place further upward pressure on unit costs. Although we expect some slowdown in cost inflation as the industry attempts to restructure operations, we calculate that a platinum price of US\$2,100/Pt oz (allowing for by-product revenue) would be needed for the 85th percentile producer to break even in 2014.

Platinum to be in deficit in 2011-15E, additional capacity is required

We see demand returning to 2007 pre-crisis levels in 2010E as the auto industry restocks, and car sales return to normal levels in developed markets and take off in China/other BRICs. With a robust demand outlook, we focus on supply, as the issues experienced in early 2008 have not been addressed by the industry. Indeed, supply issues have worsened. Mines are older, deeper and require more stay-in-business capital. Projects delayed due to the financial crisis are now years away from delivery growth (or replacement) ounces.

US\$2,650/Pt oz needed to incentivise new capacity in 2014E

We believe that miners will bring back recently mothballed capacity (such as Anglo's Boschfontein and Lonmin's open pit mines) to close the supply-demand deficit. These mines are outside the 2010 cost curve, in our view – hence why they were shuttered. The consequence of bringing back these mines will be an increase in the average unit cost of production. To solve the deficit in the long run, we believe that the industry will need to approve new build capacity. The dilemma for miners is that the required average platinum price will be outside today's cost curve. We believe this is the case with Anglo's Twickenham mine on the Eastern Limb, for example. Modelling a theoretical new-build shaft on the Eastern Limb, we estimate that the platinum price will need to average US\$2,650/oz from 2014 onwards in real terms for such a project to earn its cost of capital.

China could regularly take c.2 mn Pt oz of platinum jewellery

Much has been made of the sharp increase in Chinese jewellery demand for platinum in 2009 amid a weak platinum price post financial crisis. We believe the jump in Chinese jewellery demand is widely regarded as a one-off event. Our view differs for two reasons: (1) we see platinum as being a preferred luxury fashion item in China, providing more resilience against inevitable price rises; and (2) the number of additional consumers able to afford discretionary jewellery purchases in the US\$250-300 range is set to rise massively in the next five years. We believe that even if there is initial resistance to higher prices, gross jewellery demand in China will eventually grow to a sustained level of 2 mn platinum oz/year.

Global auto sales and move to CO₂ reduction positives for autocats

Our autos team estimates that 2010 global auto production will return to pre-crisis levels. We believe that given the dramatic PGM destocking by the auto companies during the economic crisis, PGM restocking and vehicle production will take demand back to 2007 levels, well ahead of 2008 and 2009. If we consider the continuing strong auto growth in China and other BRICs, tightening emissions regulation, a boost from CO₂ technologies like Stop/Start and Hybrid powertrains, and the reduction in recycling inventory, we expect net demand required from mining to return to 2007 levels and remain robust.

South African supply issues remain

The global financial crisis has delayed the delivery of replacement and growth projects in South Africa (e.g. Anglo Plat's Tumela 4). As major PGM producers slowed or postponed capital spending programmes in 2008 and 2009, major replacement and growth projects were delayed by an average of three years. South African supply is thus in a worse position today than it was pre-crisis. Moreover, safety concerns have also weighed on the industry. Recently, for example, seven miners were killed in South Africa in two weeks (at Aquarius and Northam), and the DMR suspended workings at Aquarius's Marikana mine and is currently negotiating on its redesign.

In the Eastern Limb they trust...with more juniors than ever

Two additional supply themes are the rise of juniors and the expansion of the Eastern Limb. After many years of BEE (Black Economic Empowerment) deals and the seeming attractiveness of PGM projects, more junior miners than ever are controlling a higher proportion of the industry's growth. Today, we estimate that c.4% of South Africa's platinum output is produced by juniors and that this will be c.10% by 2015. Juniors are generally less well capitalised and have less experience in bringing projects to full production, so represent a relative risk to project delivery, in our view.

In addition, the Eastern Limb is finally being developed in earnest. The issue for the industry is that Eastern Limb projects require higher capital as there is additional infrastructure to build (e.g. dams and roads) and significant costs associated with moving people out to run the mines. We expect projects in the Eastern Limb to cost more and take longer to build, putting further stress on South African supply.

Palladium price to move faster, but platinum to rise too

It is easy to appreciate why palladium is often identified as the preferred metal among the PGMs. We highlight two short-term drivers for palladium prices: (1) on our estimates, the Chinese auto industry will consume c.1.5 mn additional oz of palladium/year by 2015 as car ownership proliferates and tightening emissions standards are introduced; and (2) Russian stockpiles could run out in the next 4-6 years. Given that Russian stocks are providing c.600k Pd oz/year to meet the global production shortfall, a potential depletion of these stockpiles (although we note the limited visibility on where they stand) would result in a significant shortage of palladium. Ultimately, we believe that as the palladium market begins to tighten and prices rise, the economics will become attractive to switch back to platinum. In our view, both platinum and palladium prices will rise in the next few years; it is simply a question of timing. We expect the initial upward pressure from palladium followed by the switch back to platinum to push overall PGM prices up.

If it's so clear, why hasn't it happened yet? Platinum bull story is not new

We believe the bull price scenario for platinum is unfolding, as illustrated by the increase of 3x in the platinum price since 2002 (Exhibit 2). In our view, the positive case for PGMs has been clouded by a period of extreme price volatility. First, the power supply crisis in South Africa drove prices to US\$2,200/oz and the global financial crisis led to a virtually instant evaporation of industrial demand matched by a flow back of physical metal from ETFs, causing the price to dip below US\$900/oz in 3Q2008. Today, the price of platinum has returned to a level where miners are able to earn their cost of capital. However, we believe that significantly higher prices will be needed to sustain future returns and incentivise new capacity.

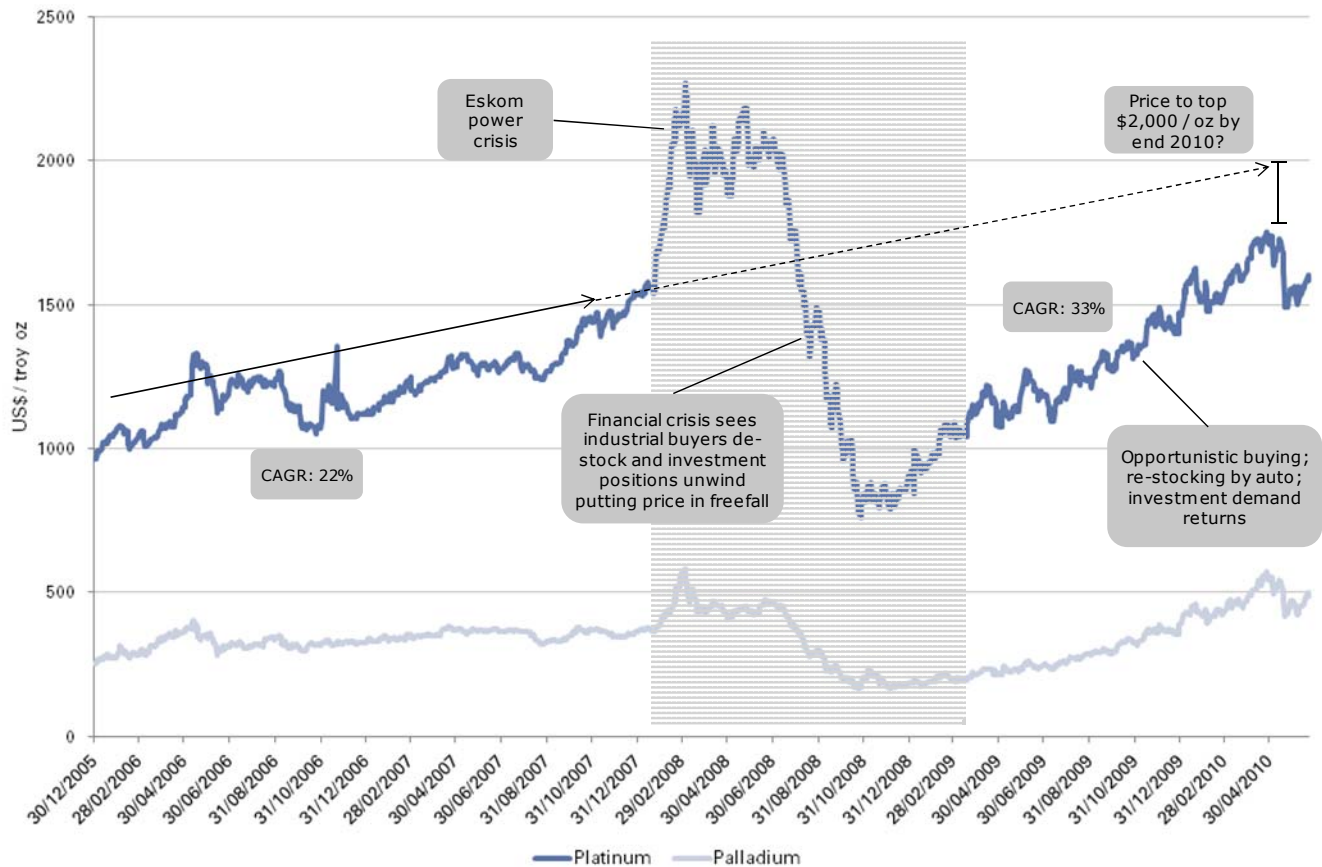
Exhibit 2 shows that the price of platinum has returned to its long-run evolution towards US\$2,000/oz. By 1Q2008, the price cleared US\$1,500/oz for the first time, on supply shortages in South Africa and robust demand. Following the Eskom power crisis, the price spiked to US\$2,200/oz. We believe this jump reflected the price needed to support investment in new capacity at industry economics in 2008, as well as a level that rationed the most price-sensitive demand.

The financial crisis simultaneously saw physical demand from industrial buyers evaporate as the auto industry destocked, faced with bankruptcy, and speculators liquidating positions in PGM ETFs at any price to cover other positions as global stock markets fell. Platinum demand fell c.15% in 2009 vs. 2007 (c.1 mn Pt oz), and the price collapsed to below US\$900/oz.

In 2009, the average cost to deliver a platinum oz from a South African mine was running at US\$1,400/oz. Once destocking was complete and confidence returned to the economy, the market got back on track (see Exhibit 2). Prior to the power crisis in early 2008, supply concerns drove the price over US\$1,500/oz. We believe that the platinum market has lost 12-15 months to the financial crisis and is now back on the steady march towards a stable platinum price above US\$2,000/oz, driven by real demand and unresolved supply issues in South Africa.

We believe recent softness in PGM prices has been driven by wider concerns over a weaker economic recovery – or even a double-dip recession. If this scenario were to unfold over the next few months, our conclusion would remain unchanged: just the timing of when it happens would be different. In our view, once solid growth comes through, demand will overtake supply and PGM prices will rise to support supply-side economics.

Exhibit 1: 2008 was a unique period: We see a continuation of the long-term price trend going forward
 Platinum price to reach US\$2,000/oz by end of 2010?



Source: Datastream; Goldman Sachs Research.

Our two key conclusions are:

- **Demand should return to 2007 levels by the end of 2010 and is set to grow at a c.4% CAGR:** We believe that demand for platinum will return to early 2007 levels in developed markets, further boosted by Chinese autos sales and sustained Chinese jewellery demand. Extra investment demand coming from Exchange Traded Funds (ETFs) and speculative investment should also boost the platinum price. Our autos analysts estimate that total global car production will grow from 65 mn units in 2010 to 85 mn by 2015 on BRICs demand.
- **Supply concerns have not been addressed; in fact, we believe they have intensified:** Industry capacity is lower today than in 2008, when the power crisis caused the platinum price to spike by 40% to US\$2,200/oz. Over the past two years, capacity has been retired and major projects have been delayed; moreover, power supply threats remain in South Africa.

The financial crisis and the ensuing recession delayed the supply crunch; however, the fundamentals of the industry have not changed; supply is still short and it appears that prices have only one way to go.

Eastplats our best way to get exposure to rising PGM prices

In our view, Eastern Platinum (Eastplats) is the best way to gain exposure to rising Platinum Group Metals (PGM) prices. Eastplats is a producing junior (c.130k PGM oz in 2009 from its Crocodile River mine (CRM)), with low costs and a robust plan to double production by 2013/14. We believe the value of CRM alone implies upside from the current share price, and see further value in the company's growth projects on the Eastern Limb of the Bushveld complex in South Africa (the Maresburg and Spitzkop/Kennedy's Vale properties). We initiate on Eastplats as Conviction Buy. For details, please see *Eastern Platinum (ELRq.L) Buy: Our favoured exposure to rising PGM prices; Conviction Buy*, also published today.

Separately, we upgrade Anglo Platinum from Sell to Neutral on improved costs and a slightly enhanced production profile.

Eastplats 12-month price target 120p, 100% upside potential

We value Eastplats' volumes to 2010E using a mid-cycle EV/EBITDA multiple on a mid-cycle margin per PGM oz. We value its 2010-2015E growth potential separately, adding to this the present value of its above-mid-cycle cash flows. The stock trades on 2010/11E EV/EBITDA multiples of 7.9x/5.8x vs. 11.2x/6.6x for our precious metals coverage; the recent share price weakness was market-related in our view, and not driven by stock-specific factors. As such, we believe the current share price represents an attractive entry point.

PGM majors have highest exposure to industry challenges

Major producers such as Anglo Platinum, Impala and Lonmin bear the brunt of legacy issues and high costs associated with having the oldest mines with poor safety records. Cost inflation is running at c.20% pa for the majors, and while each has achieved some success in limiting cost growth, these are only temporary respites. The age, depth and scale of their operations make a reversal of cost inflation appear an unrealistic proposition. In addition, we believe that the majors will also face increasing pressure from the Department of Mines (DMR) safety inspectors and the major unions. We maintain a positive view on the platinum sector overall, but prefer exposure to producing juniors with significant volume expansion to hedge against cost inflation.

Anglo Platinum best positioned of the majors; 12-month price target R1,000

Anglo Platinum has outperformed the other majors over the past three months on the back of a successful cost-cutting effort and improving production outlook (mainly on Mogalakwena tonnages). We expect 2010 earnings to reflect both these successes fully and therefore see the highest upside potential for Anglo Plat among the majors for the next 12 months.

We increase our 12-month price target to R1,000 (from R804) and upgrade our rating to Neutral from Sell. We raise our EPS estimates on the back of the company's cost reduction efforts, which have slowed cost inflation in 2009 and 2010, and an expanded production profile – mainly from the gigantic Mogalakwena open pit mine. We believe that the appointment of Anglo American's CEO, Cynthia Carroll, as Chairman of Anglo Platinum should improve the speed and quality of strategic decision-making at Anglo Plat, potentially leading to a faster return of the dividend and more rapid moves to reduce the reliance on legacy mines.

One significant risk to our view is the potential implications of the DMR's requirements to modify or limit certain types of mechanized mining at the Bathopele and Aquarius operations, in particular a reduction in bord widths. The DMR's decision could affect Anglo Plat's short-term production and longer-term project economics. We estimate that the affected mines contribute up to c.250-280k Pt oz to Anglo Platinum (130k from Bathopele and c.150k from Aquarius's Kroondal and Marikana mines on a pool & share basis).

Lonmin (LMI.L) remains Neutral but 12-month price target cut to 1,950p

In our view, among the majors, Lonmin offers the greatest potential for improving returns in the medium term. We calculate that 2009's production was c.200k Pt oz below full capacity of the asset base, and note that the company is experiencing ongoing difficulty with its furnace. As a consequence of the low production vs. capacity, unit costs are the highest of the majors and at the top end of the cost curve.

We believe there is significant upside potential at Lonmin. The market appears concerned about whether management is on the right path to deliver improvements and over what timeframe. In our view, developments at the company have clearly been positive over the past 18 months, but there are still further significant opportunities to improve returns for shareholders. Of the majors, Lonmin has the lowest CROCI and the highest cost position. However, with the right execution, we believe it could deliver the highest upside to production. In our view, progress on quality ore tonnes mined is what is needed to address the unit cost position and demonstrate that there is a production trajectory towards somewhere above 800k Pt oz/year.

As expected, Lonmin's 3Q2010 production report contained a mismatch between metal production and metal sales due to the smelter issues. In addition, management confirmed a toll processing agreement that will add US\$17.5 mn to 4Q costs. We expect this contract to roll over into 1Q2011 as well, as the #1 furnace is rebuilt again. The most disappointing aspect of the 3Q production report was the lack of progress on mined production; this eked ahead on Merensky open pit tonnes, which, while necessary, are not profitable.

We maintain our Neutral rating but reduce our 12-month price target from 2,623p to 1,950p, as we now forecast a slower ramp-up of production than previously expected and higher processing costs in the medium-term.

Impala (IMSJ.J) remains Sell; 12-month price target R230

Impala's management faces a formidable challenge, in our view. To avoid a dramatic drop-off in production due to retiring capacity, the company needs to: (1) turn around production and costs at the Impala mine in Rustenburg; (2) deliver the replacement projects to full capacity (16, 17 and 20 shafts); and (3) secure long-term growth. Management's guidance that the Impala mine will not reach 1 mn Pt oz (down 125k Pt oz from peak in 2006) before 2014/15 highlights the scale of the challenge, in our view.

We estimate that the company will spend significantly more on stay-in-business capital due to catch-up development work, and will have the highest unit cost inflation of the majors (albeit from a low base) for the next 2-3 years. Even with our revised PGM prices, we do not expect EBITDA margins to significantly exceed 35% in 2010-15, compared with an average 45% for the preceding decade.

Investment of an additional US\$500 mn in Zimplats shows the growth dilemma for Impala. Having missed out on Northam in 2008 (and the attractive Booyendal project), the expansion of Zimplats represents the next best alternative investment, despite the uncertainty over repatriating profits and indigenous ownership laws. We view the Zimplats Phase II project favourably, in isolation, given its low cost and easy access. If successful, the investment could drive returns, but visibility is still very low. We maintain our Sell on Impala, with a revised 12-month price target of R230 (from R221).

We expect the platinum market to be in deficit in 2011-15

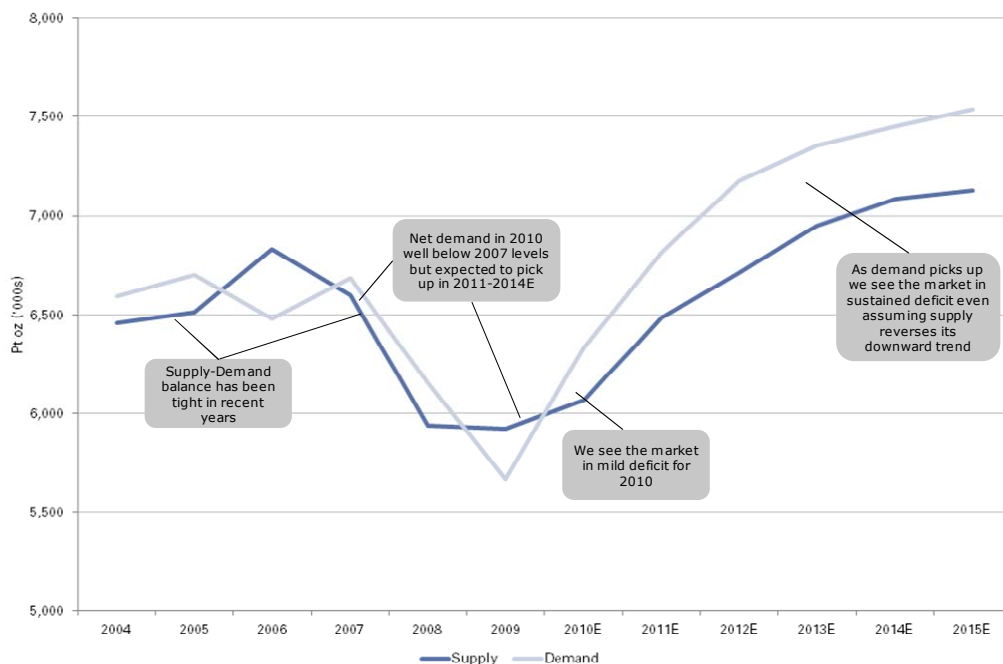
We forecast the platinum supply-demand (S-D) balance to end 2010 with a small deficit, and 2011-15 to run with an expanding deficit on robust demand and under-delivery on supply.

Our central supply-demand themes are:

- Net demand to grow to 7 mn Pt oz by 2012E:** We estimate that demand will return to early 2007 levels by the end of 2010 and continue to grow based on developed market GDP growth, Chinese/other BRICs auto sales growth and sustained Chinese jewellery market demand, driven by a rapid expansion of discretionary spend in China.
- Supply to grow but be outpaced by demand in 2011-15E:** Underperformance by ageing South African mines, late projects and unplanned stoppages from power, safety and industrial action should continue to limit supply.

Exhibit 2: We see an increasing deficit from 2010 onwards

Platinum supply-demand balance over time



Source: Johnson Matthey Platinum 2010, Goldman Sachs Research estimates, Company data.

Exhibit 3: We forecast the platinum market to go into sustained deficit from 2010

Goldman Sachs platinum supply-demand forecast 2010-15E

'000 oz	2004	2005	2006	2007	2008	2009	2010E	2011E	2012E	2013E	2014E	2015E	CAGR ('04-'07)	CAGR ('10-'15)
Supply														
South Africa	4,970	5,120	5,295	5,070	4,515	4,530	4,602	5,001	5,211	5,443	5,582	5,624	0.7%	6.9%
Russia	850	751	752	915	805	785	808	790	790	790	790	790	2.5%	-0.8%
North America	385	365	345	325	325	260	260	260	260	260	260	260	-5.5%	0.0%
Zimbabwe	83	155	165	170	180	230	277	310	325	325	325	325	26.8%	5.5%
Others	115	120	273	120	115	117	120	122	124	127	130	132	1.4%	3.4%
Mine Supply	6,460	6,511	6,830	6,600	5,940	5,922	6,067	6,483	6,710	6,945	7,087	7,131	1%	6%
Auto recycling	705	770	860	935	1,120	809	965	1,126	1,171	1,208	1,235	1,269	9.9%	9.6%
Jewellery recycling	0	0	0	650	695	564	646	664	687	710	735	746	-	4.9%
Total Supply	7,165	7,281	7,690	8,185	7,755	7,295	7,678	8,273	8,568	8,863	9,057	9,146	4.5%	6.0%
Demand by Application	2004	2005	2006	2007	2008	2009	2010E	2011E	2012E	2013E	2014E	2015E	CAGR ('04-'07)	CAGR ('10-'15)
Autocatalyst	3,510	3,795	3,905	4,145	3,660	2,230	3,568	3,885	4,024	4,084	4,071	4,129	5.7%	5.0%
Chemical	325	325	395	420	400	295	363	396	421	427	431	435	8.9%	6.2%
Electrical	300	360	360	255	225	190	210	230	235	235	235	235	-5.3%	3.8%
Glass	290	360	405	470	320	10	263	266	270	265	265	265	17.5%	0.3%
Investment	40	15	-40	170	555	660	731	824	965	1,050	1,135	1,157	62.0%	16.6%
Jewellery	2,160	1,970	1,645	2,110	2,065	3,010	2,118	2,263	2,357	2,447	2,517	2,560	-0.8%	6.5%
Petroleum	150	170	180	205	240	205	227	248	259	260	260	261	11.0%	4.7%
Other	470	475	490	495	500	440	465	491	505	507	508	509	1.7%	3.1%
Gross demand	7,245	7,470	7,340	8,270	7,965	7,040	7,945	8,605	9,035	9,275	9,422	9,551	4.5%	6.3%
Global platinum surplus/(deficit)	-80	-189	350	-85	-210	255	-267	-332	-467	-411	-365	-404		
Platinum price / oz (\$)	845	894	1,137	1,289	1,596	1,175	1,710	2,175	2,688	2,713	2,700	2,700	15.1%	16.4%

Source: Goldman Sachs Research estimates, Johnson Matthey Platinum 2010.

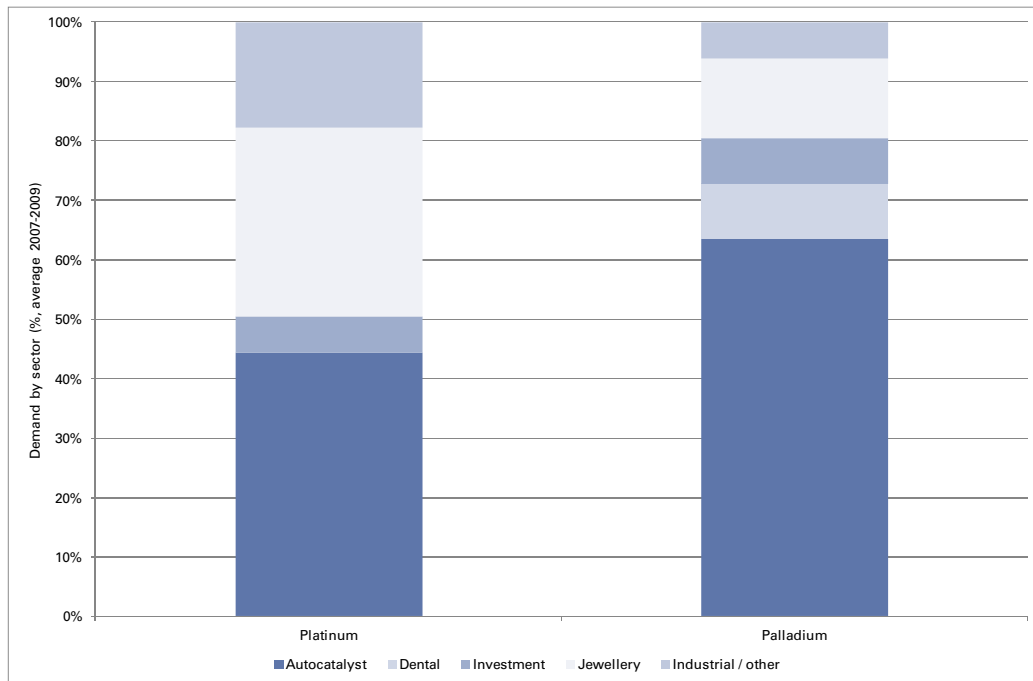
Demand: China/BRIC autos and jewellery to drive demand

We believe that gross demand will return to 2007 levels of over 8 mn Pt oz/year. We then expect it to grow at a similar rate as that seen in 2002-07, c.4% pa.

Demand for PGMs comes from four sectors: autocatalysts, jewellery, industrial/petrochemicals and the relatively new area of investment demand.

Exhibit 4: Jewellery and industrial demand a bigger share of platinum demand; autos drive palladium

Platinum and palladium demand by sector

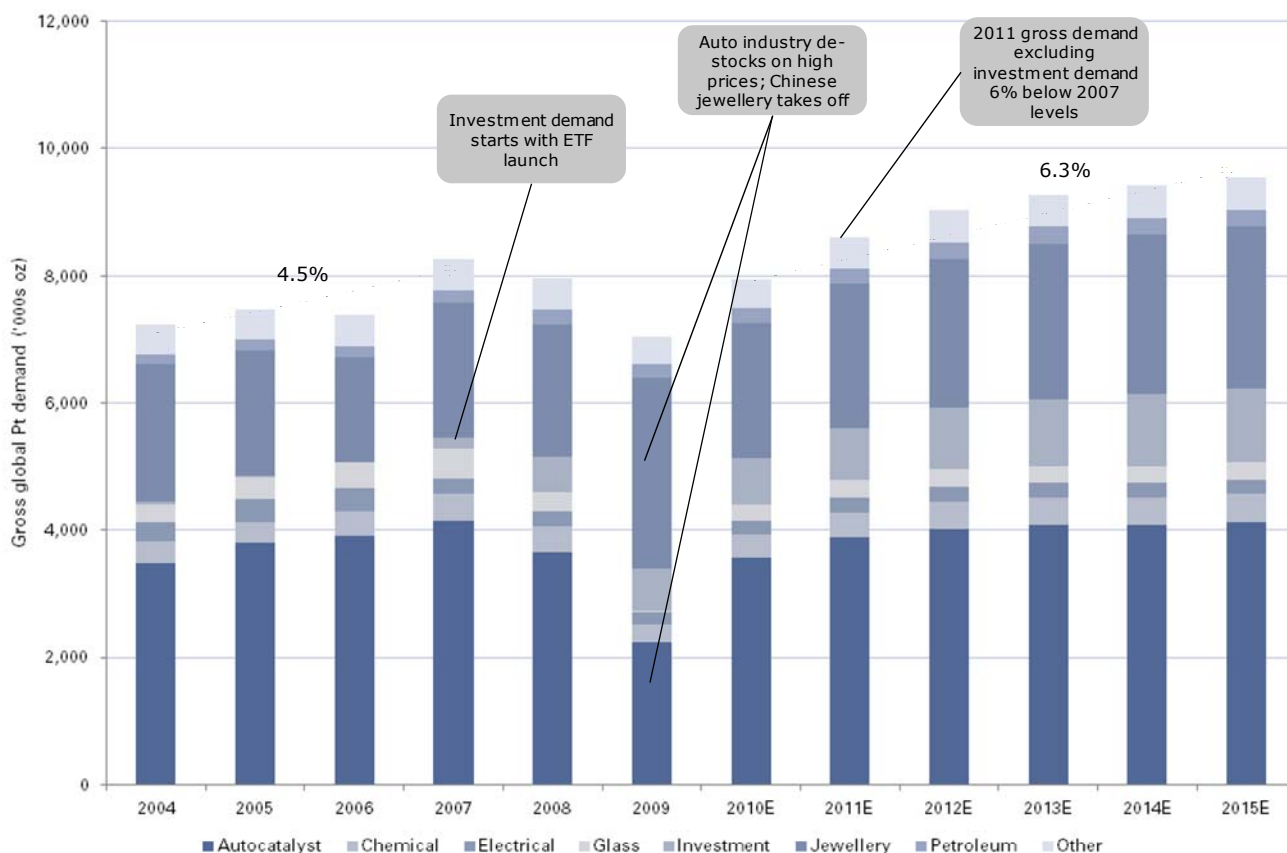


Source: Johnson Matthey Platinum 2010, Goldman Sachs Research estimates.

Industrial demand will return as the industry has destocked and activity levels are returning. The autocatalyst, Chinese jewellery and investment segments together represent c.80% of current demand, thus, we focus our discussion on these areas:

- For autos, we believe that the combination of the increase in total vehicles produced globally and the ever-higher loadings due to tightening emissions legislation will drive the platinum and palladium markets.
- For Chinese jewellery, although we expect demand to slow in 2010 vs. 2009, the increase in the number of consumers in a position to afford platinum in China should outweigh the impact of higher prices in the long run, driving an increase in Chinese platinum jewellery demand.
- We expect investment demand to grow in periods of tightness in the supply-demand balance, but to create volatility and distortions in the primary market. This is because all PGM ETFs are physically backed with no borrowing facilities, meaning that in periods of tightness, physical metal will not be available to the market. Conversely, as prices fall and investors exit the ETFs, metal will flow out, leading to further oversupply in the market.

Exhibit 5: Gross platinum demand to return to pre-crisis levels by 2011E



Source: Johnson Matthey Platinum 2010, Goldman Sachs Research estimates.

Supply: Themes stay the same; missed production, rising costs

PGMs, particularly platinum and rhodium, are almost unique commodities in that 90+% of reserves are located in South Africa or Zimbabwe. Smaller deposits exist in Canada, Australia and Russia (mainly palladium) as by-products of nickel mining, but the industry is dependent on Southern Africa. Given this lack of alternative production centres and the challenges facing the industry, we expect to see continuing production shortfalls, late products and high cost inflation.

Supply from South Africa has shrunk by nearly 750k Pt oz since 2006, due to more stringent safety standards causing stoppages and slower extraction, as well as infrastructure problems such as the power crisis of 2008.

Our analysis suggests that a further 1 mn Pt oz of production will be required from Southern Africa in the next five years to meet global demand. Theoretically, current commitments should result in a balanced supply-demand situation going forward; however, given a history of production shortages and delays, we discount this planned production by the historical shortfall and assume delays at some of the non-producing junior miners.

Industry actions support our price thesis

We believe three actions by the miners support our price thesis for 2010-15:

- **Breakeven cost of the marginal producer is US\$1,450/Pt oz:** We estimate that the breakeven cost of the marginal producer in 2010 will be c.US\$1,450/Pt oz (including stay-in-business capital and allowing for by-product credits).
- **Capacity on care and maintenance will come back at a cost outside the cost curve:** The miners will bring back near-term shuttered capacity (e.g. Boschfontein, Lonmin's Limpopo, open cast mines) at a cost/oz outside today's marginal cost (we believe this is on average c.US\$1.900/Pt oz including by-product credits).
- **Marginal producer's unit cost will be US\$2,100/oz by 2014/15E:** We have calculated our 2015 cost curve using our revised price assumptions and still estimate that the 2015 marginal producer's cost/oz will be US\$2,100/Pt oz.
- **Loss-making Merensky will be mined to balance the smelter feed:** Lonmin and Anglo Platinum both need to boost their Merensky ore tonnes as a ratio of UG2 to support their smelting operations. With such a high percentage of UG2 mined, both companies do not have enough base metal content (Mer has significantly more Ni and Cu) for their smelters and it is more difficult to blend down their chrome percentage (Mer has virtually none, UG2 up to 30% chrome by weight). We believe Lonmin's decision to re-open its open pit mines will be loss making, but the company needs to increase Merensky tonnes. This will increase average cost/Pt oz for Lonmin.
- **Industry requires incentive pricing:** Between now and 2015, miners will need to approve project capex for expansions of current mines or new, deeper level mines, which would require a cost/Pt oz of at least US\$2,650 (in 2014) to support the investment case (as shown in Exhibit 6, which outlines the economics of a new-build mine on the Eastern Limb). This is not without a challenge for the major PGM miners – going to their respective boards to approve projects that are likely to be outside today's cost curve and require a sustained price above historical averages.

Exhibit 6: We estimate US\$2,650/Pt oz is required to incentive new build capacity

Project economics for a 225 Pt oz/year platinum mine on the Eastern Limb, South Africa

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capital (\$ M)	-200	-200	-250	-250											
Pt Oz refined (k)				50	150	225	225	225	225	225	225	225	225	225	225
Basket Price / Pt oz				3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675
Revenue (R M)	-	-	-	184	551	827	827	827	827	827	827	827	827	827	827
Cost / Pt oz	1,833	2,017	2,218	2,440	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684
Cost inflation		10%	10%	10%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total costs (\$ M)	-	-	-	122	403	604	604	604	604	604	604	604	604	604	604
EBITDA	-	-	-	62	149	223	223	223	223	223	223	223	223	223	223
DDA				7.5	22.5	33.75	33.75	33.75	33.75	33.75	33.75	33.75	33.75	33.75	33.75
EBIT	-	-	-	54	126	189	189	189	189	189	189	189	189	189	189
Tax / Royalty rate				32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%	32%
Tax / royalty paid				17	40	61	61	61	61	61	61	61	61	61	61
Net income (loss)	-	-	-	37	86	129	129	129	129	129	129	129	129	129	129
Maintenance capex					-9	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5	-13.5
FCF	-	200	-	200	-	250	-	206	99	149	149	149	149	149	149
Capital cost (US\$ m)	900														
IRR	12%														
Basket price \$ / Pt oz	3,675														
Implied \$ Pt / oz	2,650														
SIC capex \$ / Pt oz	60														
DDA / oz	150														

Note: Modeled out to end 2040.

Source: Goldman Sachs Research estimates.

Platinum price to reach US\$2,800/oz and sustain over \$2,700

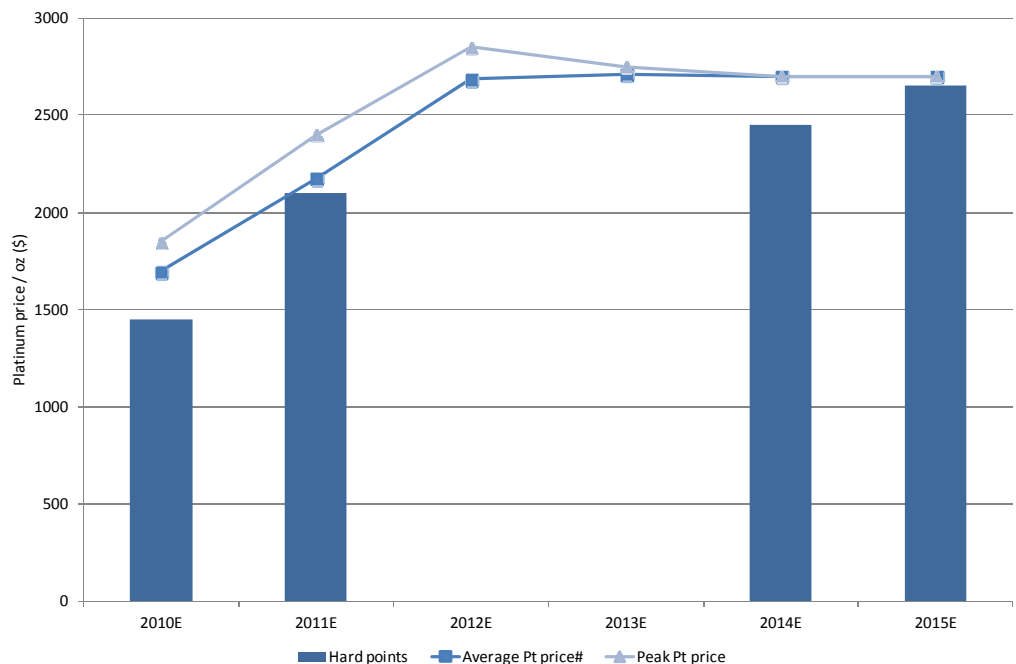
With platinum in deficit and tightening supply-demand for palladium as the Chinese auto industry grows, we believe PGM prices will be first be driven by “cost push”, as producers struggle with structural price inflation and shrinking production from current assets. The need to bring near-term mothballed capacity back online and commission expansion projects – both outside today’s cost curve – will require prices to move to support industry returns. We see three “hard points” that will guide prices:

- We estimate unit cost inflation of existing supply to run at c.10%-12% in 2011-15 – below the 2005-09 levels. We calculate that to break even, the 85th percentile producer needs a minimum price of US\$1,450/pt oz today and US\$2,100/pt oz in 2015.
- We believe that the industry will react to the supply-demand deficit by bringing back recently mothballed capacity at a higher cost (US\$2,100/pt oz in 2011 terms).
- New projects will be sanctioned in the industry, but only at an incentive price above the current cost curve (US\$2,650/pt oz in 2011 terms) to earn a cost of capital.

We believe these three points will guide PGM prices up across 2010-15E. We forecast a peak price of US\$2,800/Pt oz as we believe that at periods of tightness – caused either by a sharp increase in demand or by supply problems, the price will spike above our guide points. This is shown by the South African energy crisis of early 2008, when platinum prices jumped 60% in a month to US\$2,200/pt oz, a level that we estimate to be c.20% above the incentive price at the time.

We show this theoretical progression in Exhibit 7.

Exhibit 7: Goldman Sachs revised platinum price forecasts



Source: Goldman Sachs Research estimates.

We forecast other PGM prices using historical averages in relation to the platinum price (Exhibit 8).

Exhibit 8: Revised commodity price forecasts 2010-14E

		Current Spot	2010E	2011E	2012E	2013E	2014E
Platinum	New	1,506	1,698	2,175	2,688	2,713	2,700
(US\$/oz)	Old		1,800	2,000	2,150	2,200	2,000
	% change		-6%	9%	25%	23%	35%
Palladium	New	456	496	621	768	775	773
(US\$/oz)	Old		420	475	500	450	335
	% change		18%	31%	54%	72%	131%
Rhodium	New	2,140	2,667	3,107	4,057	3,929	3,890
(US\$/oz)	Old		3,000	4,500	6,500	6,000	4,500
	% change		-11%	-31%	-38%	-35%	-14%
Gold	New	1,207	1,181	1,350	1,225	1,001	860
(US\$/oz)	Old		1,261	1,425	1,300	1,059	860
	% change		-6%	-5%	-6%	-5%	0%
Silver	New	17.85	18.96	22.50	20.42	16.68	14.33
(US\$/oz)	Old		21.02	23.75	21.66	17.64	14.33
	% change		-10%	-5%	-6%	-5%	0%
Copper	New	6,469	7,050	8,050	8,595	9,036	6,612
(US\$/t)	Old		7,495	7,935	8,595	9,036	6,612
	% change		-6%	1%	0%	0%	0%
Nickel	New	18,675	18,650	17,500	18,734	18,734	18,734
(US\$/t)	Old		17,719	17,500	18,734	18,734	18,734
	% change		5%	0%	0%	0%	0%

Source: Goldman Sachs Research estimates.

Rand to stay relatively stable versus US dollar

Our economists have updated their forecasts for the rand/US\$ exchange rate. They expect the rand to remain relatively stable; we assume an average rate of 7.5: US\$ for 2010-14E (Exhibit 9).

The rand is so critical because even though the mines are mainly in South Africa, PGMs are sold globally in US dollars. A weaker rand therefore leads to higher revenues. Many miners we have spoken to have stated that they see the rand weakening against the US dollar, thus boosting their revenue and effectively hedging their profit against cost inflation.

Exhibit 9: Exchange rate forecasts 2010-2014E

		Current Spot	2010E	2011E	2012E	2013E	2014E
ZAR:US\$	New	7.59	7.57	7.16	7.27	7.44	7.58
	Old		7.23	7.46	7.48	7.51	7.56
	% change		5%	-4%	-3%	-1%	0%
£:US\$	New	1.51	1.52	1.63	1.62	1.60	1.57
	Old		1.58	1.61	1.59	1.58	1.56
	% change		-4%	1%	2%	1%	0%

Source: Goldman Sachs Global ECS Research, Goldman Sachs Research estimates.

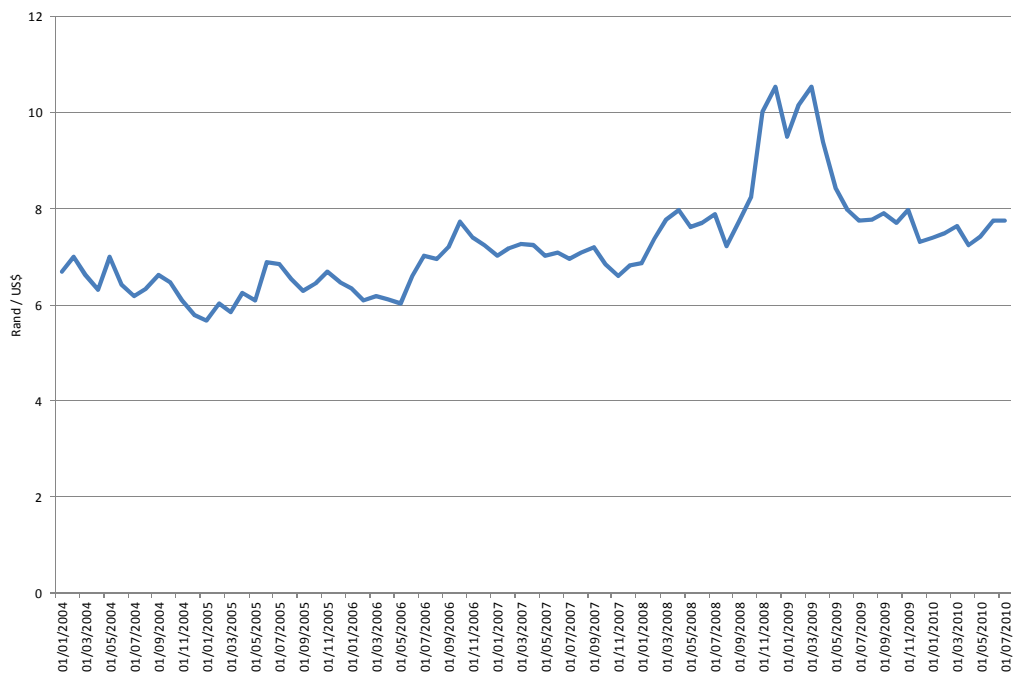
Our economists see the rand as a pro-cyclical currency in view of South Africa’s strong reliance on cyclical industries such as mining. Given our expectation that metal prices will remain strong, we believe the inflow of revenue to South Africa combined with the additional inflows of investment dollars into South African companies should lead to a healthy current account and hence a relatively strong rand against the US dollar.

The only case in which the rand weakened substantially against the dollar was during the global economic slowdown, which led to large outflow of foreign capital from South Africa in 2H2008; during this period, the rand:US\$ rate exceeded 10:1 for a short time.

In our view, miners that are forecasting a weakening of the rand are in effect assuming higher PGM prices to compensate for cost inflation or to improve the returns of a marginal project. For example, if a miner believes that the long-term platinum price is US\$1,800 and is forecasting a rand:US\$ rate of 9:1 (18% higher than spot), we believe this is effectively the same as using a 7.5:US\$ rate and forecasting the platinum price at US\$2,150/oz.

Exhibit 10 shows the long-run rand:US\$ exchange rate.

Exhibit 10: Rand/US\$ exchange rate has traded in a 6-8:US\$ band from 2004
 Rand/US\$ exchange rate 2004-2010



Source: Datastream.

Valuation: An industry in structural transition

Historically, returns for the PGM miners were 3-4x the cost of capital. These high returns were made possible by a substantial jump in demand caused by rapid and sudden regulation of emission standards in developed markets combined with a low cost base in the South African PGM mines. However, since the early 2000s, returns have collapsed to below the cost of capital due to the industry challenges discussed in this report. Although we increase our PGM price forecasts to record levels through 2010-15, we do not see returns reverting to pre-2003 levels for the PGM miners. Rather, we see them stabilising above cost of capital for low-cost producers as unit cost inflation and higher capital spend absorb most of the forecast price rises.

Industry returns have fallen dramatically since 2000. To put this into context, it is important to see where the industry has come from. Average CROCI for the three major PGM miners was above 50% in 2000 due to several structural benefits that the industry enjoyed:

- Emission regulation driving up autocatalyst demand, jewellery demand essentially being stable.
- A consolidated supply base (only three major miners).
- Relatively cheap labour.

Exhibit 11 shows the decline in CROCI for the three major PGM miners.

Exhibit 11: CROCI has fallen from over 50% to less than cost of capital
CROCI 2000-2010E – South African PGM miners



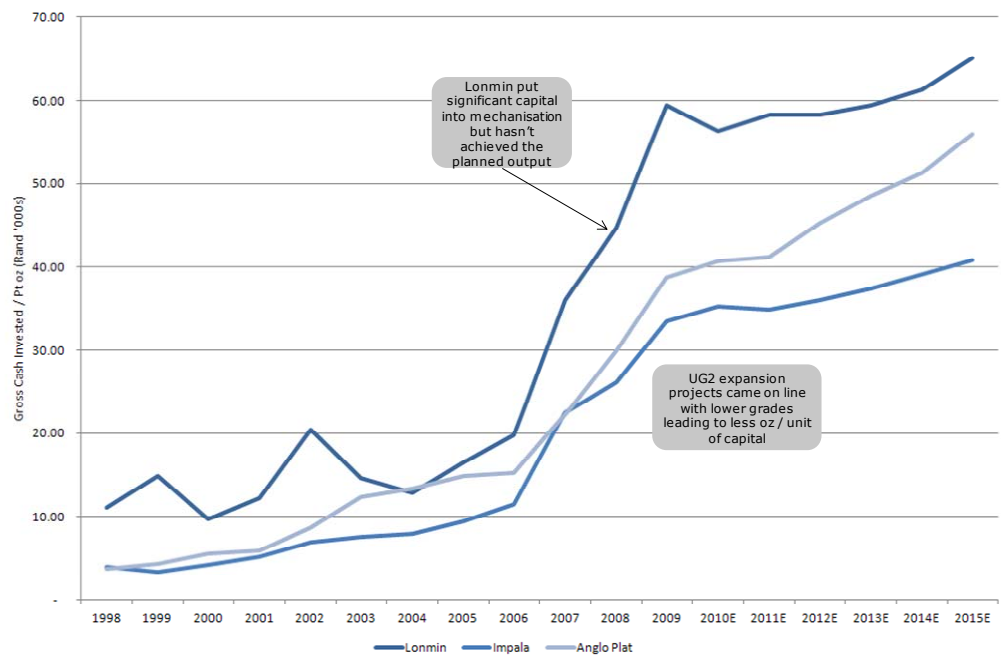
Source: Goldman Sachs Research estimates, Quantum database.

In our view, the decline in returns can be explained by:

- **Labour unionisation:** Prior to the democratisation of South Africa in 1994, workers were paid below international average wages and had little union representation. Wages are now nearing competitive levels and workers are organised into strong unions. We estimate that labour costs are c.US\$800-1,000/Pt oz today, up from less than US\$50/oz in 1994.

- Slowing net demand growth:** When emissions were first regulated in the US and Europe, there was a rush to secure PGM supplies. The industry could barely keep up and hence was able to run for a decade with virtual incentive pricing. Now, net demand is growing by 3%-4% pa, with recycling and more efficient application of PGMs creating a more balanced market than in the past. Although demand is still growing, the marginal producer (which is Lonmin in the current market) is finding its margins compressed by periods of price volatility, as in late 2008.
- Underinvestment/missed investment windows:** There are ideal times to build new capacity, as we discuss later in this report. We believe that the major miners missed investment windows that could have seen today's output coming from newer, more efficient shafts rather than the current older, expensive shafts.
- Structural:** The PGM deposits in South Africa are dipping reefs, which means that each subsequent mine that is built is deeper than the last and requires more capital, greater effort and higher costs than the one before it.
- Late projects/underdelivery compared to targets:** Exhibit 12 shows that the gross cash invested (GCI)/Pt oz delivered is 6x higher today than in 2000. This demonstrates the increased capital intensity of the industry and highlights the effects of late projects (e.g. the capital for Lonmin's K4 shaft was spent five years ago, but there is still no output) and the failure of some mines to reach their designed capacity (e.g. Lonmin's mechanised projects at Hossy and Saffy).

Exhibit 12: Each oz delivered today comes from 6x more gross capital deployed vs. 2000 GCI/Pt oz 1998-2015E



Source: Goldman Sachs Research estimates, Quantum database.

Prices have to rise to maintain cost of capital returns...

The basis of our new PGM price forecasts is that prices have to move to allow the industry to earn acceptable returns. For the 85th percentile producer, this means breaking even, while for a miner building a new project, it means cost-of-capital returns.

If today's spot prices were to be maintained into 2011 and 2012, Lonmin would be making less than cost of capital returns given its cost position and cost inflation. By 2013, Anglo Platinum and Impala would also make less than their cost of capital. We would also find it unlikely that any of the major producers would approve an expansion project that assumed today's spot prices.

If prices do not rise as a result of the cost-push effect and support new capacity expansion, the market will enter a supply-demand deficit so large that price would rise to eliminate the most discretionary demand.

...but won't lead returns back to pre-2005 levels

In our view, the structural changes in the industry mean that returns will not revert to pre-2005 levels (CROCI of over 30%). Instead, we expect cost leaders to make cost of capital plus 5%-8% for a total of c.20% CROCI. With cost inflation likely to continue at recent average levels and under-delivery to persist on the supply side, we expect further industry unit cost inflation to absorb a significant amount of the price rises that we forecast.

Updated estimates for our coverage universe

We update our estimates for the three existing PGM miners under coverage, and also initiate on Eastern Platinum – our preferred way to play our PGM price thesis – with a Buy rating (Conviction List).

Our revised estimates reflect our new platinum price forecasts, as well as what we regard as a realistic outlook on forward cost inflation and production profiles (our estimates for cost inflation are discussed later in this report). We forecast the industry to return to a mid-cycle EBITDA margin/Pt ounce by 2015, potentially benefiting from a period of above mid-cycle conditions in 2011-14E, as prices rise rapidly in advance of a supply-demand deficit.

Exhibit 13 summarises our estimate changes.

Exhibit 13: Estimate changes for our PGM coverage

		ZAR Anglo Platinum			ZAR Impala Platinum			US\$m Lonmin			US\$m Eastern Platinum		
		2010E	2011E	2012E	2010E	2011E	2012E	2010E	2011E	2012E	2010E	2011E	2012E
Revenue	New	49,320	64,459	81,880	29,563	41,897	53,534	1,565	2,104	2,928	174	234	423
	Old	48,218	60,348	71,981	30,475	45,148	54,285	1,579	2,064	2,483			
	% change	2%	7%	14%	-3%	-7%	-1%	-1%	2%	18%			
EBIT	New	10,259	19,183	29,323	7,873	12,896	18,096	274	404	1,060	59	92	192
	Old	9,443	14,912	20,172	7,834	13,372	17,102	219	595	900			
	% change	9%	29%	45%	0%	-4%	6%	25%	-32%	18%			
EPS	New	\$28.26	\$52.48	\$79.21	\$7.34	\$13.26	\$19.22	\$0.66	\$1.04	\$2.87	\$0.05	\$0.08	\$0.18
	Old	\$28.03	\$44.12	\$60.36	\$7.51	\$14.13	\$18.58	\$0.98	\$1.72	\$2.63			
	% change	1%	19%	31%	-2%	-6%	3%	-32%	-40%	9%			
Capex	New	10,000	9,982	11,254	4,980	5,950	6,000	290	350	350	13	114	117
	Old	10,000	11,090	11,862	4,980	5,450	5,500	270	350	350			
	% change	0%	-10%	-5%	0%	9%	9%	7%	0%	0%			
CROCI	New	11.9%	15.8%	20.1%	12.5%	18.8%	23.2%	5.9%	7.3%	15.6%	4.2%	5.7%	12.8%
	Old	10.7%	13.6%	15.4%	12.4%	19.6%	22.5%	4.8%	9.5%	12.8%			
	% change	11%	16%	31%	1%	-4%	3%	22%	-23%	22%			

Source: Goldman Sachs Research estimates, Quantum database.

Exhibit 14 gives a summary of our price target and rating changes.

Exhibit 14: Rating changes, price targets and valuation methodology

Company	Rating	Share price currency	Target price	Time frame	Share price	Implied upside/ (downside)	Methodology
Anglo Platinum	Neutral	ZAR	1000	12m	710	41%	EV/GCI vs CROCI/WACC, EV/EBITDA, Mid-cycle EV/EBITDA
Impala Platinum	Sell	ZAR	230	12m	191	20%	EV/GCI vs CROCI/WACC, EV/EBITDA, Mid-cycle EV/EBITDA
Lonmin	Neutral	GBP	1950	12m	1439	36%	EV/GCI vs CROCI/WACC, EV/EBITDA, Mid-cycle EV/EBITDA, M&A
Eastern Platinum	Buy*	GBP	120	12m	60	100%	EV/GCI vs CROCI/WACC, EV/EBITDA, Mid-cycle EV/EBITDA

Source: Goldman Sachs Research estimates, Quantum database.

Exhibit 15 summarises the components of our 12-month price targets.

Exhibit 15: Price target components and upside potential

	Anglo Platinum	Impala	Lonmin	Eastern Platinum
Ticker	AMSJ.J	IMPJ.J	LMI.L	ELRq.L
Currency	ZAR	ZAR	GBP	GBP
2010 volumes at mid-cycle	810	212	1,300	60
Growth 2010-2015 at mid-cycle	50	-12	400	50
PV of above mid-cycle cashflows	140	30	75	10
M&A premium	-	-	175	-
12-month price target	1,000	230	1,950	120
Share price	710	191	1,439	60
% Upside	41%	20%	36%	100%

Source: Goldman Sachs Research estimates.

Exhibit 16 shows the valuation metrics for our PGM coverage universe.

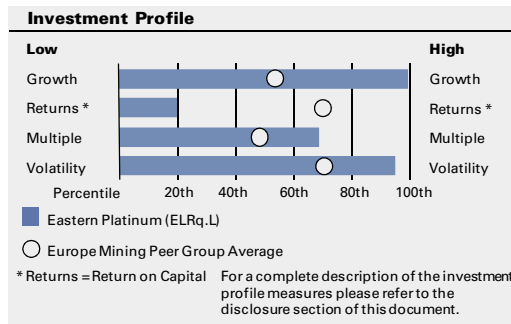
Exhibit 16: Summary valuation metrics for our PGM coverage universe

Calendar Years

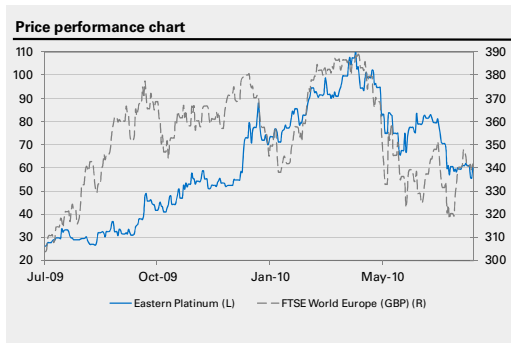
	Currency	Share price	Mkt cap US\$m	EV US\$m	2009	EV/GCI 2010E	2011E	2009	EV/DACF 2010E	2011E	2009	EV/EBITDA 2010E	2011E	2010E	2011E	2010E	2011E
Mining - Precious metals																	
Anglo Platinum	ZAR	710	24,994	25,745	1.79X	1.97X	1.78X	29.11X	14.62X	10.01X	26.07X	11.90X	8.07X	25.12X	13.53X	0.00X	3.5%
Impala Platinum	ZAR	191	15,740	15,709	2.32X	2.42X	2.15X	18.49X	15.88X	10.32X	10.72X	10.37X	6.99X	18.55X	11.80X	0.02X	3.3%
Lonmin	U.S. Dollar	1439	4,431	4,977	0.98X	1.03X	0.96X		15.89X	9.84X	47.35X	12.29X	7.50X	28.95X	14.67X	0.00X	0.8%
Eastern Platinum	U.S. Dollar	60	628	599	0.30X	0.50X	0.49X		10.27X	7.92X	19.91X	7.89X	5.82X	17.04X	10.86X	0.00X	0.0%
Average					1.35X	1.48X	1.34X	23.80X	14.17X	9.52X	26.01X	10.61X	7.09X	22.42X	12.71X	0.01X	0.02X

Source: Goldman Sachs Research estimates, Quantum database.

Eastern Platinum (ELRq.L): Initiate as Conviction Buy; 12m PT 120p



Key data	Current			
Price (p)	60			
12 month price target (p)	120			
Upside/(downside) (%)	100			
Market cap (£ mn)	412.7			
Enterprise value (\$ mn)	599.3			
	12/09	12/10E	12/11E	12/12E
Revenue (\$ mn) New	111.4	174.2	234.4	423.1
Revenue revision (%)	NM	NM	NM	NM
EBIT (\$ mn) New	(0.4)	58.8	92.2	191.9
EBIT revision (%)	NM	NM	NM	NM
EPS (\$ New)	0.00	0.05	0.08	0.18
EPS (-) Old	--	--	--	--
EV/EBITDA (X)	19.9	7.9	5.8	2.9
P/E (X)	NM	17.0	10.9	5.0
Dividend yield (%)	0.0	0.0	0.0	0.0
FCF yield (%)	(20.3)	4.0	(6.8)	2.1
CROCI (%)	(0.9)	4.9	6.5	11.6



Share price performance (%)	3 month	6 month	12 month
Absolute	(40.7)	(18.6)	128.6
Rel. to FTSE World Europe (GBP)	(34.0)	(14.6)	103.2

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 7/21/2010 close.

Source: Company data, Goldman Sachs Research estimates, FactSet.

Source of opportunity

We initiate on Eastern Platinum (Eastplats) as Buy and add the shares to our Conviction List (see *Eastern Platinum: Our favoured exposure to rising PGM prices; Conviction Buy*, also published today). The group is a producing junior with a low cost position delivering significant volume growth into what we believe will be a period of strong PGM price growth. We estimate the value of the group’s CRM mine in the Western Limb (where we forecast near 100% volume growth to 2013-14) alone implies significant upside from the current share price. Three unexploited growth projects on the Eastern Limb make the investment case even more compelling. Meanwhile, M&A activity in the sector potentially brings focus to Eastplats’ relative valuation. Our 12-month price target is 120p (100% upside potential).

Catalyst

(1) Growth delivery – we believe management’s track record suggests it will be able to deliver volume growth at CRM; (2) rising PGM prices – we have raised our PGM price forecasts and expect the platinum price to exceed US\$2,800/oz in 2012. Eastplat’s low cost position and high growth provide it with significant leverage to these drivers, in our view.

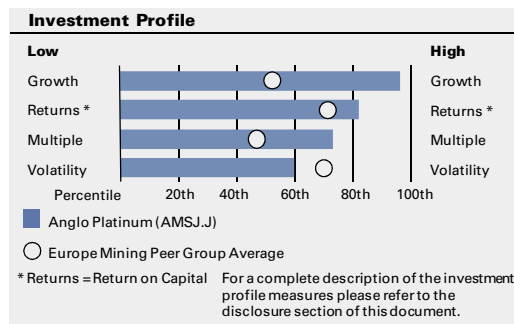
Valuation

Our 12-month price target is 120p. We value Eastplats’ 2010E volumes using a mid-cycle EV/EBITDA multiple on a mid-cycle margin per PGM oz. We value its 2010-2015E growth potential separately, adding to this the present value of the above-mid-cycle cash flows we estimate over this period. Eastplats trades on a 2010/11E EV/EBITDA of 7.9x/5.8x vs. 11.2x and 6.6x for our precious metals coverage. Recent underperformance represents a good entry level, in our view.

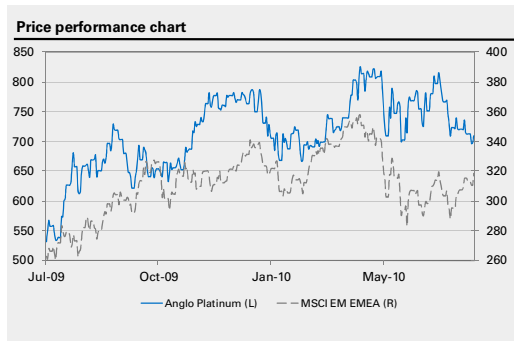
Key risks

We see a further economic slowdown, potentially delaying the rise of PGM prices and potentially reducing Eastplats’ access to finance for the growth projects, as the major risk.

Anglo Platinum (AMSJ.J): Up to Neutral from Sell



Key data	Current			
Price (R)	710.00			
12 month price target (R)	1,000.00			
Upside/(downside) (%)	41			
Market cap (R mn)	188,370.5			
Enterprise value (R mn)	194,030.7			
	12/09	12/10E	12/11E	12/12E
Revenue (R mn) New	36,947.0	49,319.5	64,459.1	81,879.8
Revenue revision (%)	0.0	2.3	6.8	13.8
EBIT (R mn) New	921.0	10,258.8	19,183.0	29,323.3
EBIT revision (%)	0.0	8.6	28.6	45.4
EPS (R) New	1.19	28.26	52.48	79.21
EPS (R) Old	1.19	28.03	44.12	60.36
EV/EBITDA (X)	26.1	11.9	8.1	5.5
P/E (X)	474.9	25.1	13.5	9.0
Dividend yield (%)	0.0	0.0	3.5	4.2
FCF yield (%)	(2.7)	1.5	5.9	7.6
CROCI (%)	6.8	14.2	18.5	23.2



Share price performance (%)	3 month	6 month	12 month
Absolute	(13.2)	(6.5)	33.5
Rel. to MSCI EM EMEA	(5.7)	(3.3)	10.0

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 7/21/2010 close.

What happened

We upgrade Anglo Platinum to Neutral from Sell, based on our revised price forecasts, management's cost reduction efforts and a small increase in our production profile assumptions. Since being added to the Sell List on October 21, 2009, Anglo Platinum is up 11.0% versus the MSCI EM EMEA down 0.6% (local currency basis). Over the past 12 months, the shares are up 33.5% versus the index up 17.3%.

In our view, Anglo Plat has outperformed the other majors over the past three months on the back of successful cost-cutting efforts and an improving production outlook (mainly on Mogalakwena tonnages). We expect 2010 earnings to reflect both these successes fully, and thus see the highest potential upside for Anglo Plat among the majors over the next 12 months (41% on our new 12-month price target of R1,000, up from R804). We also believe that the appointment of Anglo American's CEO, Cynthia Carroll, as Chairman of Anglo Plat, is likely to improve the speed and quality of strategic decision-making at Anglo Plat.

Current view

We update our production outlook for 2010 and 2011, reflecting expected advances from Mogalakwena. Our new forecasts also take into account likely cuts at the company's Bathopele mechanized mine, which uses the same method as Aquarius's Marikana and Kroondal mines – the focus of a DME directive to reduce bord widths on July 16, 2010. In addition, we cut our cost inflation assumptions for Anglo Platinum in 2011 and 2012. Finally, we incorporate our revised PGM price forecasts for 2010-15E. The net impact on our EPS estimates is a rise of 1%, 19% and 31% for 2010-12.

Our 12-month price target rises to R1,000 (from R804). We value Anglo Plat's 2010 volumes using a mid-cycle EV/EBITDA multiple on a mid-cycle margin per Pt oz. We value its 2010-15E growth potential separately, adding to this the present value of its above-mid-cycle cash flows. Anglo Plat trades on 2010/11E EV/EBITDA of 11.9x/8.1x, vs. averages of 11.2x and 6.6x for our precious metals coverage.

Risks to our price target include the following: (1) beyond PGM prices failing to rise as we predict due to a further economic slowdown, we also note that Mogalakwena's profitability is largely driven by copper and nickel revenues, so a fall in these prices would also damage Anglo Plat's returns; (2) cost inflation will eventually return, particularly in a high metal price environment – for example, we expect a redeveloped Boschfontein to restart in the near future, which will potentially increase unit costs; and (3) the DMR's requirements to modify or limit certain types of mechanized mining at Bathopele and Aquarius's operations could reduce Anglo Plat's short-term production. We estimate that up to 280k Pt oz are attributable to Anglo Plat from the affected mines (130k from Bathopele and c.150k from Aquarius's Kroondal and Marikana mines).

Source: Company data, Goldman Sachs Research estimates, FactSet.

Exhibit 17: Share price performance of Anglo Platinum versus peer group

Prices as of the close of July 21, 2010

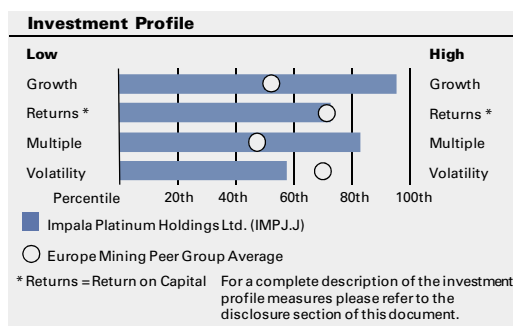
Company	Ticker	Primary analyst	Price currency	Price as of Jul 21, 2010	Price performance since Oct 21, 2009	3 month price performance	6 month price performance	12 month price performance
Europe Mining Peer Group								
Anglo Platinum	AMSJ.J	Peter Mallin-Jones	R	710.00	11.0%	-13.2%	-6.5%	33.5%
Anglo American plc	AAL.L	Peter Mallin-Jones	p	2409.00	5.8%	-14.4%	-3.2%	29.3%
AngloGold Ashanti	ANGJ.J	Eugene King	R	301.50	-7.2%	4.5%	2.9%	-1.8%
Antofagasta plc	ANTO.L	Peter Mallin-Jones	p	981.00	13.5%	0.2%	3.4%	38.8%
BHP Billiton Plc	BLT.L	Peter Mallin-Jones	p	1918.50	5.1%	-9.4%	-1.2%	25.4%
Boliden	BOL.ST	Peter Mallin-Jones	Skr	85.50	-4.9%	-21.2%	-16.7%	14.8%
Gem Diamonds	GEMD.L	Peter Mallin-Jones	p	222.00	-11.9%	-21.3%	-7.6%	20.0%
Gold Fields	GFJJ.J	Eugene King	R	96.80	-7.9%	2.4%	1.3%	5.2%
Harmony Gold	HARJ.J	Eugene King	R	75.00	-10.7%	7.9%	0.5%	3.4%
Hochschild Mining Plc	HOCM.L	Andrew Byrne	p	306.60	1.4%	11.7%	2.2%	16.2%
Impala Platinum Holdings Ltd.	IMPJ.J	Peter Mallin-Jones	R	191.00	15.1%	-10.8%	-8.5%	7.1%
Israel Chemicals	ICL.TA	Vasily Nikolaev	NIS	45.45	-2.3%	-1.6%	-10.0%	19.6%
K+S	SDFG.DE	Andrew Byrne	€	39.09	1.0%	-8.6%	-7.2%	5.4%
Kazakhmys	KAZL	Peter Mallin-Jones	p	1106.00	-13.8%	-23.7%	-13.6%	46.2%
Koza Gold	KOZAL.IS	Vasily Nikolaev	YTL	13.20	NA	-6.8%	NA	NA
Lonmin	LMI.L	Peter Mallin-Jones	p	1439.00	-14.9%	-27.2%	-22.2%	22.7%
Makhteshim Agan Industries	MAIN.TA	Vasily Nikolaev	NIS	13.27	-25.2%	-18.0%	-32.6%	-27.1%
Namakwa Diamonds	NAD.L	Peter Mallin-Jones	p	41.00	-9.9%	22.4%	5.8%	23.3%
New World Resources	NWRS.L	Vasily Nikolaev	p	770.00	25.1%	-17.4%	14.2%	140.8%
Norilsk Nickel	NKELYq.L	Vasily Nikolaev	\$	16.03	9.2%	-15.0%	-2.8%	62.6%
Norsk Hydro	NHY.OL	Peter Mallin-Jones	Nkr	33.38	-14.7%	-20.4%	-18.2%	10.3%
Nyrstar	NYR.BR	Peter Mallin-Jones	€	8.72	-2.9%	-18.0%	-12.4%	48.0%
Petropavlovsk PLC	POG.L	Vasily Nikolaev	p	1097.00	-2.7%	-8.6%	5.4%	68.3%
Polymetal	PMTLq.L	Vasily Nikolaev	\$	12.70	38.2%	21.0%	34.4%	57.8%
Polyus Gold	PLZLq.L	Vasily Nikolaev	\$	26.30	-12.0%	2.1%	-6.4%	23.0%
Randgold Resources	RRS.L	Eugene King	p	6015.00	31.8%	18.5%	28.3%	50.2%
Raspadszkaya	RASP.RTS	Vasily Nikolaev	\$	3.90	-9.5%	-46.4%	-33.6%	62.5%
Rio Tinto plc	RIO.L	Peter Mallin-Jones	p	3247.50	9.2%	-12.0%	-1.4%	42.2%
United Company Rusal	0486.HK	Yulia Chekunaeva	HK\$	7.22	NA	-25.5%	NA	NA
Uralkali	URKAq.L	Vasily Nikolaev	\$	20.11	-18.1%	-7.8%	-14.8%	24.1%
Vedanta Resources	VED.L	Peter Mallin-Jones	p	2399.00	3.9%	-10.3%	-5.4%	53.0%
Xstrata plc	XTA.L	Peter Mallin-Jones	p	990.70	-0.4%	-15.0%	-9.9%	37.0%
Yara	YAR.OL	Andrew Byrne	Nkr	221.10	3.2%	-3.0%	-9.3%	18.2%
MSCI EM EMEA				318.60	-2.7%	-8.0%	-3.3%	21.3%
Index performance in stock price currency				2401.15	-0.6%	-6.5%	-3.6%	17.3%

Note: Prices as of most recent available close, which could vary from the price date indicated above

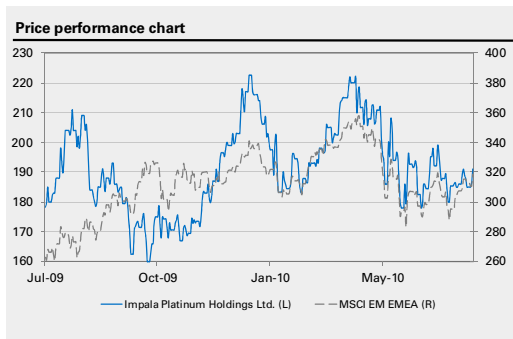
This table shows movement in absolute share price and not total shareholder return. Results presented should not and cannot be viewed as an indicator of future performance.

Source: FactSet, Quantum database.

Impala Platinum (IMPJ.J): Higher PGM prices not enough; still Sell



Key data	Current			
Price (R)	191.00			
12 month price target (R)	230.00			
Upside/(downside) (%)	20			
Market cap (R mn)	118,621.3			
Enterprise value (R mn)	119,818.3			
	6/09	6/10E	6/11E	6/12E
Revenue (R mn) New	26,121.0	29,562.8	41,897.1	53,533.6
Revenue revision (%)	0.0	(3.0)	(7.2)	(1.4)
EBIT (R mn) New	9,762.0	7,873.4	12,895.7	18,096.3
EBIT revision (%)	0.0	0.5	(3.6)	5.8
EPS (R) New	9.79	7.34	13.26	19.22
EPS (R) Old	9.79	7.51	14.13	18.58
EV/EBITDA (X)	9.4	13.5	8.4	6.0
P/E (X)	16.5	26.0	14.4	9.9
Dividend yield (%)	2.0	1.7	2.9	3.7
FCF yield (%)	0.7	1.3	4.5	6.5
CROCI (%)	14.6	12.0	19.4	24.0



Share price performance (%)	3 month	6 month	12 month
Absolute	(10.8)	(8.5)	7.1
Rel. to MSCI EM EMEA	(3.1)	(5.3)	(11.7)

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 7/21/2010 close.

Source of opportunity

We reiterate our Sell rating on Impala. In our view, the company faces significant challenges, namely the need to: (1) turn around production and costs at the Impala mine in Rustenburg; (2) deliver replacement projects (16, 17 and 20 shafts); and (3) secure long-term growth. Impala's guidance that the Impala mine will not reach 1 mn Pt oz (down 125k Pt oz from peak) before 2014/15 highlights the scale of the challenge.

We estimate that Impala will spend significantly more on stay-in-business capital due to catch-up development work and will have the highest unit cost inflation of the majors (albeit from a low base) for the next 2-3 years. Even with our revised PGM price forecasts, we do not expect an EBITDA margin much above 35% for 2010-15, compared with an average 45% for the preceding decade.

Impala's investment of a further US\$500 mn in Zimplats illustrates the growth dilemma for the company. Having missed out on Northam in 2008 (and the Booyensdal project), it would appear that expansion of Zimplats represents the next best alternative investment, despite the uncertainty over repatriating profits and indigenous ownership laws. We view the Zimplats Phase II project favourably given its low cost and easy access, but still see considerable risks to the investment.

Catalyst

We believe that production from the core Impala operations will disappoint in 2010-12. This implies that unit cost inflation will exceed market expectations through the period, acting as a negative catalyst.

Valuation

We update our 2010 and 2014 production forecasts for Impala to reflect the latest management guidance. We also increase our assumptions for stay-in-business capital at Rustenburg and unit cost inflation, due to the reduced production profile and additional spend required to address development. In line with the reduced overall production profile that we expect for the industry, we also lower our forecasts for IRS's third-party total refining. Finally, we incorporate our revised PGM prices for 2010-15E. The net impact on our 2010-12E EPS is -2%, -6% and +3%.

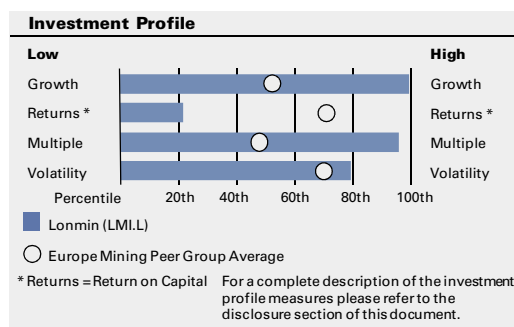
We raise our 12-month price target marginally to R230 (from R221). We value Impala's 2010 volumes using a mid-cycle EV/EBITDA multiple on a mid-cycle margin per Pt oz. We value its 2010-15E growth potential separately, adding to this the present value of its above-mid-cycle cash flows. Impala trades on CY2010/11E EV/EBITDA of 10.4x/7.0x, vs. 11.2x and 6.6x for our precious metals coverage.

Key risks

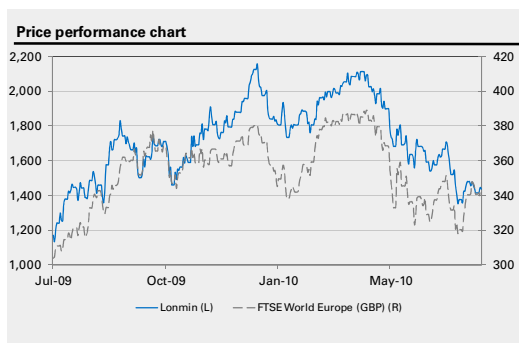
Impala's new shafts are replacement capacity for the Impala mine. These shafts are all significantly deeper and more complex than the shafts they replace. Two key risks to our price target relate to: (1) timing of delivery – production could decline further than planned if the new shafts are late and (2) the mining complexity of the new shafts, which requires experienced management. Ramp-up could be slow while management develops this experience. Faster price rises or a faster return to 1mn Pt oz from Rustenburg are upside risks to our view.

Source: Company data, Goldman Sachs Research estimates, FactSet.

Lonmin (LMI.L): Highest costs, more uncertainty from the furnace



Key data	Current			
Price (p)	1,439			
12 month price target (p)	1,950			
Upside/(downside) (%)	36			
Market cap (£ mn)	2,912.5			
Enterprise value (\$ mn)	4,951.3			
	9/09	9/10E	9/11E	9/12E
Revenue (\$ mn) New	1,062.0	1,565.5	2,104.0	2,928.3
Revenue revision (%)	0.0	(0.9)	1.9	17.9
EBIT (\$ mn) New	(93.0)	273.9	404.2	1,060.2
EBIT revision (%)	0.0	25.2	(32.1)	17.8
EPS (\$ New)	(1.22)	0.66	1.04	2.87
EPS (\$ Old)	(1.22)	0.98	1.72	2.63
EV/EBITDA (X)	NM	13.3	10.0	4.2
P/E (X)	NM	32.9	21.1	7.6
Dividend yield (%)	0.0	0.0	0.0	3.2
FCF yield (%)	(9.1)	0.5	(2.1)	11.3
CROCI (%)	(2.1)	6.2	7.9	16.3



Share price performance (%)	3 month	6 month	12 month
Absolute	(27.2)	(22.2)	22.7
Rel. to FTSE World Europe (GBP)	(19.0)	(18.3)	9.1

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 7/21/2010 close.

What's changed

Of the majors, we believe the size of production upside is greatest at Lonmin. In 2009, production was c.200k Pt oz below full capacity of the asset base, on our estimates, and there have been recurring problems with the furnace, which has experienced multiple unplanned shutdowns. Because of its low production versus capacity, Lonmin's unit costs are the highest of the majors and at the top end of the cost curve. While we believe there is significant upside potential at Lonmin, the key questions for the market are (1) whether the company is on the right path to deliver improvement after 18 months under CEO Ian Farmer and (2) in what timeframe.

While we believe developments at the company over the past 18 months have been positive, we still see further significant opportunities to improve returns for shareholders. Of the majors, Lonmin has the lowest CROCI and the highest cost position. However, with the right execution, we believe it could have the biggest upside to production and relative earnings growth. In our view, progress on mined ore tonnes is what is needed to address the unit cost position and demonstrate that there is a production trajectory towards somewhere above 800k Pt oz/year. We maintain our Neutral rating.

Implications

We update our estimates to reflect: (1) concentrator recoveries back to levels last seen five years ago and matching best in industry levels for UG2; (2) management's guidance on the furnace improvement plan; (3) the updated production plan for 2010-15; and (4) our revised PGM price forecasts for 2010-15E. We cut our near-term EPS estimates but increase our forecasts for 2012 onwards.

Valuation

We cut our 12-month price target from 2,623p to 1,950p as we now forecast a slower ramp-up of production than previously expected, and higher costs. We value Lonmin's 2010 volumes using a mid-cycle EV/EBITDA on a mid-cycle margin per Pt oz. We value its 2010-15E growth potential separately, adding to this the present value of its above-mid-cycle cash flows. Lastly, we add a multiple premium to reflect value in a potential M&A scenario. Lonmin trades on a CY2010/11E EV/EBITDA of 12.3x/7.5x vs. 11.2x and 6.6x for our precious metals coverage.

Key risks

The risk of Lonmin having to reconfigure its mechanized sections at Hossy and Saffy following the Aquarius accident cannot be completely ruled out. This would be a significant negative for the stock. Upside risk to our view comes from Lonmin's operational leverage from its high cost position. If prices were to move faster than our forecasts, Lonmin would see the fastest margin expansion in the short term. Conversely, slower or lower than expected increases in PGM prices could see Lonmin burning cash by the end of 2011 based on its average unit cost.

Demand: Autocatalyst demand boosted by car sales and tighter emission standards

We expect four factors to drive higher autocat demand for PGMs in 2010-15: (1) an increase in the number of cars sold, led by a return in demand in developed markets and boosted by sales in China; (2) a rise in average PGM loading per car over the next five years as emissions standards offset savings from technological innovation; (3) hybrid cars and other CO₂ reducing technologies like Stop-Start boosting loadings; (4) volumes of electric cars being unlikely to reach significant levels within the next ten years; and (5) the slowdown in recycling volumes during the recession, which means that more mined PGMs are required for the auto industry in the next few years.

Autocatalyst demand has many moving parts

Net demand for the autocatalyst sector is complex, as there are many moving parts and visibility is somewhat limited, as suppliers and customers tend not to disclose their positions.

Net PGM demand = Gross demand – Recycling

Gross demand = Total vehicles produced x PGM loading/vehicle

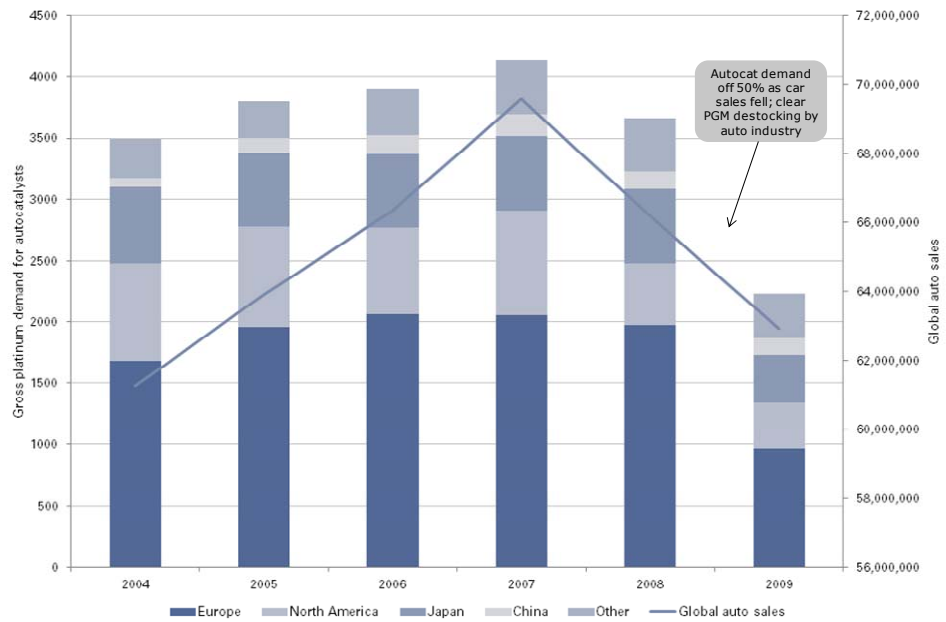
This is complicated by the need to take a view on the platinum versus palladium split and technology, both in autocatalysts and development of alternative powertrains such as electric cars to predict how demand for both metals will evolve in the future.

Demand fell sharply with the financial crisis

Two factors caused platinum demand in the autocat segment to fall in 2008 and 2009, as shown in Exhibit 16. First was the high platinum price, driven by the South Africa power crisis, reaching over US\$2,200/oz in the first half of 2008. In our view, auto companies destocked through this period rather than purchasing at abnormal prices. Second, as the global financial crisis took hold in the second half of 2008, auto sales and hence production fell markedly as auto companies managed down their own inventory.

As auto sales growth returns, we expect PGM demand to return as well – and potentially at a higher growth rate as auto companies make up for the apparent destocking.

Exhibit 18: Autocat demand fell sharply as auto sales fell

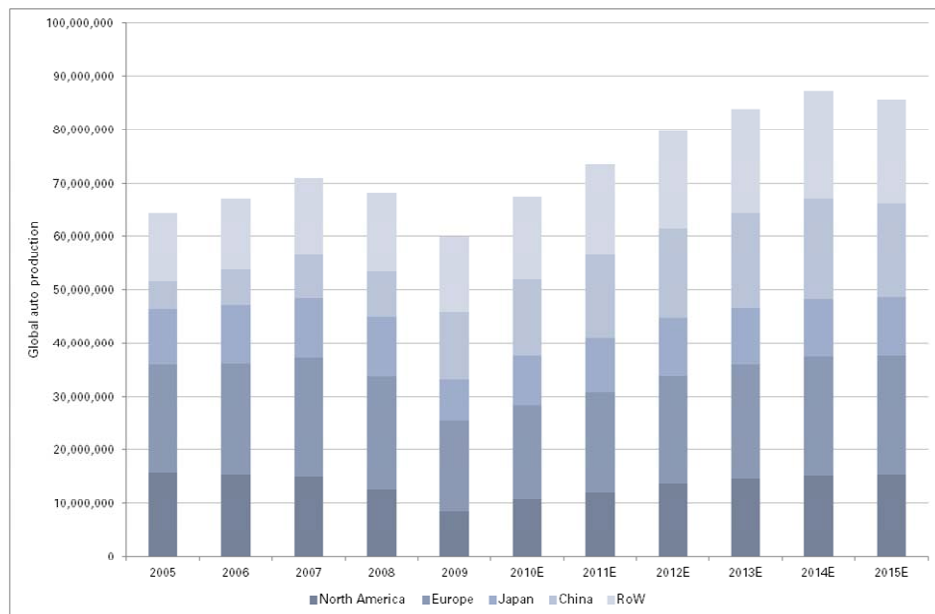


Source: Goldman Sachs Research estimates.

We expect an increase in auto volumes led by a return of demand in developed markets and boosted by sales in China

Using estimates from our global autos team, we forecast that vehicle sales and production will return to pre-crisis levels and grow on the back of China and India vehicle sales. Exhibit 17 shows our outlook for auto sales.

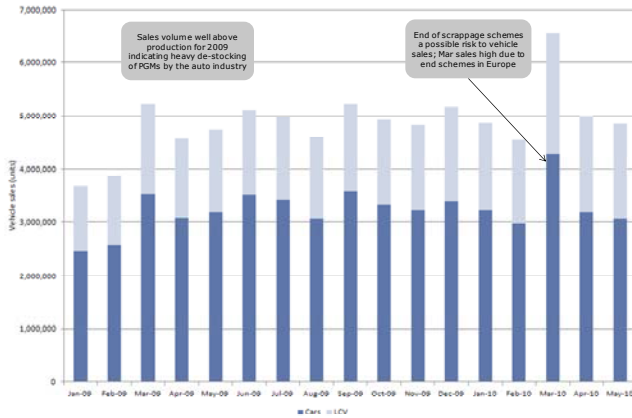
Exhibit 19: Auto production growth from 2010E, increasing to c.85 mn vehicles by 2015
Global auto production 2005-15E



Source: Goldman Sachs Research estimates.

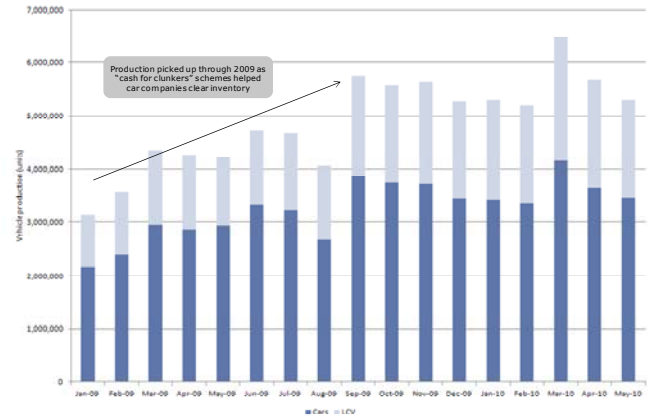
Importantly, our autos analysts forecast 2010 production volumes to be well up on 2009. Auto manufacturers, supported by the various government scrappage stimulus schemes, cleared significant backlogs of inventory in 2009. From the PGM supplier point of view, these metal sales were made in 2008 (if not earlier). A positive for the 2010 outlook for autos is that both sales look strong (Exhibit 20) and factory production has picked up markedly (Exhibit 21).

Exhibit 20: Car sales supported in the downturn by scrappage schemes



Source: Goldman Sachs Research estimates.

Exhibit 21: Production rates have increased through late 2009 into 2010



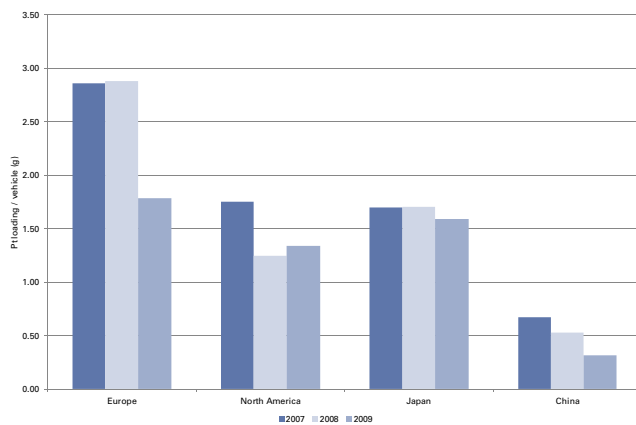
Source: Goldman Sachs Research estimates.

In China, our autos analysts expect car sales to continue to move ahead significantly in 2010E-15 – although this is mainly for small engine petrol cars with c.1-1.5g PGM/car loading, albeit higher palladium loadings given the bias towards petrol.

Average PGM loading/car to inch up, but ongoing shift to palladium

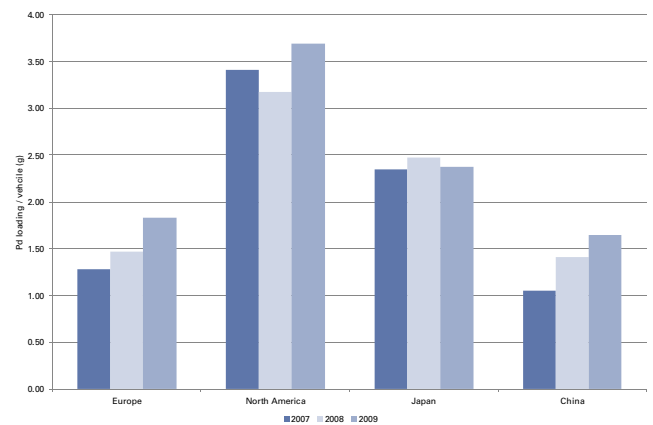
Each major car market has different preferences for fuel type and engine size and different regulations for emissions. The implications of this are that each market has a different average loading per vehicle. Exhibits 22 and 23 show the range of loadings for platinum and palladium in major markets.

Exhibit 22: Platinum loadings higher in diesel-loving Europe



Source: Goldman Sachs Research estimates.

Exhibit 23: Palladium loading much higher in the US; petrol is preferred and engine sizes are large



Source: Goldman Sachs Research estimates.

We believe that emissions regulation will outpace technology innovation and result in PGM loadings per car, in each market, increasing over the next five years.

Exhibit 24 outlines our view on the drivers and trends of PGM loading.

Exhibit 24: Overall we see PGM loadings/car increasing over time

Issue	Background	Key trend	Impact
Regulation	<ul style="list-style-type: none"> - Every tightening of NOX emissions regulations means higher loading for autocats 	<ul style="list-style-type: none"> - Emissions regulation continues to tighten around the world - China and India are introducing similar legislation to Euro III and IV over the next few years 	Positive – regulation marches on; China and India introducing tougher measures
Engine size	<ul style="list-style-type: none"> - Larger engines generate more emissions and require higher PGM loadings in their catalytic converters - Range of loading is from 1g PGM for 1.0 litre petrol engines to over 15g/car for performance cars 	<ul style="list-style-type: none"> - Engines are downsizing to conserve fuel and reduce CO₂, leading to generally lower loadings/car - China and India will predominantly have smaller capacity engines, lowering the global average PGM loading/car 	Negative – general trend to downsize globally
Petrol vs. diesel	<ul style="list-style-type: none"> - Catalytic converter performance is temperature dependent, with platinum working better at lower temperatures - Diesel engines combust at lower temperatures and hence use a higher loading for platinum over palladium 	<ul style="list-style-type: none"> - Diesel has reached full saturation in the European market - Small capacity engines are generally petrol - China is now a predominantly petrol market 	Mixed – likely a continuing shift to palladium globally
City vs. country driving	<ul style="list-style-type: none"> - Short trips with frequent stop-start driving lead to higher emissions and more temperature fluctuation in the catalyst 	<ul style="list-style-type: none"> - Urbanisation trend points to increased loadings to maintain emissions standards 	Positive – urbanisation drives loadings
Hybrid cars / CO ₂ reduction technology	<ul style="list-style-type: none"> - Hybrid cars and Stop/Start technology increase the operating temperature range for the catalytic converter 	<ul style="list-style-type: none"> - CO₂ reduction technology is a net positive for PGM loadings as engines downsize 	Neutral – engine sizes fall but loadings increase

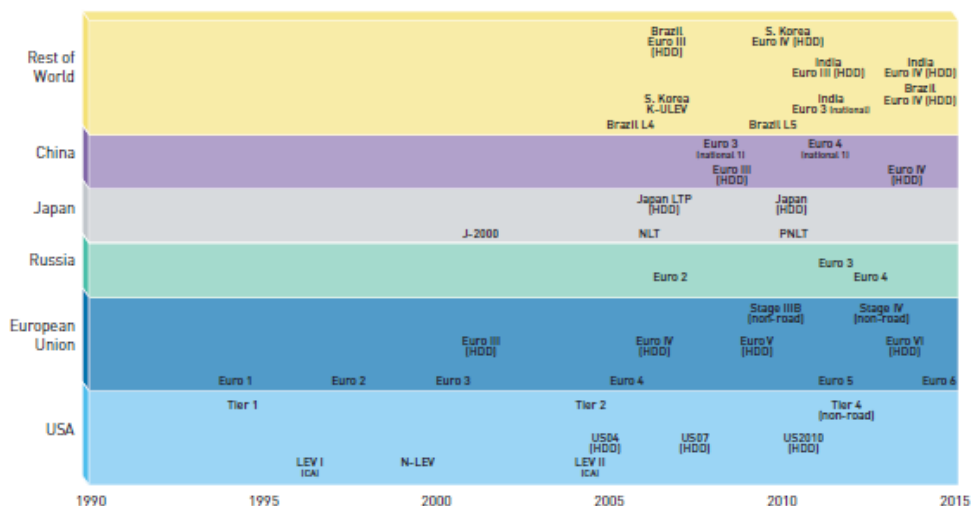
Source: Goldman Sachs Research estimates.

Generally, we expect emissions standards to continue to tighten globally, driving up the loading per car. This has to be offset against the efficiency savings from technology and experience by the autocat manufacturers. As shown in Exhibits 32 and 33, for the autocat segment, we expect a small decline by 2015 in Pt loadings but a small net rise in Pd, driven by Chinese and Indian emission regulations tightening.

China enacted its first emissions controls on automobiles in 2000, equivalent to Euro I standards. China’s State Environmental Protection Administration (SEPA) upgraded emission controls again in July 2004 to the Euro II standard. More stringent emission standards (National Standard III), equivalent to Euro III standards, went into effect in mid-2007. Plans are for Euro IV standards to take effect in 2010. Beijing introduced the Euro IV standard in advance on January 2008, becoming the first city in mainland China to adopt this standard.

The EU introduced Euro IV from January 2008, with Euro V coming in from January 2010. Euro 6 will further increase loadings from January 2014. Euro VI will match the planned standards in the US in 2014, which could well lead to European diesel cars being sold in the US – particularly higher-end luxury cars, which have the highest platinum loading. Exhibit 25 shows Johnson Matthey’s view on emission standards evolution across global auto markets.

Exhibit 25: Emission standards increasing globally, which we believe will offset savings from thrifting



Source: Johnson Matthey annual report 2009

Continuing shift to Palladium and China auto sales to drive palladium volumes significantly higher

In the autocatalyst sector, there is an ongoing shift away from higher-cost platinum and towards palladium. Generally speaking, both metals perform the same function, but platinum is more effective at lower temperatures and is gram-for-gram more efficient. Hence, in diesel vehicles, which run at lower combustion temperatures, more platinum is used.

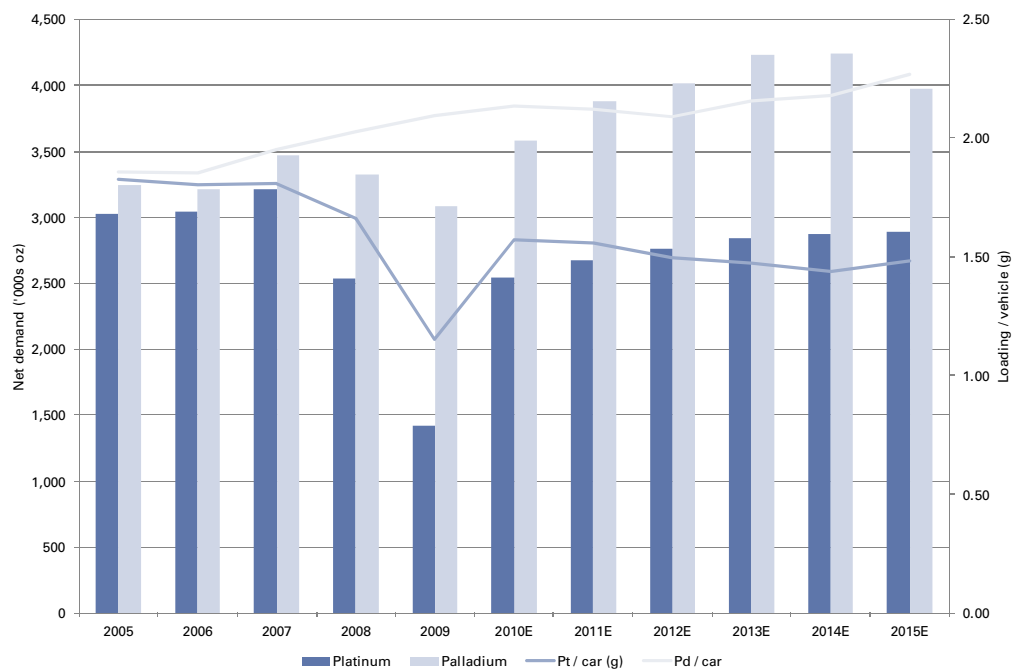
Given that the historical cost premium of platinum over palladium is about 4x, car companies have strived to maximise the palladium loading in their vehicles. Car companies have to submit any change to catalyst design (and the loading factor) to the local regulator for emissions performance testing and certification.

This takes effort and costs a reasonable sum, and redesigning power-train components (e.g. moving the catalyst closer to the engine so the exhaust gases are hotter) can be a multi-year exercise.

However, as platinum prices continue to rise and palladium looks to be in oversupply (at least while Russian state stocks last), we expect an ongoing shift to higher palladium loadings. The spike in platinum prices in early 2008 clearly gave an incentive to the auto companies to push even more towards palladium. Another significant driver of global palladium demand comes from China, where the market has seemingly settled on petrol as the preferred fuel. In addition, the government has given tax breaks to smaller engines, which has driven lower loadings.

Exhibit 26: We expect a steady shift to Palladium to continue; 2009 drop in Platinum explained by scrappage schemes and global financial crisis

Pt & Pd consumption by global auto industry



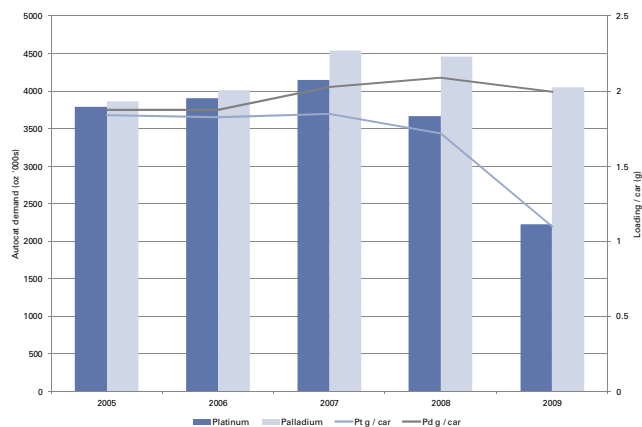
Source: Goldman Sachs Research estimates.

In 2009, platinum demand from China fell as cars sales surged ahead, but palladium received a big boost. We forecast this trend to continue in terms of loadings, but believe growth in Chinese autos sales will also lead to increasing gross platinum sales as well.

Platinum demand fell in 2008 and 2009 due to a temporary change in auto sales mix in Europe

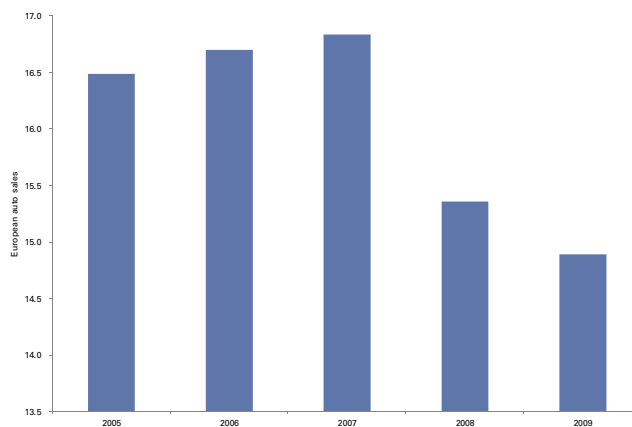
Exhibit 27 shows that platinum loadings in Europe fell sharply from over 1.5g to just over 1g/vehicle in 2009. An average year's European production is about 16.5 mn units, as shown in Exhibit 28. This mix is typically c.60% fleet sales, which are largely composed of D-segment (e.g. Ford Mondeo, BMW 3-Series) diesel cars, typically 1-8-2.2 litres with a relatively high platinum loading.

Exhibit 27: Platinum loading/car also fell – but mainly due to mix



Source: Goldman Sachs Research estimates.

Exhibit 28: European auto sales fell c.2 mn units through the financial crisis



Source: Goldman Sachs Research estimates.

Three factors lowered the European platinum loading/car in 2009:

- **Dramatic change in mix due to scrappage schemes:** A fixed value for scrappage payments irrespective of the value the car purchased encouraged buyers to move towards smaller A/B segments cars. These typically run on petrol, meaning a higher palladium content, and the smaller engine size also means lower total metal loadings.
- **Fleet buyers stayed out of the market – pushing mix change even further:** The traditional buyer mix in Europe is 60% fleet/40% retail. Fleet purchasers typically buy D segment, 1.8-2.2 turbo-diesel cars, which have high platinum loadings. Retail buyers – even without scrappage – are more likely to buy cars with smaller engines.
- **Destocking of PGMs by car companies conserving cash:** Even allowing for a switch in mix, the amount of platinum consumed by the auto industry demonstrates that the auto companies also destocked holdings of PGM metals in 2008 and 2009.

Traditional auto mix returning in Europe post scrappage –platinum loadings to increase

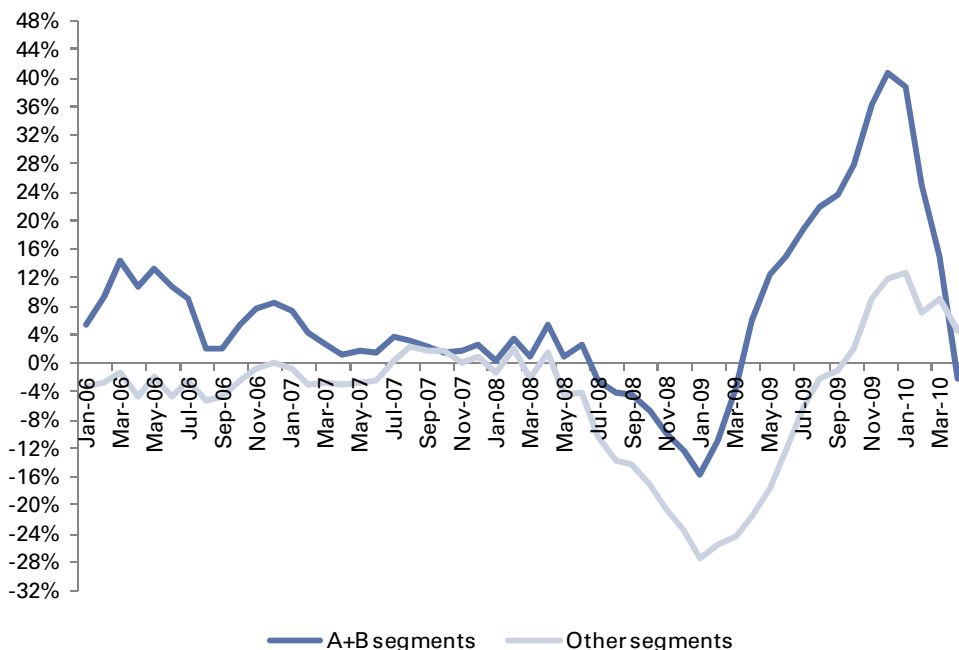
Our autos colleagues' analysis (Exhibit 29) shows the dramatic mix shift that occurred through 2H2008 and 2009. We note that the mix is returning to normal as the rate of growth in the A+B segment (small cars) is slowing and growth in other, more traditional segments is accelerating.

Implications for platinum loadings are:

- In the short term (2010-12), we expect a continued shift back to the traditional segment mix in Europe as fleet sales return to historical levels and governments end scrappage schemes, suggesting a return to 2007 levels of platinum/car (2g).
- In the long term, we expect platinum loading/car to decline, but not at the rate seen in 2008 and 2009. We expect a more gradual decline of c.0.1g/car every two years as per our demand forecast.

Exhibit 29: Scrappage schemes encouraged retail buyers into smaller cars, but the traditional segments are returning in 2010

European monthly auto sales 2006-April 2010 by segment



Source: Goldman Sachs Research estimates.

In our view, 2009 was an unusual year, in which large fluctuations in auto sales and production led to a dramatic shift in the platinum/palladium loading balance. We believe that a shift towards lower cost palladium is taking place where this can be effective and that it will continue, but not at the rate demonstrated in 2009.

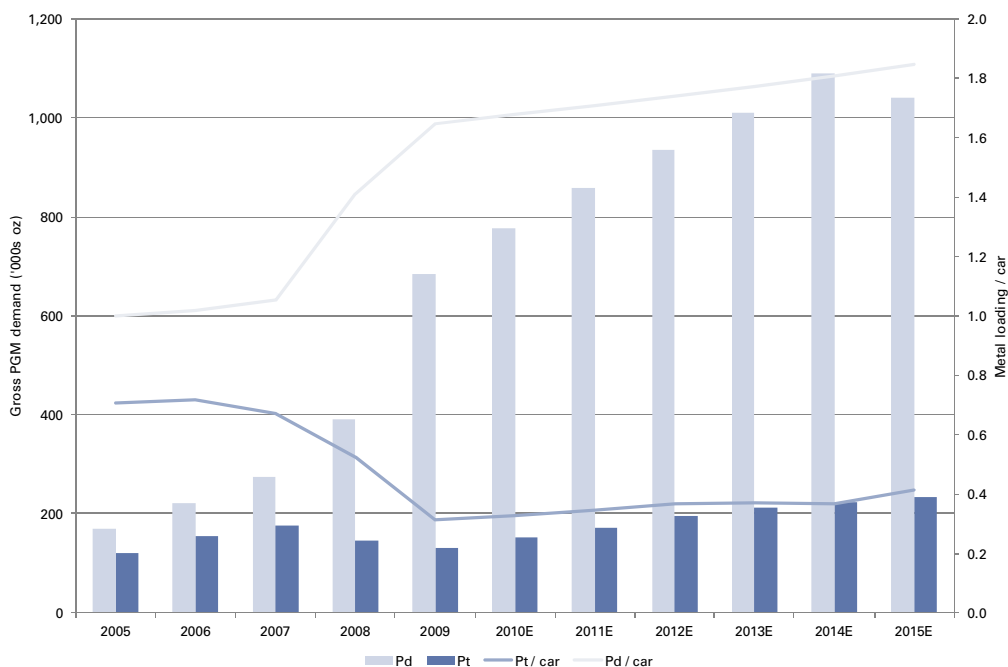
China auto sales drive palladium demand; risk of palladium shortage

One strong case for those preferring palladium over platinum in the short term is the Chinese auto industry. We see the market as being primarily for small engine petrol cars, which require more palladium than platinum. With auto sales set to grow to the point where China could be the largest market for cars by 2025, and with the Chinese government introducing tougher emissions legislations, our estimates suggest that China could require an additional 600k oz of palladium.

Currently, the palladium market is in production deficit, with the gap between gross demand and mined output plugged by Russian state sales. Although no definite figure is available, the Russian stockpile is generally estimated to be c.3-3.5 mn oz today. This would allow about 5-7 years' supply to the market as demand stands today. Adding c.500-600k Pd oz demand from auto demand in China will put additional pressure on stockpiles.

Exhibit 30 shows our outlook for Chinese PGM demand for the autocat segment.

Exhibit 30: China auto sales and increased loadings could add 500k Pd oz to gross demand
 Chinese gross metal demand and loading/car



Source: Goldman Sachs Research estimates.

Hybrid cars and other CO₂ reducing technologies like Stop-Start are a boost for loadings, not a negative factor

As global warming has become a political issue, governments around the world have turned their attention from NOX and particulates to the reduction of greenhouse gases, and CO₂ is now a major focus for the auto industry.

The industry reaction has been to address CO₂ output/car by three means:

- Downsizing engine capacity and adding turbo-charging for similar power output but reduced CO₂
- Introduction of Stop/Start technology
- Introduction of hybrid battery/smaller petrol engine powertrains, such as Toyota’s Prius

All three of these approaches are a positive for loading per car and create a slight shift back to a higher platinum ratio as the catalytic converter is required to run in a wider range of temperatures. The rapid heating and cooling of exhaust gases associated with the combustion engine is exacerbated in city driving, where the majority of hybrid vehicles are sold.

Electric vehicles are coming, but not in volumes to lower our forecast demand until 2020

Two types of electric vehicles will eventually reduce the need for PGM-based catalytic converters: (1) battery powered rechargeable vehicles and (2) hydrogen fuelled Fuel Cell Vehicles (FCVs).

Battery powered electric vehicles already exist in limited volumes, primarily city-based delivery vehicles. The first commercial volume cars will come from Renault/Nissan with the Leaf in early 2011. As with any new technology, many issues still exist that will be worked out through subsequent models. The main ones are: (1) an effective range of only c.100 km (60 miles); (2) 8-12 hour recharge periods; (3) a 4-5 year life for the battery pack; (4) a cost of c.US\$20k/unit for the battery packs today; and (5) the limited charging point infrastructure.

In our view, battery electric vehicles will not be a major part of the sector before 2020.

FCVs are essentially electric vehicles with the battery replaced by a hydrogen fuel cell. FCVs have favourable environmental characteristics as they use the most abundant element as fuel and produce water at the tail pipe. The PGM industry also likes fuel cells as they require PGMs as the catalyst to create the electricity flow. Current generations of fuel cells use c.30g PGM/car – well in excess of autocatalysts. In fact, the PGM requirements are so high that the industry would not be able to produce enough to supply even a 20% conversion to FCVs.

Umicore, a leading metal recycler, autocat maker and fuel cell expert, estimates that with sufficient R&D spend, the PGM loading could be brought down to under 10g/car, but this would still be very attractive to the PGM industry.

One FCV is currently in partial production, the Honda FCX Clarity, which is on limited consumer lease in California. However, there are major barriers to popularising FCVs, namely: (1) a lack of hydrogen fuel refuelling infrastructure; (2) producing hydrogen from natural gas is energy intensive and carbon negative; (3) the cost of fuel cells is even higher than battery packs; and (4) safety, given the flammability of hydrogen.

In conclusion, we believe that alternative powertrains pose a minimal risk over the next ten years to our core outlook for a platinum deficit.

Recession slowed recycling volumes, but they will bounce back

We expect global recycling from autocats to increase from 2009 levels, but not to return to 2008 levels until 2011. Factors leading to a reduction in recycling volume were:

- Fewer total cars scrapped in 2008 and 2009 as consumers generally held onto older cars for longer in preference to buying a replacement. This is borne out by car sales data for the period. Scrappage schemes did stimulate some additional sales, but gross sales were well below 2007 levels.
- Spiking PGM prices accelerated recycling of the autocatalyst stockpile in the first half of 2008, reducing the buffer inventory in 2009.
- Metal prices were on average lower in 2009 – a reduced incentive to recycle.
- Much of the autos sales growth is in developing markets, where cars are generally on the road for significantly longer than in developed markets. We do not expect China, for example, to have a significant recycling industry for many years.

These factors have to be balanced against growth drivers:

- Higher metal prices will increase the number of cars – even those previously viewed as marginal – that can be recycled economically.
- Each newer generation of cars has higher loadings of PGMs, so recyclable metal/car will increase over time as these cars are scrapped.
- Technology improvements mean that most recyclers can recover almost 100% of the PGMs from recycled autocats today.
- “Cash for clunkers” type schemes encouraged the scrapping of old cars, which increased the ratio of cars recycled.

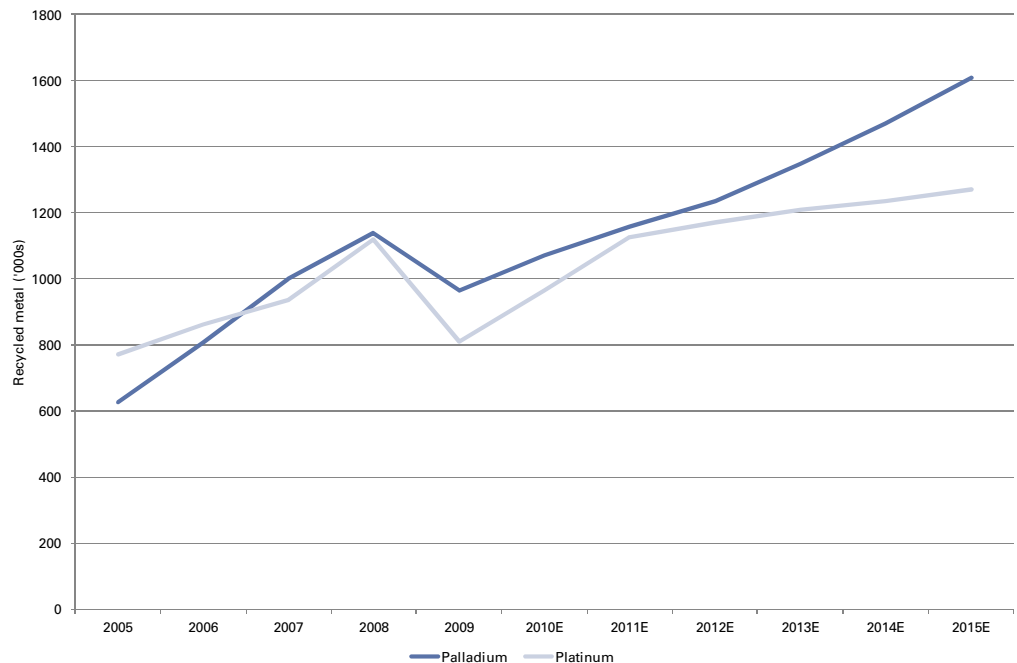
Lastly, the move towards higher ratio Pd over Pt in past years will see recycled Pd grow at a faster rate than Pt after 2012 as newer generations of cars are scrapped.

The implication of these factors is that total recycling PGMs from autocats will return to 2008 levels, but not until 2011, on our estimates, as the scrapped cars of 2010 work their way through the supply chain. In addition, growth in Pt from recycling will slow just as Pd volumes will grow.

As newer generations of cars are recycled, we expect higher palladium loading in recycled cars, also suggesting that palladium recycling will grow faster than platinum.

One interesting point from our research in recycling is that the industry ran at near capacity in 2008, when the platinum price spiked. No additional capacity has been added, and with recoveries running at near 100%, two outcomes are likely: (1) a cap on recycling throughput, leading to a focus on high platinum and rhodium catalysts or (2) additional investment for recycling. Exhibit 31 shows our estimates for recycling from autocatalysts for platinum and palladium. We have assumed additional investment and growth in recycling volumes. Any delay to this view would increase the deficit we forecast in the Pt market.

Exhibit 31: Recycling slowed through 2008-09; we forecast growth from 2010
Pt and Pd from autocats 2005-15E



Source: Johnson Matthey Platinum 2010, Goldman Sachs Research estimates.

No clear technology substitute for PGMs on the horizon

We estimate that PGMs cost auto manufacturers about US\$250-300/vehicle. Given our forecast of rising PGM prices, it is easy to understand why the auto manufacturers want to investigate other technologies to meet emissions regulations.

About twice a year, there is news of a technology breakthrough that promises to radically cut PGM loading. Mazda announced in early 2009 that it had developed a nano-technology to reduce the required loading for PGM in catalysts by 70%. In June 2010, Panasonic announced that using an alloy of different metals (without giving details), it could cut PGM usage by 90%. Gold and silver are also alternative solutions.

We believe that these technologies are not commercially ready to offer a viable solution for the auto manufacturers, but as PGM prices rise, we expect more R&D money to be spent on finding a solution. However, with drivetrain technologies more or less already set for model year 2017/18 cars and given the period of re-certification for alternative catalyst technologies, we do not expect a radical departure from the loading/car curves described in the earlier section.

Pt and Pd forecasts for the autocat sector

Exhibits 32 and 33 summarise our view of demand for Pt and Pd in the autocat segment. For Pt, we expect net demand to be lower in 2015 than 2007 owing to substitution by palladium, thrifting, recycling and downsizing of engines.

Exhibit 32: Platinum loadings will fall but demand will be at 2007 levels for the foreseeable future

Global platinum demand for the autocat sector by region

	2005	2006	2007	2008	2009	2010E	2011E	2012E	2013E	2014E	2015E	CAGR (2008-2015)
Europe												
Gross demand	1,960	2,060	2,055	1,970	970	1,750	1,890	1,947	1,986	1,966	1,946	-0.2%
Recycling	-170	-190	-215	-385	-296	-325	-374	-396	-412	-425	-437	1.8%
Net demand	1,790	1,870	1,840	1,585	674	1,425	1,516	1,550	1,573	1,541	1,509	-0.7%
Vehicle production (m)	20.3	20.9	22.3	21.2	16.9	17.6	18.7	20.2	21.3	22.4	22.4	0.8%
Pt / car (g)	2.99	3.06	2.86	2.88	1.78	3.08	3.14	2.99	2.88	2.72	2.69	-1.0%
North America												
Gross demand	820	705	850	505	370	725	850	876	867	858	841	7.6%
Recycling	-505	-575	-605	-620	-425	-545	-650	-670	-676	-683	-697	1.7%
Net demand	315	130	245	-115	-55	180	200	206	191	175	144	-
Vehicle production	16	15	15	13	9	11	12	14	15	15	15	2.8%
Pt / car (g)	1.61	1.43	1.75	1.24	1.34	2.05	2.16	1.97	1.84	1.76	1.70	4.6%
Japan												
Gross demand	600	605	610	610	395	540	529	524	519	513	508	-2.6%
Recycling	-35	-35	-35	-60	-46	-50	-55	-55	-56	-57	-58	-0.5%
Net demand	565	570	575	550	349	490	474	469	463	457	450	-2.8%
Vehicle production	10.4	11.1	11.2	11.1	7.7	9.1	10.1	10.8	10.8	11.0	11.1	0.0%
Pt / car (g)	1.78	1.69	1.70	1.70	1.59	1.83	1.62	1.51	1.49	1.45	1.42	-2.5%
China												
Gross demand	120	155	175	145	130	152	172	196	212	222	233	7.0%
Recycling	0	0	-10	-15	-12	-12	-13	-14	-25	-28	-30	10.5%
Net demand	120	155	165	130	118	139	159	182	187	195	203	6.6%
Vehicle production	5.3	6.7	8.1	8.6	12.9	14.4	15.6	16.6	17.7	18.7	17.5	10.7%
Pt / car (g)	0.71	0.72	0.67	0.52	0.31	0.33	0.34	0.36	0.37	0.37	0.41	-3.3%
RoW												
Gross demand	295	380	455	430	365	402	444	482	501	511	600	4.9%
Recycling	-60	-60	-70	-40	-31	-32	-34	-35	-39	-43	-47	2.4%
Net demand	235	320	385	390	334	369	410	446	462	468	553	5.1%
Vehicle production	13.4	19.9	22.6	23.3	26.8	29.8	32.6	35.1	37.1	38.9	36.9	6.8%
Pt / car (g)	0.68	0.59	0.63	0.57	0.42	0.42	0.42	0.43	0.42	0.41	0.50	-1.8%
Total												
Gross demand	3,795	3,905	4,145	3,660	2,230	3,568	3,885	4,024	4,084	4,071	4,129	1.7%
Recycling	-770	-860	-935	-1,120	-809	-965	-1,126	-1,171	-1,208	-1,235	-1,269	1.8%
Net demand (from mining)	3,025	3,045	3,210	2,540	1,421	2,604	2,760	2,853	2,876	2,836	2,859	1.7%
Vehicle production	64.4	67.1	71.0	68.2	59.9	67.5	73.6	79.9	83.9	87.3	85.7	3.3%
Pt / car (g)	1.83	1.80	1.81	1.66	1.15	1.64	1.64	1.56	1.51	1.44	1.49	-1.5%

Source: Johnson Matthey Platinum 2010; Goldman Sachs Research estimates.

For palladium, we expect demand to grow significantly on Chinese auto sales and toughening emissions standards in India and China. We forecast loading/car to increase to above 2g/vehicle (on average) and net demand to be c.4 mn Pd oz by 2015. This would add c.1.6 mn Pd oz to net demand. Even without Russian state sales, which currently balance the market with their c.600k oz/year, palladium prices could increase faster than platinum prices.

We would also expect Pd recycling to dramatically increase to support this market situation, although this will require investment. Even aside from this, the rise of auto production in the BRICs and the shortfall in palladium production from Russian, Canadian and South African mines should push the palladium price well ahead of today's levels, in our view.

Exhibit 33: Palladium loading will rise slightly due to shift from platinum; auto sales drive gross demand

Global palladium demand for the autocat sector by region

	2005E	2006E	2007E	2008E	2009E	2010E	2011E	2012E	2013E	2014E	2015E	CAGR (2008-2015)
Europe												
Gross demand	975	890	920	1,005	995	950	1,050	1,125	1,175	1,215	1,275	3.5%
Recycling	-165	-225	-300	-310	-280	-290	-320	-330	-345	-360	-380	3.0%
Net demand	810	665	620	695	715	660	730	795	830	855	895	3.7%
Vehicle production (m)	20.3	20.9	22.3	21.2	16.9	17.6	18.7	20.2	21.3	22.4	22.4	0.8%
Pd / car (g)	1.49	1.32	1.28	1.47	1.83	1.67	1.74	1.73	1.71	1.68	1.76	2.6%
North America												
Gross demand	1,430	1,415	1,655	1,290	1,020	1,250	1,300	1,430	1,500	1,540	1,575	2.9%
Recycling	-390	-500	-605	-670	-540	-600	-650	-700	-777	-862	-957	5.2%
Net demand	1,040	915	1,050	620	480	650	650	730	723	678	618	-0.1%
Vehicle production	16	15	15	13	9	11	12	14	15	15	15	2.8%
Pd / car (g)	2.82	2.87	3.41	3.18	3.69	3.54	3.31	3.21	3.18	3.16	3.19	0.1%
Japan												
Gross demand	660	795	845	885	590	750	850	900	900	900	900	0.2%
Recycling	-30	-30	-35	-70	-50	-65	-72	-79	-87	-95	-105	5.9%
Net demand	630	765	810	815	540	685	779	821	813	805	795	-0.3%
Vehicle production	10.4	11.1	11.2	11.1	7.7	9.1	10.1	10.8	10.8	11.0	11.1	0.0%
Pd / car (g)	1.96	2.23	2.35	2.47	2.38	2.55	2.60	2.59	2.58	2.54	2.52	0.3%
China												
Gross demand	170	220	275	390	685	778	857	935	1,011	1,091	1,041	15.1%
Recycling	0	0	0	-30	-35	-39	-42	-47	-51	-56	-62	10.9%
Net demand	170	220	275	360	650	739	815	888	960	1,034	979	15.4%
Vehicle production	5.3	6.7	8.1	8.6	12.9	14.4	15.6	16.6	17.7	18.7	17.5	10.7%
Pd / car (g)	1.00	1.02	1.05	1.41	1.65	1.68	1.71	1.74	1.77	1.81	1.85	3.9%
RoW												
Gross demand	630	695	775	895	760	1,100	1,250	1,350	1,450	1,450	1,380	6.4%
Recycling	-40	-50	-60	-60	-60	-66	-73	-80	-88	-97	-106	8.5%
Net demand	590	645	715	835	700	1,034	1,177	1,270	1,362	1,353	1,274	6.2%
Vehicle production	13.4	19.9	22.6	23.3	26.8	29.8	32.6	35.1	37.1	38.9	36.9	6.8%
Pd / car (g)	1.46	1.09	1.07	1.19	0.9	1.1	1.2	1.2	1.2	1.2	1.2	-0.4%
Total												
Gross demand	3,865	4,015	4,470	4,465	4,050	4,828	5,307	5,740	6,036	6,196	6,171	4.7%
Recycling	-625	-805	-1,000	-1,140	-965	-1,060	-1,156	-1,235	-1,348	-1,471	-1,610	5.1%
Net demand (from mining)	3,240	3,210	3,470	3,325	3,085	3,768	4,151	4,505	4,688	4,725	4,561	4.6%
Vehicle production	64.4	67.1	71.0	68.2	59.9	67.5	73.6	79.9	83.9	87.3	85.7	3.3%
Pd / car (g)	1.86	1.86	1.95	2.03	2.10	2.22	2.24	2.23	2.23	2.20	2.23	1.4%

Source: Johnson Matthey Platinum 2010, Goldman Sachs Research estimates.

China jewellery: Don't worry about the price, look at the volume

Much has been made of the sharp increase in Chinese jewellery demand for platinum in 2009 amid a weak platinum price post financial crisis. We believe the jump in Chinese jewellery demand is widely regarded as a one-off event. Our view differs for two reasons: (1) we see platinum as being a preferred luxury fashion item in China, providing more resilience against inevitable price rises; and (2) the number of additional consumers able to afford discretionary jewellery purchases in the US\$250-300 range is set to rise massively in the next five years. We believe that even if there is initial resistance to higher prices, gross jewellery demand in China will eventually grow to a sustained level of 2m platinum oz/year.

2009 an extraordinary year for Chinese jewellery: Can it last?

In 2009, gross jewellery demand for platinum in China was 2.08 mn oz, up from 1.06 mn oz in 2008. The question is whether jewellery demand will dry up as prices increase or whether demand from Chinese consumers will continue to grow.

Decomposing demand

We believe there were several moving parts to the 2009 China demand story that explain the jump in platinum demand in 2009:

1. A preference for white metals over gold.
2. Platinum being well established as the premium white metal, reflecting its appearance and rareness, leading to a store of value perception in consumers' minds.
3. A historic low in the platinum/gold price ratio made platinum jewellery look relatively good value next to gold.
4. About 250k of palladium jewellery demand moved to platinum according to Johnson Matthey, due to the low relative price of platinum (*Platinum 2010*, March 2010).
5. A growing number of Chinese consumers are participating in the market as the Chinese middle class expands (a factor we believe will become more important).
6. Speculative investment demand for platinum increased given the low prices (likely from jewellery wholesalers).

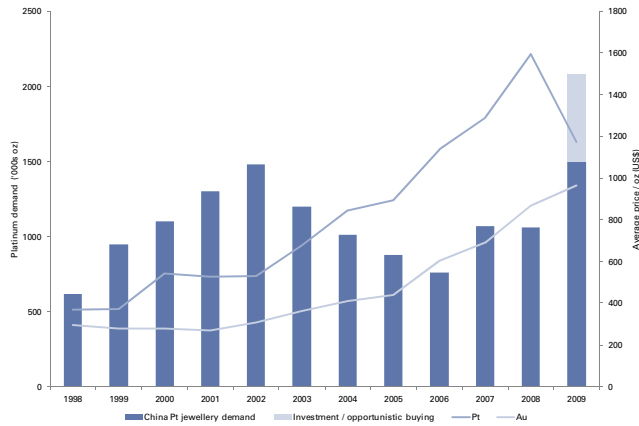
We estimate that only 1.5 mn oz of the 2.08 mn oz total actually went into jewellery demand for 2010, and that the remainder (580k oz) went towards building stock or investment demand. Given there are no ETFs or a physical coin or bar market in China, this demand is counted as jewellery demand.

Platinum the preferred jewellery in China

Buying habits for platinum jewellery in China are different than those in the US or Japan. Anglo Platinum's recent research shows that the primary customer is female, between 20 and 30 years old and is buying for herself. The average price per piece is US\$250-300, with chains, pendants and rings most popular. The swing back from palladium and white gold as platinum becomes relatively more affordable demonstrates consumers' preference for this over other white metals.

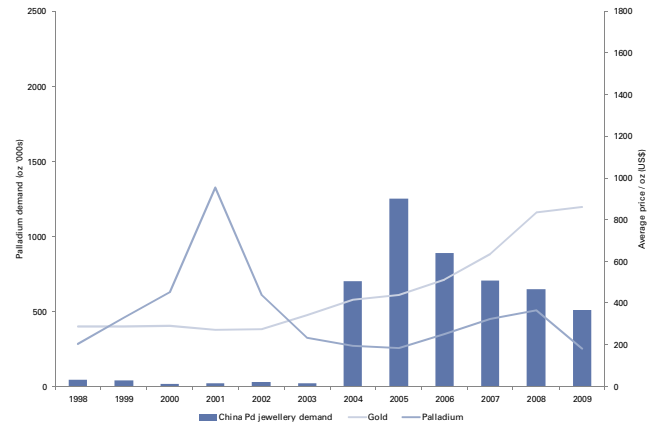
Exhibits 34 and 35 show the evolution of China jewellery demand for platinum and palladium. What is interesting to observe is that gross demand for jewellery in 2009 was back to recorded 2002 levels after we adjust for our estimate for investment demand (shown by the lighter colour segment in Exhibit 34) – even though the price had more than doubled.

Exhibit 34: Platinum jewellery growing again despite price at historic highs...



Source: Johnson Matthey Platinum 2010; Goldman Sachs Research.

Exhibit 35: ...palladium jewellery not sustaining with volume shifting to platinum even at low prices

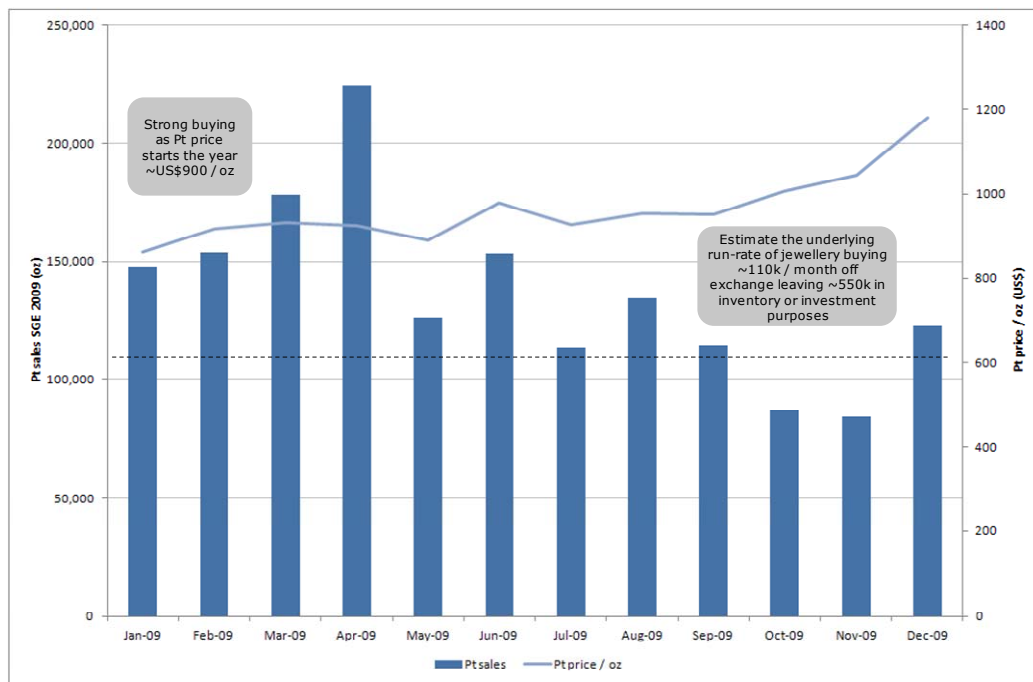


Source: Johnson Matthey Platinum 2010; Goldman Sachs Research.

It is also interesting to note that demand for palladium jewellery is not being sustained among Chinese consumers even though the price of platinum is near all-time highs and palladium is relatively cheap. There was clearly some substitution in 2004-06 as jewellers and wholesalers attempted to shift demand to Pt/Pd alloys. We could easily argue that the total market for PGM jewellery has been c.1.5 mn oz in 2002-08, with the mix shifting between platinum and palladium. However, it would appear that price considerations are not the sole driver of this preference for Chinese consumers, given the significant swing back to platinum even at higher prices.

Analysing 2009 physical metal sales on the Shanghai Gold Exchange (see Exhibit X) shows that 1.64 mn Pt oz were sold. Adding to this recycling of old jewellery of c.330k Pt oz gives a gross jewellery market value of c.2 mn Pt oz, which compares to Johnson Matthey's 2.08 mn Pt oz estimate (*Platinum 2010*). Thus, we believe the SGE gives a good proxy of the total Chinese platinum jewellery market.

Exhibit 36: Pt sales on the Shanghai Gold Exchange, 2009



Source: Shanghai Gold Exchange.

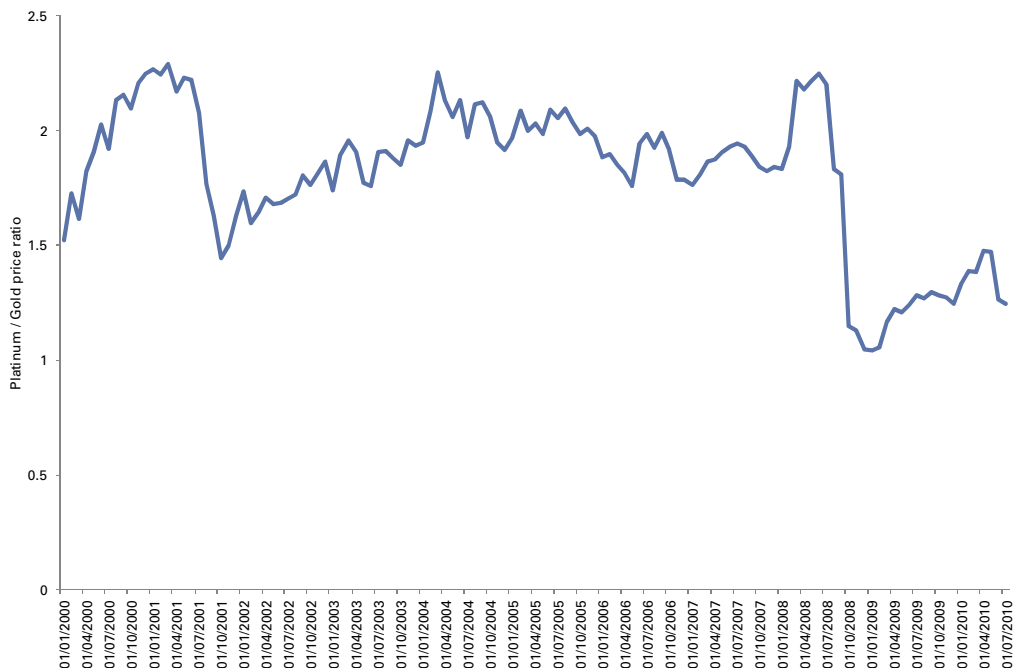
Given that the financial crisis affected consumer confidence in China as it did in the West, we assume that the high sales in January-April 2009 were driven by wholesalers taking advantage of a big drop in platinum prices. We assume that this was investment speculation, alongside some opportunistic restocking by jewellery wholesalers.

Recycling data for China in 2009 adds weight to the argument, as recycling increased to 330k oz from 210k in 2008, even though prices were on average lower. We believe that metal bought in January-April 2009 by wholesalers was sold back into the market for profit in 2H2009 as prices increased, which gave a lift to recycling volume.

Platinum/gold ratio near all-time low – platinum looks cheap

Reinforcing the existing strong preference for platinum jewellery in China is the high gold price, which is making platinum jewellery look like good value on a relative basis. Exhibit 37 shows the historical price premium of platinum over gold. It is clear that even at US\$1,500/platinum oz, the ratio to gold is at an all-time low. With respect to white gold – a significantly less attractive substitute for many consumers given its silver colour – a currently low relative uplift price to trade up to platinum is converting many customers to platinum.

Exhibit 37: Premium of platinum over gold at a record low in 2009, remains low vs. history
 Month-end Pt/Au price/oz



Source: Datastream.

Sustained high prices a positive for platinum jewellery in China?

Luxury goods markets can sometime work counter intuitively, with demand being enhanced by higher prices. Luxury branded handbags, sunglasses and watches all trade on this effect. While this can seem irrational, it is underpinned by the consumer's belief in the long-run value (financial or emotional) in a product. We believe that demand for platinum is based on: (1) exclusivity through rareness and (2) a belief in the long-run value of the metal.

A higher – and more importantly, sustained – price reinforces both of these purchasing drivers. Hence, we believe the market will become less price-elastic, within reason, at a price level around our 2012/2013 forecast of US\$2,800/oz.

With regard to the second driver highlighted above, while the price decline from US\$2,200 to US\$900/oz in 2008 may have stimulated additional demand through bargain hunting, we believe it could damage the long-term belief in platinum's value. For example, will consumers immediately feel good about buying platinum jewellery at US\$1,600/oz if there is a chance the price will drop again to US\$900/oz?

We conclude that a higher price (more than US\$2,000) can be absorbed by the market as:

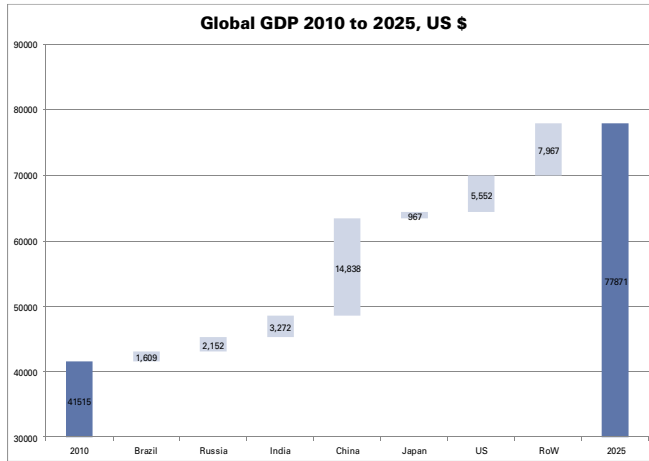
- The average value of purchase in China is relatively low, at US\$250-300, so a 50% increase in today's US\$1,600 platinum price to c.US\$2,400/Pt oz would be unlikely to significantly change the purchasing decision.
- Platinum has flexibility to return to its long-run 2:1 ratio to gold, which at today's gold price is c.US\$2,500/Pt oz; this would be a positive for consumer sentiment.
- Sustained prices at a higher level boost consumer confidence in the long-term value of platinum as an investable metal.

Luxury goods spending in China to quadruple by 2015E

The second leg of our argument is that Chinese platinum jewellery demand will grow to eventually eclipse 2009's extraordinary year and sustain over 2 mn Pt oz / year. This is due to the number of consumers who will come to be in a position to afford discretionary, luxury purchases within in the next five years.

Exhibits 38 and 39 demonstrate the change we expect to see in luxury spending by Chinese consumers. As our economists forecast that China will show the highest growth in GDP globally through to 2030, we expect equally explosive growth in luxury goods spending.

Exhibit 38: China to show the fastest growth in GDP...



Source: Goldman Sachs Research estimates.

Exhibit 39: ...and in luxury spending



Source: Goldman Sachs Research estimates.

According to our Luxury Goods colleagues in their June 2010 report *Luxury Goods: A trillion dollar global industry by 2025?*, Chinese consumers earning more than US\$30k per annum spend more on luxury goods than Japanese consumers (Exhibit 40).

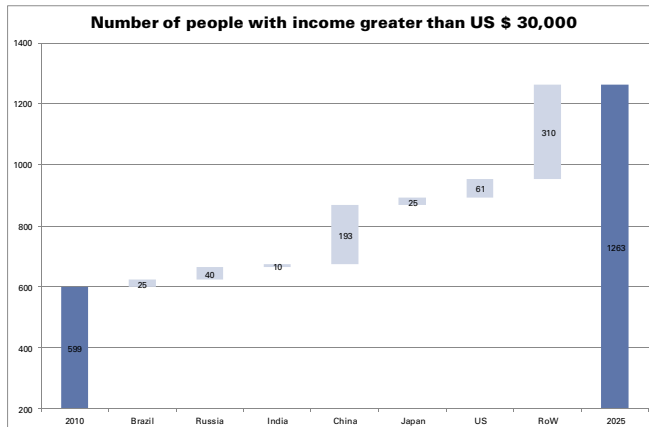
Exhibit 40: Chinese earning >US\$30k spend more on luxury goods than Japanese (in US\$)



Source: Goldman Sachs Research estimates.

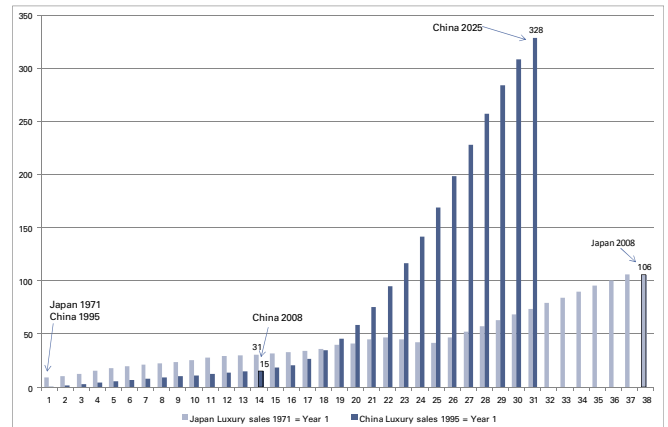
So the question becomes how many more Chinese consumers will be earning more than US\$30k in the next five years? As shown in Exhibit 41, our economists expect 200 mn more consumers earning over this level to emerge by 2025. Based on this, our luxury goods analysts expect China's market for luxury goods to dwarf Japan's within 15 years (Exhibit 43).

Exhibit 41: An estimated 200 mn more consumers to earn over US\$30k by 2025...



Source: Goldman Sachs Research estimates, Goldman Sachs Global ECS Research.

Exhibit 42: ...making the luxury goods market in China 3x that of Japan by 2015E



Source: Goldman Sachs Research estimates.

No sign of a slowdown in Chinese jewellery in 2010

We look at tax receipts and department store sales as our guide to demand drivers and metal sales from the Shanghai Gold Exchange as a sign of real demand. On both indicators, we see no signs of a slowdown in demand for platinum jewellery.

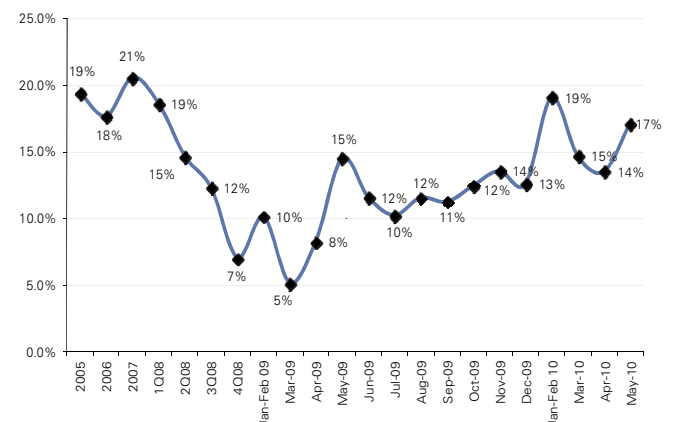
Exhibits 43 and 44 show that tax receipts for 2010 ytd have increased, as have month-to-month department stores sales through to end May 2010.

Exhibit 43: Individual income tax receipts in April is consistent with 1Q's strong trends (20%+)
China Income tax receipts growth, 2000 to April 2010



Source: Goldman Sachs Research estimates.

Exhibit 44: Comps for department stores still strong
GS China Department Stores Composite SSS Index, 2005 to May 2010



Source: Goldman Sachs Research estimates.

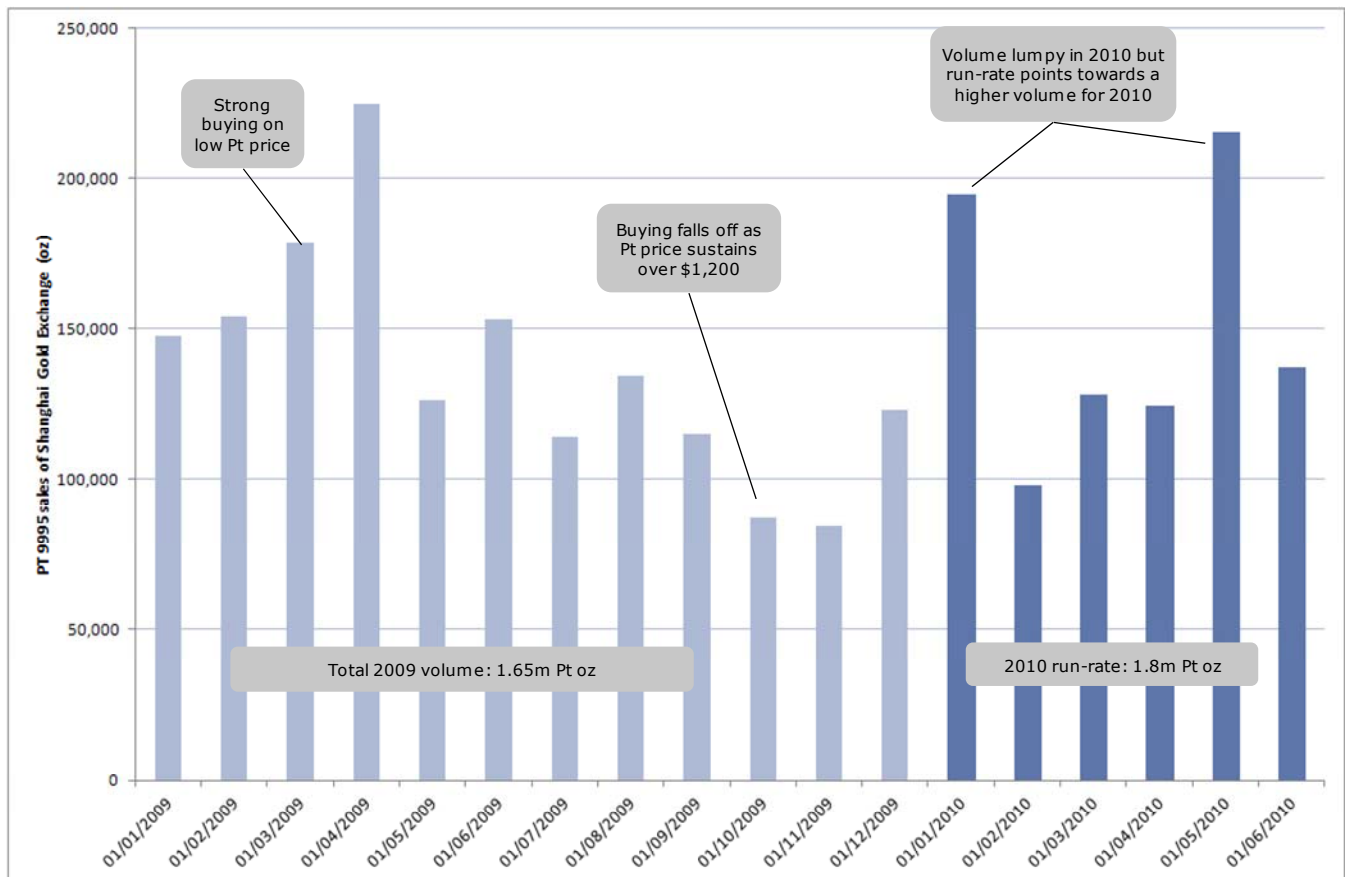
Chinese jewellery could surprise on the upside in 2010

Exhibit 45 shows that while sales have been lumpier than in 2009 (January and May are the standout months), total physical metal sales on the Shanghai Gold Exchange are up on a run-rate basis for 2010 over 2009. If we assumed that recycling was up on higher prices to c.400k Pt oz annualised, this would imply gross sales of physical metal for jewellery of >2.15 mn Pt oz – actually up on 2009’s level.

We believe that May’s buying was higher because of seasonal holidays and some opportunistic buying on intra-month volatility in the platinum price. June’s sales figure looks surprising given that it seems to maintain the underlying upward trend, even though Pt prices remained around US\$1,500/oz.

Overall, this points to positive trends in Chinese jewellery sales in 1H2010. We forecast net jewellery demand of 1.15 mn Pt oz for FY2010 (down from 2.08 mn in 2009), but the fact that 900k Pt oz have been sold YTD on the exchange suggests that the risk to this forecast is to the upside.

Exhibit 45: Platinum sales on the Shanghai Gold Exchange at a higher run-rate in 2010 than 2009
 Volumes in 2010 more lumpy as de-stocking occurs when prices move ahead, but underlying demand remains strong



Source: Shanghai Gold Exchange; Goldman Sachs Research.

Investment demand will remain a driver of prices – and volatility

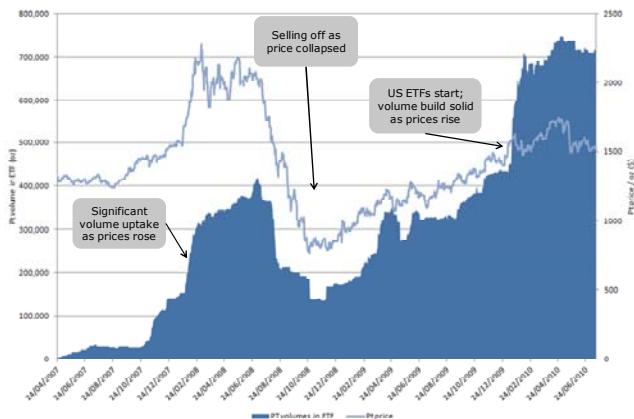
Investment demand is a relatively new component of the overall demand picture. We expect it to grow for four reasons: (1) on the heels of the gold ETFs, the popularity of ETFs overall is growing; (2) we expect holders of gold ETFs to diversify into Pt and Pd ETFs; (3) while high prices create the opportunity for investors to exit, the conditions that lead to high prices draw in more investment; therefore, we expect ETFs to grow rather than return physical Pt to the market; and (4) we expect additional ETF demand to soak up lost demand from other segments, leading to a situation where the price required to “kill off” price-sensitive demand is higher than at any time in the past.

ETFs are a relatively new asset class for investors, but have gained ground on the heels of the gold ETF, which provided a way for professional and personal investors to access physical gold without the complications or costs of storage. ETFs are now emerging in multiple metals across multiple exchanges.

There is now about 60m Au oz in ETFs worth over US\$70 bn. The platinum and palladium ETFs were started in 2007 as investors sought a way to play the inherent tightness in PGM markets with the same ease of the gold ETF.

Today, there is c.700k Pt oz in the three major platinum ETFs worth over US\$1.1 bn and 1.2 mn Pd oz in the palladium ETFs worth US\$510 mn (see Exhibits 46 and 47). These are rare, precious metals that have a store of value element supported by a core, regulated element of industrial demand as well.

Exhibit 46: Cumulative platinum volume in ETFs
Sum of US, Swiss and UK



Source: Bloomberg.

Exhibit 47: Cumulative palladium volume in ETFs
Sum of US, Swiss and UK



Source: Bloomberg.

Potential switching from gold ETFs into PGMs

Given that there is about US\$70 bn locked up in gold ETFs and only US\$1.6 bn in the Pt and Pd ETFs, it is easy to see that very limited switching would be required to have a big impact on the dynamics of the PGM ETFs.

While we believe that some of the PGM ETF demand has already come from gold, we view the motivation for investing differently. Gold remains primarily a defensive investment to hedge against wealth destruction – whether that is from equities, bonds or even currencies.

PGMs are primarily an industrial metal and as such are primarily cyclical in nature. We believe most ETF investors are seeking capital gains from price spikes as supply falls short of demand – or, as we believe, the price adjusts to give miners adequate returns.

For that reason, we expect physical metal to flow into and out of the ETFs as market conditions change. One way to think about this is that ETFs provide an extra source of recycling.

ETFs tighten supply further – but create volatility

We forecast investment demand to take c.600-800k pt oz out of supply each year. Every oz of the ETF is backed by a numbered physical Pt 99.999 ingot in a secure safe. As the conditions that make investment attractive increase, this will draw more speculators to the market and increase the flow of metal out of the market – further exacerbating the supply deficit. Hence, we expect prices to rise rapidly in these periods as investors compete with industrial users for metal.

An additional benefit to metal prices will be the effect by which ETFs soak up price sensitive demand, which would otherwise have been reduced in periods of high prices. Now, we expect investors to speculate on further price moves by taking increasing positions in the ETFs. The net effect of this will be that the price required to eliminate price-sensitive demand will increase.

Conversely, as the price of platinum falls, in the run-up to a cyclical slowdown for example, this could trigger investors to crystallise their gains from the ETF, which could release enough platinum and palladium to put the market firmly in oversupply and lead to a sharp drop in prices. On our estimates, it would take c.500k oz to put platinum into oversupply in 2012, for example.

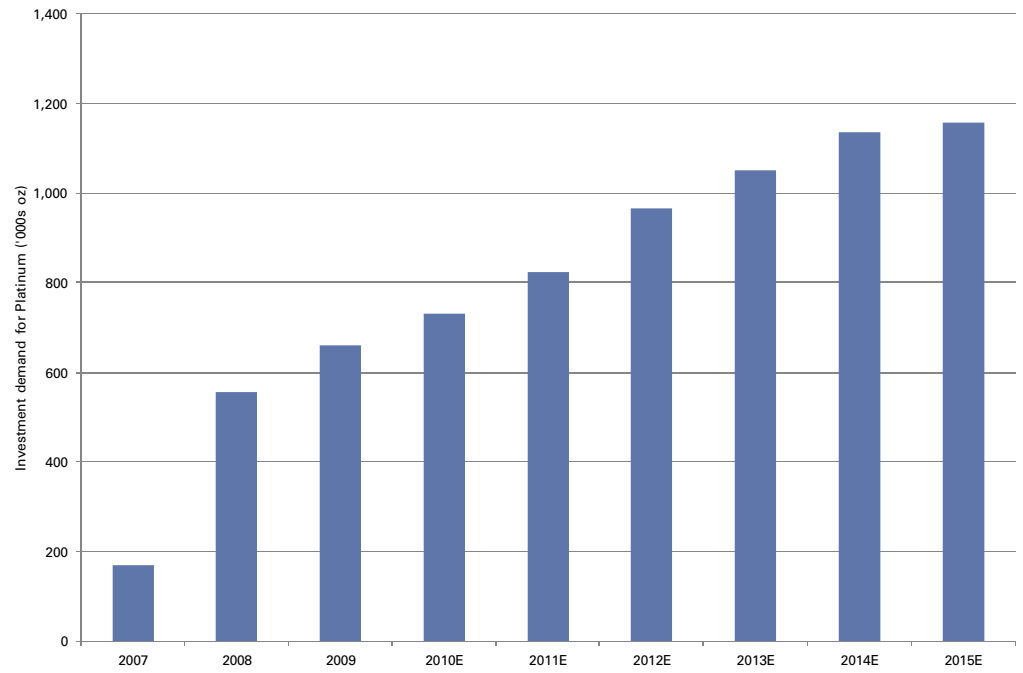
We see an analogy with the Russian palladium stockpiles, except that the data on physical ETF inventory is public. For years, suppliers and investors have wondered about the size of the Russian state stocks and how they affect the dynamics of the palladium market. Having a couple of million oz of PGMs that could possibly come back into the market is a potential risk to the pricing dynamic, and we believe this add significant volatility to the price going forward.

We estimate a c.9% CAGR in investment demand through 2010-15E as prices move up

Investment demand in PGMs through the ETFs has grown fairly solidly since 2007. The jump in demand as new ETFs are launched, as seen with the US ETFs at the beginning of 2010, shows that there is still unmet regional demand. As new ETFs are launched in the Johannesburg, China and Eurozone markets, we believe demand will jump. This is in addition to the growing attractiveness of increasing holdings for existing investors, which could also add to investment demand.

Exhibit 48: Investment demand to rise at historical rates

Estimated global investment demand 2010-15E



Source: Goldman Sachs Research estimates.

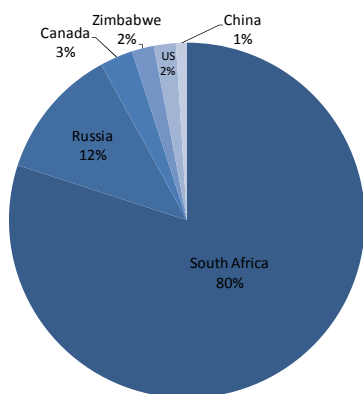
Supply themes unchanged: Production under-delivers, costs go up

Two themes dominate the supply side of global PGMs: (1) Under-delivery versus production targets caused by ageing mines and power and safety concerns and (2) rapidly increasing unit costs as labour costs move up to global averages and mine deterioration lowers production.

The global PGM market is unique among commodities in that 85% of global platinum reserves are in South Africa and Zimbabwe (Exhibits 49 and 50). As with all mining, costs increase as the mines get older, deeper and more complex to operate. Typically, mining would switch to an alternative production centre as new reserves are discovered. This is what happened with gold production in South Africa, for example. Given that this is not an option with PGMs, the industry continues to experience production issues and rapidly rising unit costs.

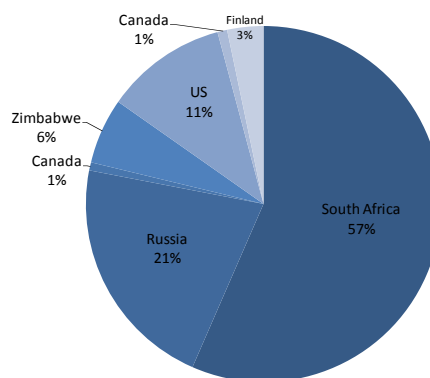
In the sections below, we examine cost inflation and supply constraints.

Exhibit 49: 85% of proven platinum reserves are in South Africa and Zimbabwe



Source: MEG 2007.

Exhibit 50: c.60% of the world's palladium reserves are in South Africa; Russia a major producer



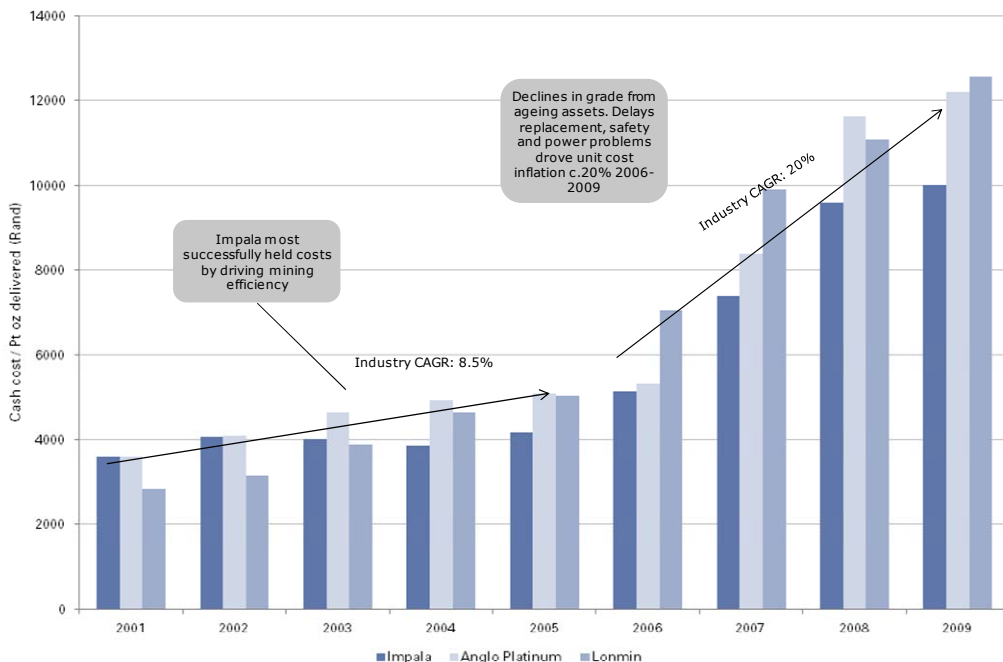
Source: MEG 2007.

Unit cost inflation to continue: Cost/Pt oz up 80% by 2015E

South African cost per delivered platinum oz increased by an average of c.15% pa from 2000 to 2009, with unit cost inflation rising in the second half of the decade. Unit cost inflation is a function of gross cost inflation and reduced output from existing mines due to grade declines, an increased ratio of UG2 over Merensky and unplanned stoppages due to safety, power and industrial action. A key point to remember is that although the miners may be able to stem the increase in unit costs through cost cutting plans (such as Lonmin's R&R programme and Anglo Platinum's recent strides) for one or maybe two years, cost inflation is structural in the industry and to a large extent predictable.

Exhibit 51 shows the scale of the challenge facing the industry, with costs increasing c.20% pa over the last five years as the power and safety crises have affected production and severe inflation has hit the industry.

Exhibit 51: Unit costs have increased at a c.20% rate pa in 2006-2009
 Cost/pt oz 2001-2009 for PGM major miners



Calculated as Revenue-EBITDA/platinum Oz delivered; Impala and Lonmin calendarised

Source: Company data, Goldman Sachs Research.

2010 industry cost curve

Analysing the cost curve in the PGM industry is complicated by the multiple products produced by the mines. We have developed an industry cost curve at the cost/delivered Pt oz level, where we credit the by-product revenues against the cost to effectively get the breakeven price/Pt oz for each mine. Lastly, we add stay-in-business capex/oz to normalise for the accounting treatment of development costs. In our analysis, we take palladium, rhodium, ruthenium, iridium, copper and nickel as by-products using our price estimates for each of these metals.

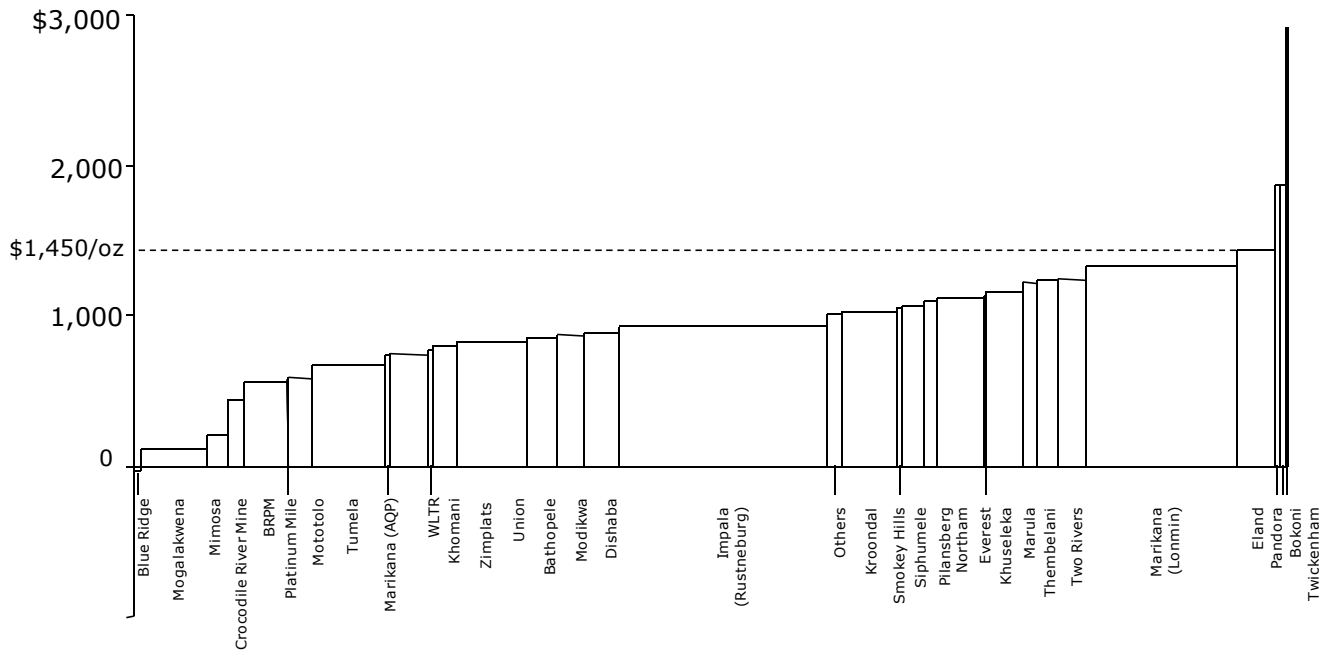
We have built the cost curve for all operating mines in South Africa and Zimbabwe. Exhibit 53 shows our estimate for the industry cost curve.

Our analysis immediately shows that costs for Impala’s Rustenburg lease area, which have for many years been in the lower quartile, have increased sharply and now straddle the second and third quartiles.

In addition, Lonmin’s Marikana mine occupies the majority of the fourth quartile on the cost curve and in our view essentially sets the platinum price in the market, with an estimated breakeven price of c.US\$1,450/Pt oz.

Exhibit 52: PGM industry cost curve for 2010E

Cost / Pt oz net of by-products
(including stay-in business capital)



Note: Prices used: Pt \$1,698 / oz; Pd \$496 / oz; Rh \$2,667 / oz; Gold \$1,181 / oz; Copper \$7,050 / tonne; Nickel \$18,650 / tonne

Source: Goldman Sachs Research estimates.

To illustrate the importance of by-product revenue, we take the Mogalakwena mine, which is, at a gross level, a middle-ranking cost/pt oz mine. When the high base metal contribution is taken into account, Mogalakwena becomes one of the lowest cost mines, requiring only US\$115/platinum oz to break even due to its high basket price/Pt oz. With huge volume increases likely in the next few years, this mine is a source of competitive advantage for Anglo Platinum, in our view.

Components of unit cost inflation

Cost/refined platinum oz is the total number of platinum oz/gross costs from mining, refining and overhead. Exhibit 53 outlines how we see the drivers of unit cost moving in 2010-15E.

Exhibit 53: Costs by category and estimated inflation for 2010-15E

Cost area	Inflation 2005-2009	Driver	Outlook	GS assumption
Labour (55% of costs)	12%	- Unionisation of the workforce	- Continuing CPI +2% increases for 2010-2015E - Potentially declining to CPI post 2015 (or with government intervention)	2010E-2012E: 10% 2013E-2015E: 8%
Mining consumables (30%)	10%	- Oil, steel and power price drive the major mining consumables - Generally runs slightly ahead of consumer inflation	- Ongoing 10%/year with possible spikes if the mining economy really heats up in the next few years	2010E-2012E: 10% 2013E-2015E: 7%
Power (8%)	14%	- Eskom tariff set by the government - Eskom requires capital for new build programme	- 32%/year for next three years (2010E-2012E) with potential increases beyond this	2010E-2012E: 32% 2013E-2015E: 25%
Royalty (3%-8%)	3%-8%	- South African government enacted a royalty based on profit, applies to revenue	- Sliding scale of 0.5% for loss-making miners through to 7% where there is no beneficiation	2010E-2015E: 4.5% (for PGM industry)

Source: Goldman Sachs Research estimates.

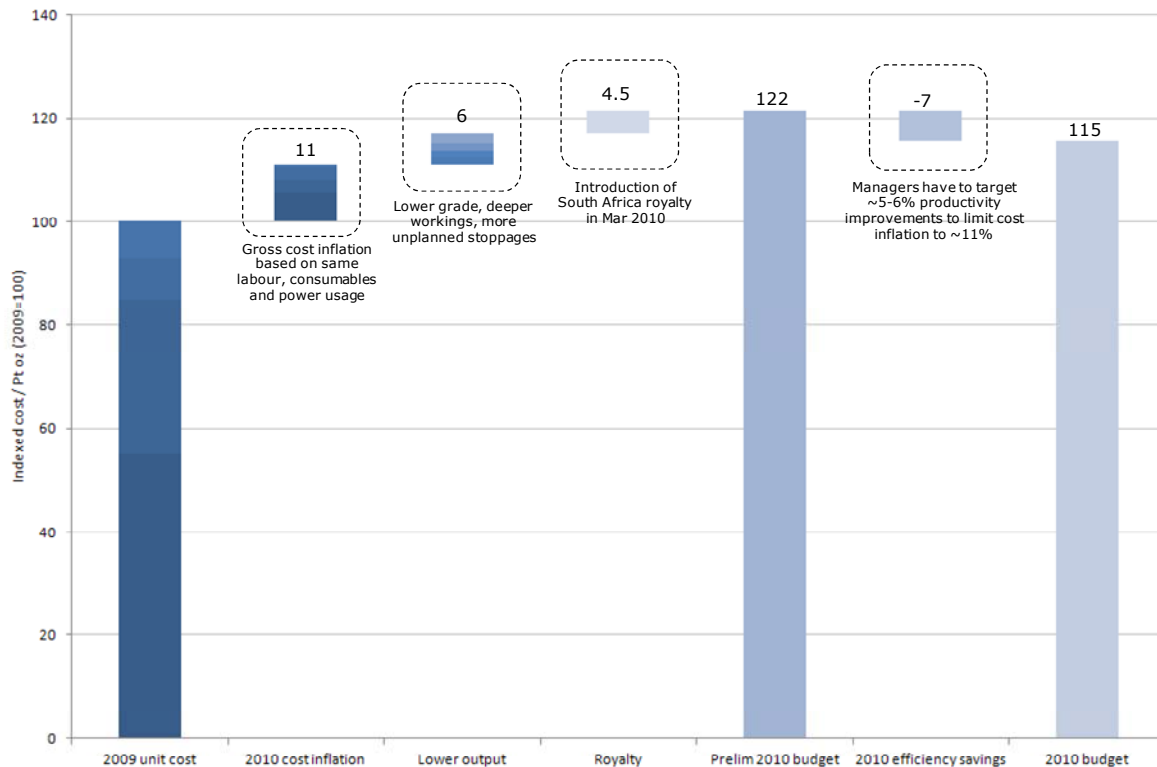
Running hard to go backwards?

Mining is a challenging business. There are very few industries that require explosives to be used in the workplace every day to actually do some damage. Mines floods, roofs fall in and every day is slightly harder than the last.

This is very true in South African deep hard rock mining. As we outline in Exhibit 53, gross cost inflation for the major categories is more or less a given we expect all PGM miners to see their gross costs inflate by c.11%-12%/year, on our estimates.

Exhibit 54 shows a build-up of a typical budget for a PGM mine. On the left, we start with last year's unit cost index rebased to 100. We add 11% gross cost inflation first, then adjust for operational issues such as declining grade, slightly deeper working, some Section 54 and power stoppages, which would add c.6% to unit costs in our estimates. We estimate that the new mining royalty could add c.4.5% to costs for most of the miners (but this could in fact be higher, given that it is levied on revenue). Our analysis returns 2010 unit costs 22% ahead of 2009. This is a common situation for the miners, in our view.

Exhibit 54: PGM miners have to target significant efficiency gains just to limit unit cost inflation to c.15%
 2010E cost inflation over 2009 for a typical PGM mine in South Africa



Source: Goldman Sachs Research estimates.

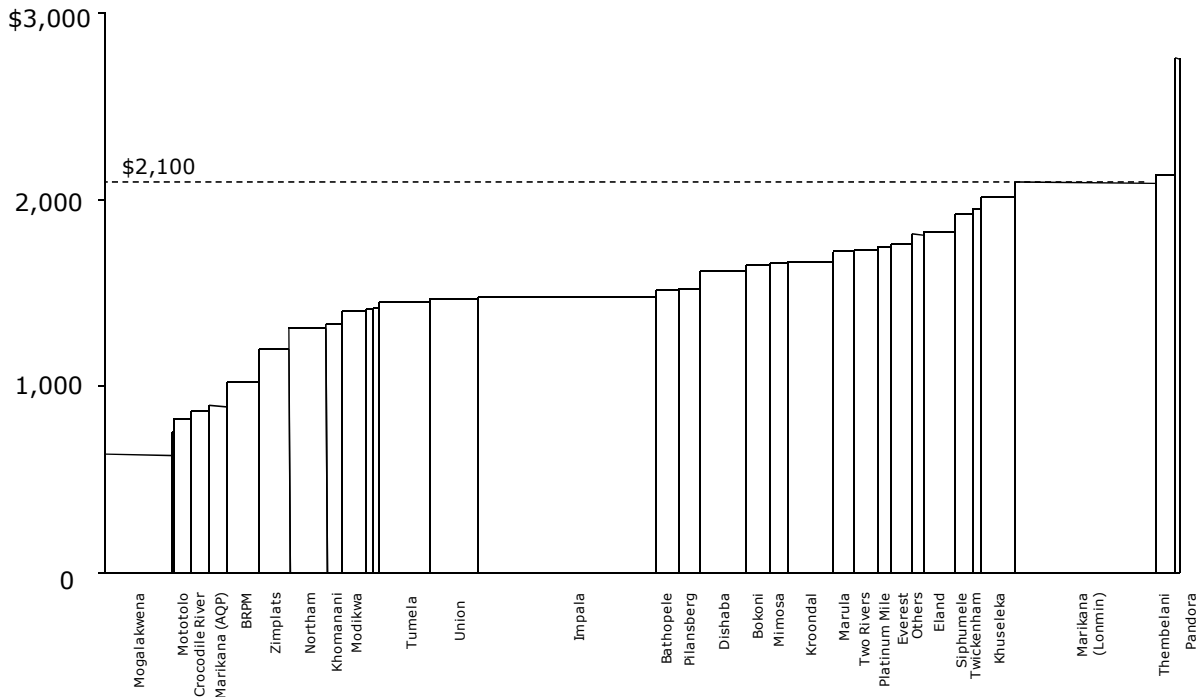
We believe that the typical solution would be for miners to re-examine their budgets and either find the productivity or cost efficiencies to reduce cost inflation or produce a budget that is unlikely to be achieved, given overoptimistic output targets. This is why, in our view, miners often miss output targets.

2015 cost curve to set future prices

Based on the average rates of inflation seen in 2005-09, as well as our forecasts for cost inflation, commodity prices and production, we have pushed out our cost curve analysis to 2015. Exhibit 55 shows the revised cost curve. Our analysis suggests that the 85th percentile producer would require a platinum price of at least US\$2,100 to break even by 2014-15.

Exhibit 55: We estimate the 85th percentile producer would require US\$2,100 to break even by 2014/15E

Cost / Pt oz net of by-products
(including stay-in business capital)



Note: Prices used: Pt \$2,700 / oz; Pd \$773 / oz; Rh \$3.890 / oz; Gold \$860 / oz; Copper \$6,612 / tonne; Nickel \$18,734 / tonne

Source: Goldman Sachs Research estimates.

Turnarounds can delay but cannot stop cost inflation

In their performance improvement briefings, management teams have consistently repeated similar ideas: (1) costs would be cut and (2) output would be improved. Although we do not disagree with their approach, we cannot see much lasting impact on the results.

The most notable sustained periods of performance improvement for the PGM mines (Exhibit 51) were at Impala in 2001-2004 (under CEO Keith Rumble); at Lonmin in 2004-05 (under Stopmie Shiels) and most recently in 2009 at Anglo Platinum (under the leadership of Neville Nicolau).

Why is it so hard to cut costs?

Mining is very unlike other industries, and South African platinum mines are huge and unwieldy, with many complicating factors that make it difficult to effect a long-term turnaround.

- **Scope of operations:** A typical mine employs c.3,500 people working in three shifts over 15 ½-levels covering a total working area of up to 20km² at around 1,000m deep. There can be up to 250 individuals working in places where experienced supervision is required.
- **Headcount reductions are justifiable in times of hardship:** But the reality is that times have not been that bad in the platinum industry for much of the last 20 years. We

believe that for Lonmin and Anglo Platinum to reduce headcount when platinum was at US\$900/oz made strategic sense. It helped the companies reduce management positions and focus on contract labour. With platinum back to US\$1,500/oz, shareholders are pushing for more production and the National Union of Mineworkers (NUM) is asking Impala for 15% annual wage increases. Under these demands, it is difficult to justify headcount reductions and cut costs. Having reviewed history, we believe that in similar situations, companies focus on growing output and managements are less focused on costs, hoping that the economies of scale will work in their favour.

- **Culture:** South African mines are a melting pot of different cultures: Workers come from five surrounding countries, and miners can speak up to ten different languages, which can create tension. It is difficult, with so many different cultures, to identify common motivators across the board. What works for some cultures might not work for others.
- **Decline in average health of worker:** The rate of HIV infection in South African mines has remained steady at c.35% of the workforce. However, the number of cases of full-blown AIDS has increased, resulting in a decline in the average health and strength of workers. Moreover, the instance of tuberculosis has increased in underground mines.
- **Measuring progress is complicated:** Because there are so many moving parts to unit costs, tracking them and measuring improvements is very difficult. The dynamics of changing production, grade, recoveries, like-for-like costs and gross cost inflation all increase the complexity. With the “do nothing” case for unit cost inflation at around 20%, how does management build support for a project when the result is a 10% cost increase?

The industry track record shows that when costs are in the top quartile, management can cut costs back to the industry average, but eventually cost inflation will come through again.

Union negotiations continue to be challenging

Historically, South Africa’s NUM has been asking for a 15% wage increase per annum and getting something in the 8-10% range. Given that South African workers were receiving less than global norms for the same roles for many years, there has been a period of catch-up in which workers have won above CPI wage increases. As South African wages reach the global average, economic theory would suggest that wage increases far above the country’s CPI (our economists expect CPI of 3.2% in 2010) would reduce the competitiveness of the industry and mines would move offshore.

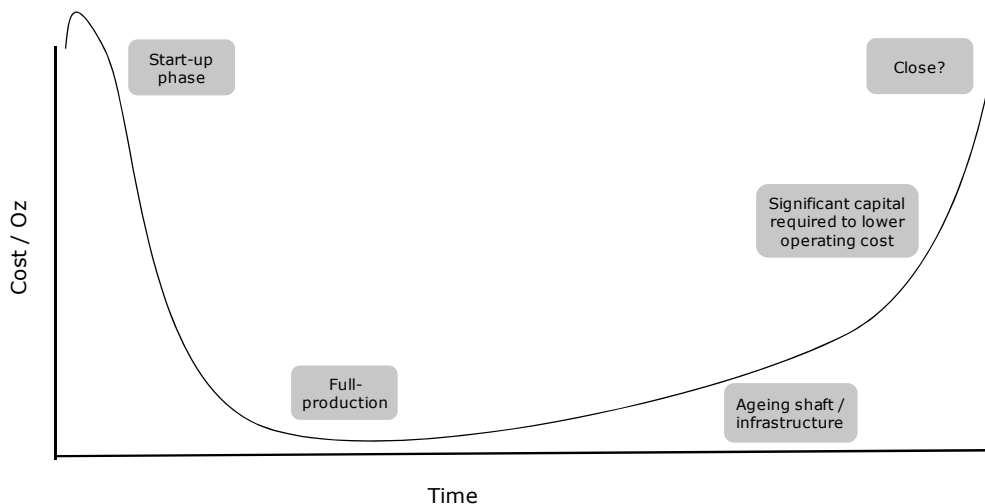
However, the lack of viable alternative reserves of platinum in other countries means that miners have little room for negotiations with the unions, and labour costs will have to rise in order to maintain production. This is a very different position from that of the South African gold mines, which have seen their output fall and their share of global production shift from 60% to c.12% in 40 years, as cheaper production was found in Russia and China.

We believe that a further decline in the gold sector could help slow the rate of cost inflation in the platinum mines. If, for example, an extra 20,000 experienced and skilled workers were to move from the gold sector to the platinum sector, there could be some reduction in wage inflation. However, this would require some support from the government, COSATU and the NUM.

Stay-in-business capital and bathtub curves: Major cost factor

All mines have a life of mine cost curve, or a bathtub curve, as shown in Exhibit 52. When a mine is commissioned, it has high costs until it reaches scale production (for example Anglo Platinum's Thembelani 2 shaft). Mines then get to their design output, hit their lowest operating cost and require small amounts of stay-in-business capital. This period of low operating cost can last approximately ten years assuming development activity is maintained and regular maintenance is kept up to date.

Exhibit 56: Bathtub curve shows evolution of operating costs at deep mines



Source: Goldman Sachs Research.

The next phase in a mine's cycle is decline, where reserves begin to run out and the stay-in-business capital increases. There is a critical switch point in the unit cost performance of mines at this stage – either the investment is made and the mine can carry on for a few years with acceptable costs, or costs surge very quickly (for example, Anglo Platinum's mothballed Boschfontein shaft). Mines that pass a certain point of reinvestment typically have to be closed.

Driving maximum value out of mining projects is about getting down the first part of this curve as quickly as possible and staying for as long as possible on the flat section. When it goes wrong and costs get out of hand, getting the mine back to a low cost position can be extremely challenging and can take multiple years. Lonmin's Hossy and Saffy shafts are good examples: management was unable to secure mechanised shafts and target unit costs were never achieved. The company then got into a multi-year struggle with unit costs and the project did not earn a return on its capital.

The role of development in operating cost

Miners are always keen to highlight their improved development rates. Development rates and level of immediately stoppable ore (panels that are equipped and ready to be mined today) are the levers of unit cost control.

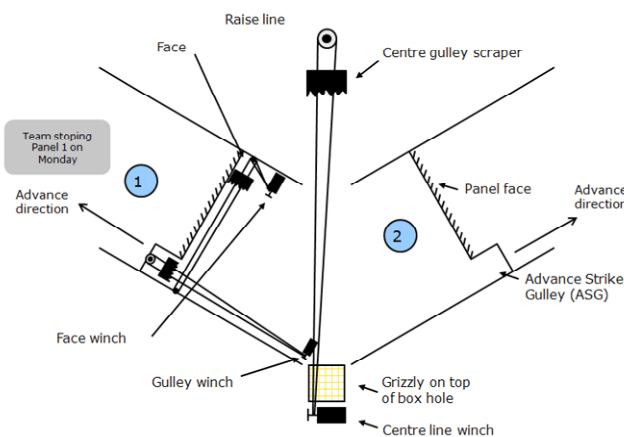
The issue is that once the labour complement is in place, the shaft operates at a fixed cost with a slight flex based on how much explosives, wood and other support materials it consumes. The point of financial leverage at the mine is critical to understand: if miners can get ahead of this curve, the mine will be profitable. If they fall behind that curve, losses can be significant.

Productivity comes from flexibility

Miners often focus on the importance of training and supervision and trying to improve skills up on the “face” (the front line of mining). However, we believe that having a choice of equipped ready-to-stop panels is the most secure way to ensure production targets are met or exceeded. This is what miners call “flexibility”: the option to produce from a second workplace.

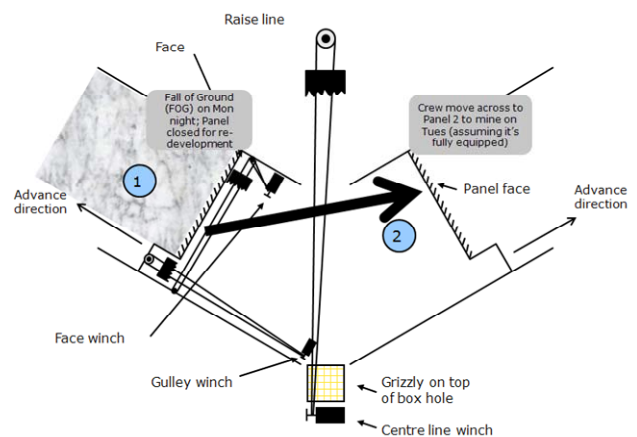
Exhibits 57 and 58 show what panel flexibility is. When a mining crew with a 23-day target of 500m² (normally 20 successful blasts out of 23 x 25m²) have only one panel to work with, the chances of hitting their 500m²/month target are slim. The typical risks to a single panel are potholes (where the reef runs away from the mining plane), falls of ground or support problems, equipment failure, temperature and gas problems.

Exhibit 57: Panel stoppages are common place in South African platinum mines...



Source: Goldman Sachs Research.

Exhibit 58: ...having the flexibility to move to an alternate working place ensures higher productivity



Source: Goldman Sachs Research

To maximise the chance of a team reaching its 500m² target, management should provide a backup panel fully equipped and ready for mining. There is some flexibility on this, as if the ground conditions are very good a 1 panel:1 crew ratio can work. Where conditions are poor (like in many older shafts in the Western Limb), a 2:1 ratio is required. Typically, a 3 panel:2 crew ratio is a healthy average.

Achieving the right panel flexibility requires development metres – which are the (generally) non-revenue generating tunnelling needed to gain access to the ore. These are non-revenue generating because much of the development is in the rock below the reef horizon where the workers, materials and haulage systems are put in to support the mining above.

The problem for the mining companies is a reasonable expectation by investors that the production target will be met at the promised unit cost. Without sacrificing production, the only way to reduce in-year costs at a shaft is to cut back on development. Because this does not affect the year’s mining results, miners have been cutting back on development for years. In our experience, the common failings with development are all linked to putting less effort and focus on this relative to producing the ounces for the next production period.

Other problems related to ageing assets include the mine getting deeper and more development metres being required to liberate enough reef to keep production constant. This is just simple geometry. The next downward level will require more off-reef development to access the ore, as will the level down from that one.

Therefore, if a shaft is falling behind in 2009, it needs to make up that amount in 2010, plus increase the target by 5% to keep at parity; hence mines can get out of ideal shape very quickly.

A practical example

We take an example of a South African PGM mine that is budgeting 10k Pt oz/month at R14,000/Pt oz. 100k tonnes of Merensky ore at 4g/tonne would need to be mined, which in stoping terms is c.25k m² at a 1m stoping width (or 25k m³).

We assume that this mine's manager is optimistic and plans 50 stoping crews at 500m²/month to deliver these platinum ounces, which is how they achieve the budgeted cost of R14,000/oz for 2010. The mine has 60 equipped panels at the start of the year.

Month 1:

- A typical panel loss rate is about 5%/month meaning the mine will lose three panels through fall of ground or geological loss such as potholes.
- Stopping teams are required to hit 20 blasts out of 23 days to meet their 500m²/month target. Without the panel flexibility, we calculate that the average team would probably achieve 17/23 blasts, a very reasonable performance. With a 0.9m advance and a 28m face length, each blast would be 25m². $17 \times 25\text{m}^2 = \text{c.}425\text{m}^2/\text{month}$, which for 50 teams = $50 \times 425 = 21,250\text{m}^2$. This translates into 85% of the target or 8,500 Pt oz/month.
- The implications on unit cost are drastic. Unit cost for the month would be R16,470/Pt oz, or 18% higher than planned.

Month 2:

- The manager would most likely shift teams from development, or bring in extra contractors to mine spare panels. Panel flexibility would go to 1:1 and productivity would fall from the previous month's figure.
- Either development rates will fall (if crews are moved) or costs will increase if labour has been added.
- Working through month two of the year, the mine loses another two panels to geology and has 54 panels worked by 54 crews. The average productivity falls slightly to 410m²/month/crew due to less flexibility. Costs increase by 3%.
- At the end of the month, the mine produces $54 \times 410\text{m}^2 = 22,140\text{m}^2$, which translates into 8,850 pt oz (11.5% behind target) at a unit cost of R16,300/oz – 16.5% higher than planned. The mine would have reduced development metres if crews were moved.

The net impact of this cycle is that the mine manager gets trapped trying to hit the unrealistic budget target, missing the unit cost target and cannot allocate the extra resources to fix the development problem.

In our experience, this is where the majority of older South African platinum mines find themselves.

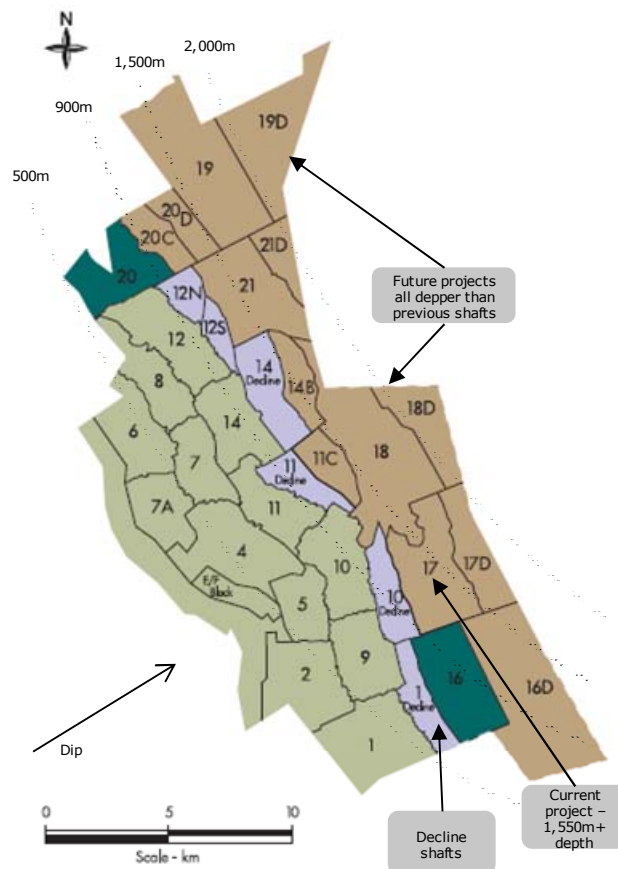
Capital cost inflation: The challenge of deeper shafts

Cost inflation is not just limited to operating costs; it affects capital projects as well. First, capital development uses all the same major costs: labour, concrete/steel/wood and power. These costs experience the same inflation as operating costs. Second, this cost inflation is compounded by increased depths which add time and material cost and require additional infrastructure such as refrigeration. Lonmin’s K4 is 1,400m deep and Impala’s 16 Shaft is 1,700m deep, compared with c.800-900m for the Generation 1 shafts in the Western Limb operated by Anglo Plat and Impala. The multiplying effect of the operating costs and the increased capital can lead to a 4x jump in capex for these Generation 3 shafts.

Heat gradients explain this multiplying effect. For every 100m of depth, the temperature increases by c.2.2°C. At c.1,300m, the temperature is c.40°C. At c.1,800m (the depth of the new Impala 17 shaft), the temperature is 62°C. This necessitates refrigeration and higher rates of airflow, which consume 2-3x the power of a shallow shaft.

Exhibit 59 shows the Impala Rustenburg lease area and demonstrates the challenge. The shallow shafts 1 through 8 are largely mined out. Impala has then moved to build the next generation of shafts, shafts 9 through 12. The next generation of shafts are where some of the under-investment started, in our view.

Exhibit 59: Future projects at Impala’s Rustenburg mine will be around 1,750-2,000m



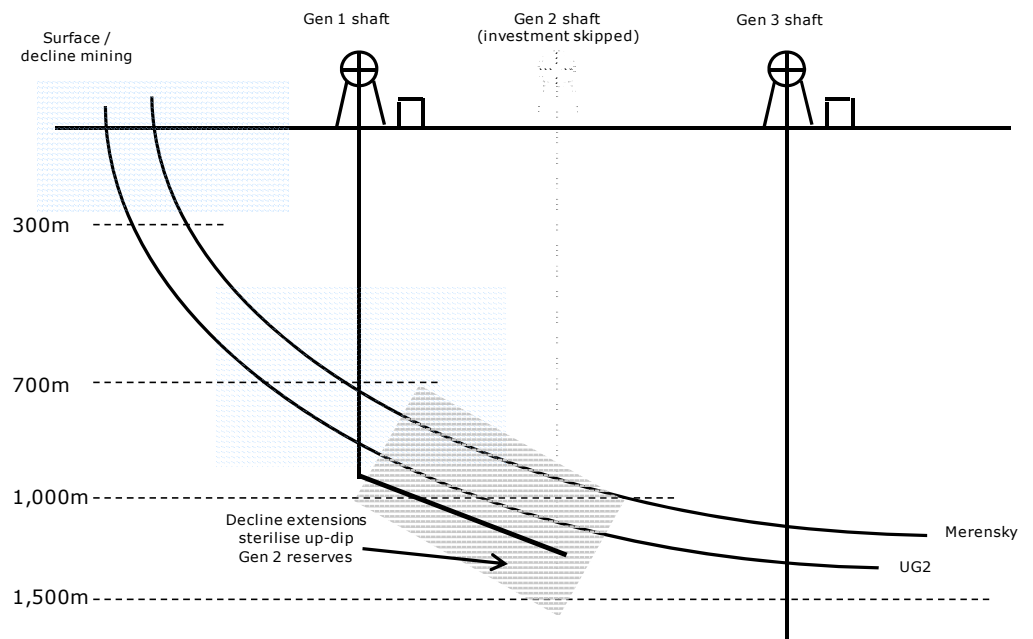
Source: Company data, Impala company website; Goldman Sachs estimates.

The challenge of when to invest in new platinum mines is tricky. As the cost inflation has pushed PGM prices along, management teams at the big miners do not have the luxury of using a ten-year pricing history to guide the investment case. Rather, they have to assume the price will go to uncharted territory. This is why management has preferred to go with smaller decline extension projects over big shaft projects. A shaft can cost as much as US\$1 bn. Declines can cost c. US\$70-90 mn each.

The miners have taken the option of building these smaller decline shafts (essentially extensions from the base of the existing deep level shafts) as they had shorter pay-back periods given the perceived country risk and higher NPVs as there is less reliance on rising PGM prices given the shorter lives.

Impala's 1 through 14 declines extended the life of these ageing shafts but they also sterilised the up-dip portion of the reserves of the next generation of shafts. Therefore, while declines may have looked like the right decision in isolation, the company lost value from the sterilisation coupled with the jump in capital required to build what was now an even deeper next generation shaft. Exhibit 60 illustrates this point as the decline extension on the Generation 1 shaft sterilises the up-dip section of the Generation 2 shaft.

Exhibit 60: Decline extensions may look attractive, but have longer-term implications



Source: Goldman Sachs Research.

Impala is now building out three deep level shafts (16, 17 and 20), which are geotechnically complex mines that are taking more time and capital than first planned. We do not believe this is specific to Impala. All the major miners are faced with similar issues. Lonmin has been building K4 for over 11 years having redesigned the project on at least two occasions.

Nationalisation debate unhelpful for investment

Since the publication of the Freedom Charter in June 1955 by the African National Congress, the possible nationalisation of South African mines has been an issue for miners to consider. The topic often resurfaces either during periods of industrial action or when miners post extraordinary profits.

While some might be in favour of nationalising South Africa's industries, we believe nationalisation is unlikely to become a policy objective for the foreseeable future for several reasons:

1. Through Black Economic Empowerment (BEE), Historically Disadvantaged South Africans (HDSAs) are benefiting from the mining industry both as shareholders and through better jobs and higher wages.
2. The Minerals and Petroleum Resources Development Act (MPRDA) of 2002 and subsequent iterations ensure that mineral rights are handled for the wider benefit of all South Africans.
3. Given other priorities in the economy (e.g. financing Eskom's capital build), we believe the government might struggle to take on such a capital intensive sector. Moreover, most of the foreign direct investment associated with mining comes from international capital markets and capital might be difficult to raise post nationalisation.

Nevertheless, the presence of a nationalisation debate adds risk and volatility to mining assumptions, which in turn create delays and further uncertainty.

Zimbabwe has significant reserves, but risks are high

A key part of argument is that PGM prices will rise to reflect the required returns for investors in South African mines. This is based on the operating and capital cost inflation and the slightly higher country risk compared to other mining countries such as Canada or Chile.

As mentioned previously, economic theory would say that when costs cannot be controlled, miners would naturally move towards lower-cost and lower-risk areas. This would be true of any other mineral. But in the case of PGMs, the only available low-cost option is Zimbabwe, which is the only other country with significant platinum reserves.

Zimbabwe's Great Dyke feature has significant deposits that are reasonably shallow and can be operated at a first quartile on the operating cost curve. Impala has investments in two operations, Mimoso and Zimplats, and Anglo Platinum has built the Unki mine and is acquiring other exploration licences.

Impala Platinum has recently committed US\$500 mn to expanding Zimplats and both companies talk about expansion coming from Zimbabwe. In our view, this represents Impala Platinum's best growth option after missing out on the Booyesdal project via its failed acquisition of Northam Platinum.

We believe the issues around repatriating profits from Zimbabwe, changing tax/royalty structures and the uncertainty over indigenous ownership legislation (with the chance of up to 51% local ownership in miners) require that these investments use a significantly higher risk rate.

We conclude that Impala's next best investment is to expand its production at Zimplats. Given the problems that the company has had and the ongoing uncertainty, we can only see prices going up to support these economics.

Increasing reliance on unproven juniors and the Eastern Limb

We see four major supply trends: (1) PGM mines have consistently missed production targets. (2) Growth projects are really replacement projects and have a likelihood of running late. (3) Eastern Limb now being developed as a priority for project growth and contains more risk of delay than the Western Limb. (4) More of the industry's future production is in juniors/BEE companies than at any time in the past ten years, adding delivery risk.

PGM miners have historically outlined their plans for expansions and increased production from existing mines and then usually under-delivered on these plans. For example, in 2007, Impala stated that it targeted 2.5 mn Pt oz by 2012, which was pushed back subsequently and is now 2.1 mn by 2015. In 2003, Anglo Platinum targeted 3.5 mn Pt oz by 2010. We estimate that the company will achieve 2.5 mn oz in 2010. Under former CEO Brad Mills, Lonmin targeted over 2 mn Pt oz by 2010 at the acquisition of Akananni in 2006.

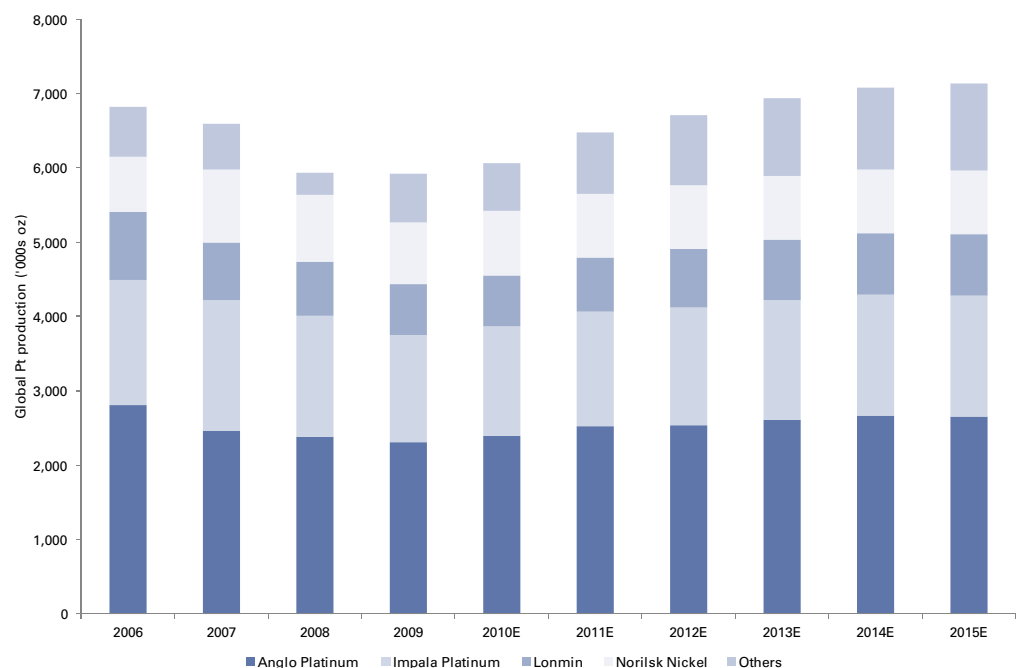
These examples confirm the complexity and challenges in finding, developing and producing from an underground PGM mine in South Africa.

Exhibit 62 shows that global production declined in 2007-09 due to a series of unforeseen circumstances. Key factors include:

- South Africa's power crisis;
- Safety-related stoppages in 2007;
- Closures for economic reasons; and
- Late delivery of replacement projects.

Exhibit 61: Global production has declined c.750k Pt oz since 2006; our supply model requires an extra one million Pt oz by 2014

Global Pt production by country

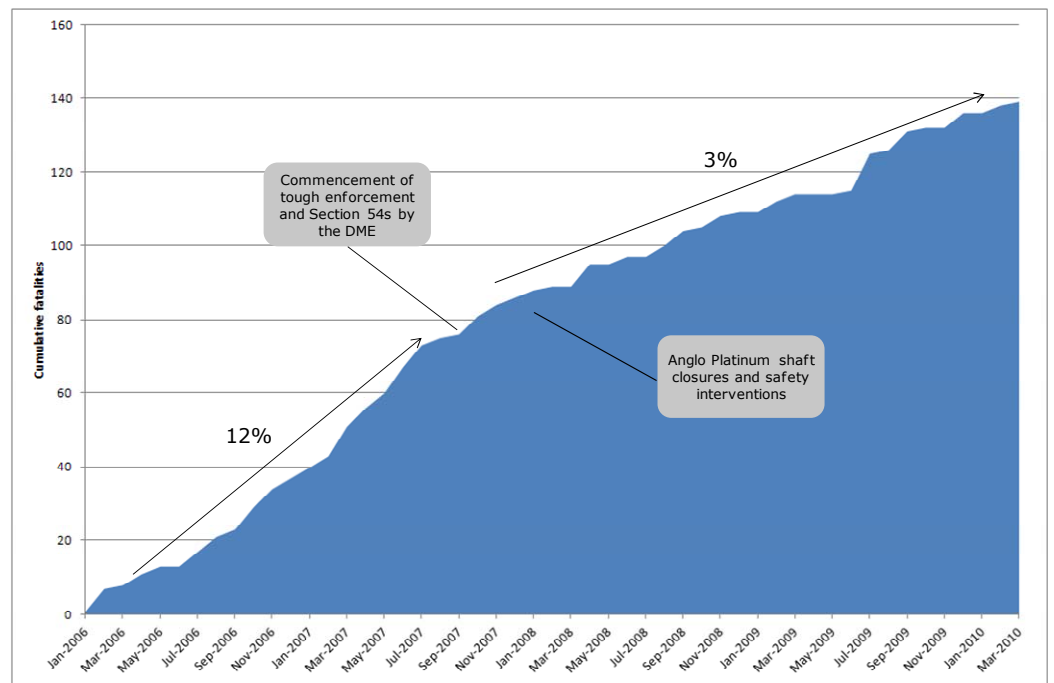


Source: Goldman Sachs Research estimates.

Safety will be a major focus: Production and cost impacts

Safety is an important factor in PGM mining. Exhibit 62 shows the cumulative deaths in South Africa PGM mines since January 2006. The Department of Minerals and Energy (DME) has not updated the statistics since March 2010, but since that time a further 18 people have died, bringing the total to 157.

Exhibit 62: 157 people have been killed since 2006 mining platinum in South Africa



Source: DME, South African Government; no data available for April – June 2010

However, the rate of life loss has slowed from an average 12% growth to 3%. Key contributors to this improvement include:

- Anglo American's decision to intervene at Anglo Platinum and close shafts at Rustenburg to address safety standards.
- The DME's increased sanctioning against safety violations through the strict enforcement of the safety regulations, leading to a huge rise in Section 54 notices and resulting in stoppages for what might appear to be small violations. Again, the miners continue to question the "fairness" of this approach, but recent data shows that the DMRE's measures are having an impact. Nonetheless, miners estimate that they lost between 4%-5% of output in 2007 and 2008 due to Section 54 stoppages and time lost to serious accidents. This is approximately c.250k Pt oz/year.

The key takeaway on safety is that while deep level, hard rock mining is inherently dangerous, with proper standards and procedures it can be made significantly safer. With the competing forces of (1) ageing, deep shafts and (2) more stringently enforced safety standards, the implication for production is that there will be more stoppages and costs will rise to ensure the best possible safety for workers.

On our analysis, this suggests that approximately 3%-5% of theoretical output will not be achieved due to safety and that costs will increase as a result.

Projects are typically 3-5 years late in the PGM industry

One of the major challenges for all miners is delivering growth and replacement projects on time. This is magnified in the PGM industry given one major factor that has been a constant since 1990: almost all new projects need to be approved with a platinum price higher than the recent history's average.

Theoretically, for a copper project, miners would take a view on the next 1-2 years of copper prices and look at the historical long-run average price. The project would typically be NPV positive and the board would approve it.

In practice, however, this does not work for PGM projects as the long-run historical price does not generate a positive NPV. Take the example of Anglo Platinum's Twickenham mine, which has been in development in some form or another since around 2000. Project engineers have looked at various designs and brought them to management for evaluation. Almost all scenarios require a rising PGM price to be economically viable.

Another unique aspect to PGM mines in South Africa is that as the reef dips into the earth (at 10%-20%) each new mine becomes deeper, more expensive to build and has a higher operating cost as miners need to add air conditioning, longer travel times and a higher number of non-productive supervisory staff to meet regulations.

In summary, projects are:

- Deeper.
- More capital intensive.
- They require longer build times given their complexity.
- And they are in lower grade areas.

The key implication is that projects are typically late. While we realise that this is not unique to the PGM industry, we believe that the need to take a leap of faith on higher prices to approve projects introduces an extra level of delay. Exhibit 63 shows the most recent major projects and their delays and cost over-runs.

Exhibit 63: Industry has a track record of late, delayed and over budget projects

South African and Zimbabwe PGM projects

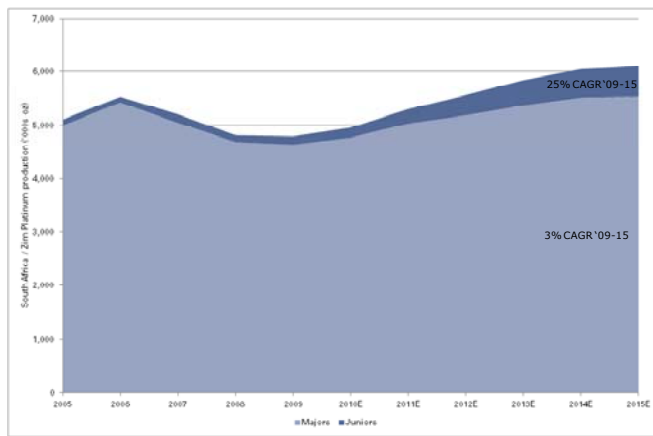
Project	Current owner	Pt oz / year	First announced	Original cost (\$ m)	Targeted first production	Revised cost (\$ m)	Latest production date	Years late
K4	Lonmin	120	2001	225	2006	280	2012	6
Twickenham	Anglo Platinum	180	2001	300	2006	850	2016	10
Der Brochen	Anglo Platinum	160	2002	225	Feasibility	1.5b	Unknown	na
Unki	Anglo Platinum	58	2003	90	2007	460	Q4 2010	3.5
Sheba Ridge	Aquarius	150	2003	690	Feasibility	Unknown	Unknown	5*
Booysendal (1)	Anglo / Khumama	100	2003	250	2007	Unknown	Sold	na
Blue Ridge	Aquarius	40	2004	143	2007	190	2010	3
BRPM 2 / Styledrift	BRPM	245	2004	1.2B	2009	1.6-1.8b	2017	8
16 Shaft	Impala	230	2004	600	3Q 2011	Unknown	2Q 2013	2
20 Shaft	Impala	100	2004	200	2008	320	2012	4
Leeuwkop	Impala	160	2004	250	2008	850	Shelved	na
Amand UG2 East Upper (Dishaba)	Anglo Platinum	100	2005	200	4Q 2007	235	2010	2.5
Mogalakwena North Expansion	Anglo Platinum	230	2005	530	4Q 2007	730	2Q 2010	2.5
Tumela 4 (Amandelbult 4)	Anglo Platinum	270	2006	1.4b	2013	1.8-2.0b	2016	3
Thembelani 2 (Paard 2)	Anglo Platinum	120	2006	250	2012	350	2011	-1
Pilansberg	Platmin	120	2006	140	2008	450	2010	2
Smokey Hills	Platinum Australia	30	2006	Unknown	2008	Unknown	2Q 2009	1
17 Shaft	Impala	150	2007	725	2012	250	2015	3
Booysendal (2)	Northam	75	2007	200	2010	415	2013	2
Akanani	Lonmin	625	2007	700	2010	Unknown	Shelved	na

Source: Company data, Goldman Sachs Research.

Project expansion in the Eastern Limb and juniors introduces more supply risk

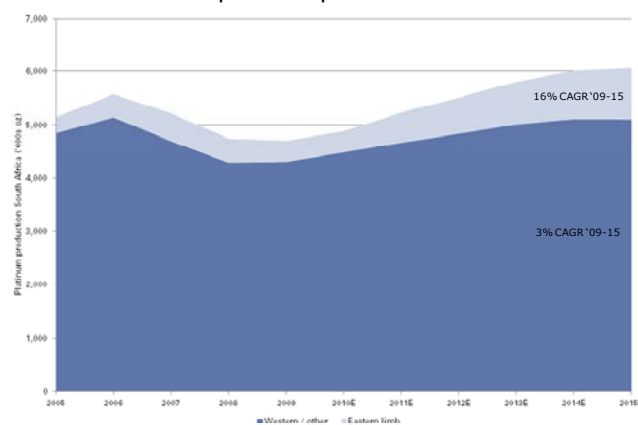
The Eastern Limb has not been developed at anything close to the speed promised. Projects were first developed in the Eastern Limb in the mid 1980s. There was a real push around 2003-06 to get projects up and running but the economics did not look attractive. Exhibits 64 and 65 show the rise of Eastern Limb and the increase in junior miners.

Exhibit 64: Growth increasingly coming from juniors...
2005-2015E share of platinum production



Source: Goldman Sachs Research estimates.

Exhibit 65: ...and from the Eastern Limb over existing production areas
2005-2015E share of platinum production



Source: Goldman Sachs Research estimates.

The Eastern Limb is quite undeveloped compared to the Western Limb. In the West, Rustenburg is now a city of more than 500,000 people and provides a base for the workforce of mines from Xstrata’s Eland mine through to Northam’s Zondefontein mine in Limpopo. There are schools, hospitals, and a large pool of workers to draw on from surrounding areas.

The Eastern Limb has none of this. The big development challenge is building out all the infrastructure required to attract a workforce and support the mines. In South Africa these costs will fall on the miners, hence the problems in the past with the Booyseendal, Twickenham and Bokoni projects. Exhibit 62 shows the major projects.

The deposits on the Eastern Limb are different from the Western Limb but not necessarily inferior. Grades can be c.6-7g on a 6e PGM basis which is comparable if not higher than on the West. The dip angle of the reef can be steeper, but this can be compensated in that the section widths of the reefs are thicker. Miners have to make a trade-off decision: either take on an Eastern Limb project with infrastructure complications but in essence a shallower shaft at a lower capital cost, or invest in a Generation 3 shaft on the Western Limb. It would appear that at today’s prices, the Eastern Limb projects are more attractive. Anglo Platinum is fully backing Twickenham and Northam and is pushing ahead with Booyseendal over other options.

The downside of the Eastern Limb

Overall we see the projects in Eastern Limb taking slightly longer to develop with capital costs higher than a similar project near Rustenburg. With longer build times, we see the average delay to production increasing and this taking more capacity out of industry’s supply side.

The rise of junior production implies further supply constraints

We believe it is tough to operate as a junior miner. In order to get funding, management has to make optimistic assumptions on what can be delivered and over what timeframe. Once the funding has been confirmed, the company then has to compete with hundreds of other juniors to be recognised as viable and secure the next round of funding to move to feasibility.

Generally, we believe juniors are not as well funded, have less attractive assets than the majors and less experienced/available teams to exploit the deposit.

For this reason, we see the rise of new production by junior miners as an overall negative for the supply side of the PGM industry. Without being project-specific, in our forecasts, we cut the publicly available Pt oz associated with start-up miners by 50% from 2012-15 as we believe that many of these will not be built, and if they are, will be late, with a slower ramp-up than planned.

Power concerns to return; water constraints to emerge on the Eastern Limb

A combination of better capacity management, maintenance and reduced demand due to the financial crisis and ensuing recession has reduced the immediacy of the power supply problems in South Africa. Our analysis suggests that as economic activity picks up and the PGM industry pushes to increase capacity, power issues could affect industry supply. If our price thesis is correct, then platinum prices will adjust to absorb potential power price increases so that returns could be largely protected. After all, the reality of the last power spike is that the miners increased profits through the crisis.

Eskom has improved its communication with the miners regarding supply and demand through the crisis. It has also become significantly better at planning and executing maintenance shutdowns. But ultimately, we believe that the march of economic growth will catch up with the capacity limitations of the current generating network.

We see a confluence of factors potentially creating a short-term power issue towards the end of this year. This would see summer peak demand coincide with the miners' peak production period and a period of maintenance that was put off due to the World Cup.

Moreover, we expect the NUM (the main union for employees at Eskom) to bring back its claim for a 15% wage increase that was postponed by the government in the run-up to the World Cup using "essential services" legislation. Industrial action in a tight period of adequacy would not be ideal.

In the longer term, we continue to see a delay in the delivery of new power stations due to financing challenges for Eskom and the South African government.

Exhibit 66: Status of Eskom build programme shows delays already emerging

Project	Capacity (MW)	Current Status	Latest commission date	Project Delay (months)
Medupi	4,764	Under construction	Jul 12	4
Ingula	1,352	Under construction	Jan 13	8
IPP OCGT	1,040	Under construction	Jan 14	48
Kusile	4,338	Under construction	Jun 14	12
Sere	100	On hold	May 10	-
Tubatse	1,500	On hold	Nov 15	12

Source: Eskom; Goldman Sachs Research.

Water is the new infrastructure challenge

With so much development on the Eastern Limb, miners may find themselves contributing to the building and maintaining of dams and water infrastructure. Not only will there be the challenge of supporting mining and processing facilities, but the miners will also have to provide for the c.200,000 people that will need to be relocated to support the mines.

Although this is not an immediate issue, it is yet another reminder that capital requirements are bound to increase and operating costs will also increase for future production. This reinforces our central thesis that prices will have to rise to support the economics of mining PGMs in South Africa.

Reg AC

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