

Platinum Market - Position Paper

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ABSTRACT: This paper considers the fundamentals affecting platinum prices. It offers a brief overview of supply and demand patterns and highlights the volatility in market prices over the last decade. This situation has left South African producers of platinum with the difficult challenge of planning future capacity. Although no solution is offered for the problem of estimating future platinum prices at reasonable confidence level, this article nevertheless offers the reader an understanding of price variables currently at issue in South Africa.

1 INTRODUCTION

South Africa is one of the wealthiest countries in terms of mineral resources and it is the world's number one gold and platinum producer. South Africa alone produced seventy-seven percent (4.98 million oz) of annual global platinum output during 2004. Anglo Platinum (Angloplat) the world's number one platinum miner, produced 2.45 million oz of platinum in 2004 making up almost fifty percent of the South African annual platinum production.

To be able to predict future platinum prices, we need to have a look at the fundamentals affecting the platinum market. This paper attempts to identify those fundamentals.

2 USE OF PLATINUM

The platinum group metals (PGMs) play a vital role at the heart of everyday living. From fountain pens to aircraft turbines, from anti-cancer drugs to mobile phones, from catalytic converters for automobiles to ceramic glazes all rely on platinum and other PGMs. The International Platinum Association (2005) estimates that about one in four goods in daily use owes its existence to PGMs (platinum, palladium, rhodium, iridium, ruthenium and osmium).

As an industrial metal, platinum is enormously useful and valuable. It is the hardest of the precious

metals, and has many unique properties that make it essential and irreplaceable to many vital industries. One of the most common industrial uses for platinum is based on its attributes as a catalyst. Automobile catalytic converters rely heavily on platinum (and palladium) to reduce polluting emissions from cars. Platinum is most efficient as a catalytic converter in automobiles burning diesel fuel, the fossil fuel that sustains most of the world. Platinum is also used as a catalyst in cracking crude oil into various other petroleum distillates.

Platinum has a very high melting point of 1700 degrees Celsius (70% higher than gold) and is useful in industrial applications exposed to high heat, including industrial thermocouples and laboratory vessels. Other civilian uses include electrical wiring in harsh and demanding environments, corrosion resistant applications, and providing cathodic protection systems for large ships, pipelines, and steel piers exposed to ocean water.

Platinum is extremely important for defense and aerospace applications, and is used in environments exposed to tremendous heat for long periods of time, including coating ballistic missile warheads to protect from atmospheric re-entry heat to constructing high performance jet engine components. The US government declared platinum a strategic metal while working on the Manhattan Project in the 1940s, as it is tremendously important in nuclear fission and fusion physics and applications. Many other uses will probably be

discovered for platinum's unique and unequalled physical properties (Hamilton, 2000).

The outlook for future industrial use for the metal is very bullish, as it will most likely be a critical ingredient in the much hyped hydrogen fuel cells. The fuel cells will be an alternate form of power, employing platinum to help separate common water into its component hydrogen (high yield fuel) and oxygen (oxidizer). Honda Japan recently started delivering fuel cell powered cars to the USA (Platinumtoday, 2005)

3 PLATINUM PRICES

Like any other commodity, the platinum spot price is mostly driven by the supply and demand figures which require comprehensive analysis in terms of predicting future platinum prices. The main factors that influence the platinum prices are:

- Supply and demand
- Speculative activities
- The ratio between US dollar - South African rand rates
- Market cyclically

In addition to these factors, political uncertainty and research and development had some impact on platinum pricing. Those impacts are somehow visible in supply and demand figures. The market leaders in these fields like Johnson Matthey, Barclays Capital, UBS Investment Bank, JP Morgan Investment Bank, etc. are the organisations that usually predict the future platinum price trading range through a comprehensive analysis of these factors.

3.1 Supply

Mauve (2000) defined supply as "the provision of a commodity". An analyst must recognize the effect the following factors have on availability. Tilton (1985) lists the following factors which drive supply for most mineral commodities:

- The price of the commodity
- The status of the commodity
- Input costs
- Socio-political disruptions
- The structure of the market
- Technological change
- Governmental activities

Total world supply for a commodity is estimated by calculating the total amount of that commodity made available to the market. Mineral commodities are made available from primary production (which generates individual products, main products, co-products and by-products) and secondary production, i.e. new and old scrap. Figures for both primary and secondary production can be acquired from annual reports of producers.

Such data should be audited and must be verified to ensure the accuracy of supply estimation. Supply can be measured at each stage of the production process of a commodity (e.g. comminution, concentration, refining and scrap metal recovery).

3.2 Demand

Mauve (2000) defined demand as "the desire that a consumer has for a commodity". Tilton (1985) lists the following factors which drive demand for most mineral commodities:

- The price of the commodity
- Income (growth in GDP)
- The availability of substitutes for a commodity
- The availability of complimentary substances which can be used in combination with a commodity
- Consumer preferences
- Technological change
- Governmental Activities

An understanding of these factors is critical to an analysis and prediction of demand for a commodity. Demand can be measured and analysed at different stages of use. Platinum demand, for example can be measured during the following stages of beneficiation:

- Fabrication of refined platinum and platinum products
- Manufacturing of platinum products (i.e. mints, autocatalyst producers, jewellery manufacturers etc.)
- « Consumption of final platinum products

Radetzki and Tilton (1988), suggest four techniques for estimating the demand for a mineral commodity. These are:

- The Intensity of Use (IU) technique which calculates the demand for a commodity based on its use in all final products.

- Demand for a commodity in relation to its determinants. This technique suggests that demand for a commodity is a function of its price, the price of its close substitutes and GDP.
- Demand based on one specific application of a commodity. An example of this is the estimation of total world copper demand based on its use in the manufacture of insulated cable.
- The use of input-output tables. This technique requires that input-output tables are sufficiently disaggregated to allow an analyst to identify the individual commodity and determine its intermediate and final uses.

Two factors are critical when estimating annual world demand for a commodity, viz:

- Data used must be validated. The higher the quality of the data used the more accurate the estimation of demand
- Changes in inventory must be accounted for. This is a difficult task due to the general lack of reporting on inventories. It is important to remember that quantities demanded by inventories must be negative in order to compensate for shortfalls in supply

Platinum Supply and Demand										
'000 oz.	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Supply										
South Africa	3 270	4 390	3 793	3 630	3 400	3 873	4 100	4 450	4 100	4 900
Russia	1 280	1 220	900	1 300	540	1 100	1 300	900	1 050	860
North America	240	240	240	230	270	280	300	300	290	360
Others	100	100	120	130	160	105	100	150	175	240
Total Supply	4 990	6 950	4 960	5 430	4 870	6 258	6 800	6 970	6 290	6 430
Demand by Application										
Autocatalyst: gross	1 850	1 890	1 830	1 300	1 010	1 890	2 570	2 990	3 210	3 430
recovery	(320)	(350)	(570)	(400)	(400)	(470)	(500)	(560)	(640)	(695)
Chemical	275	230	235	230	320	295	290	275	315	360
Electrical	250	275	305	300	370	455	305	315	260	280
Glass	245	185	265	220	200	255	290	245	160	240
Investment: small	75	110	180	210	20	40	50	45	30	25
large	270	130	60	105	90	(100)	40	35	(15)	(20)
Jewellery	1 880	1 990	2 150	2 430	2 830	2 830	2 590	2 820	2 440	2 200
Petroleum	135	185	170	125	115	110	130	130	150	160
Other	230	255	245	305	385	375	425	540	570	570
Total Demand	4 840	4 960	5 130	5 370	5 800	6 050	6 270	6 470	6 420	6 470
Movements in Stocks	150	20	(170)	30	(720)	(300)	(270)	(600)	(220)	(40)

Figure 1. Platinum Supply and Demand (Johnson Matthey, 2004)

Information pertaining to annual estimates of supply and demand for commodities is available from a number of sources. Actual observation, internet web sites, news reports and annual reports of producers and consumers are the most current and relevant sources for such data. Once data has been sourced it must be verified and validated before it can be used with any degree of confidence. The higher the degree of accuracy of all data which constitutes total world supply or demand for a commodity, the greater the confidence in a prediction of the state of the market.

Once the underlying factors that affect supply and demand of a commodity have been well researched (sourced and validated), a supply and demand

balance can be worked out. This balance can be calculated for historic, current and future commodity markets. A derived excess or shortfall in future supply (within the "balance") will assist analysts in their predictions of commodity prices (Mauve, 2000). Figure 1 shows platinum supply and demand over the last ten years while Figure 2 shows the graphical representation of similar data between 2000 and 2004.

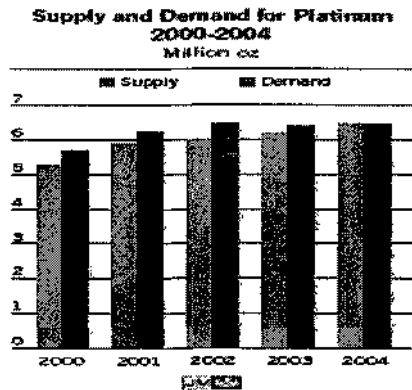


Figure 2. Platinum Supply and Demand (Johnson Matthey, 2004)

Figure 3 shows platinum prices over the last five years. Over the last five years, platinum demand was always greater than the supply but Johnson Matthey (2004) as well as UBS Investment Bank (Brown, 2004) forecast that in 2005, supplies of platinum would expand faster than demand, so that the market would move into surplus for the first time in six years. If surplus take places, it will have a negative impact on platinum prices. However, the platinum price rose from \$815/oz at the beginning of January 2004 to a twenty-four year peak of \$937/oz on the 19th of April, 2004. Johnson Matthey claims that speculative activities such as platinum features by funds as well as investors were primarily responsible for driving the platinum price high. According to Johnson Matthey, speculative activity is likely to continue to have a substantial influence on daily movements on the platinum price.

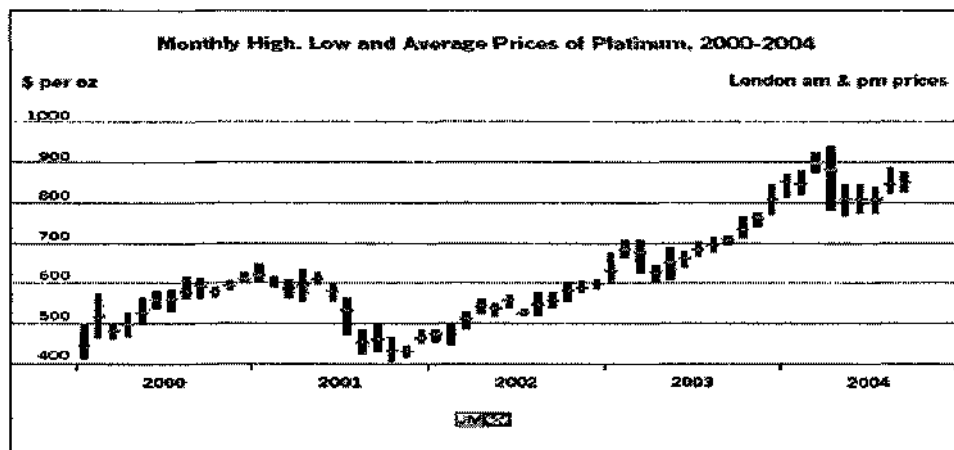


Figure 3. Platinum Prices 2000-2004 (Johnson Matthey, 2004)

When platinum demand by application is considered, the autocatalyst sector is the biggest user (40%) of the metal while jewellery follows with 38%.

Johnson Matthey reported that in 2004 purchases of platinum for use in autocatalysts increased by 7 per cent to a record 3.43 million oz, propelled by higher diesel car sales in Europe and tighter emissions limits. Higher European demand resulted from the ongoing growth of diesel car sales, and an increase in average catalyst loadings in response to Euro IV emissions limits, which came into effect for new car models in January 2005. The result of this

regulation necessitated the use of higher platinum loading in diesel oxidation catalysts. Currently, the European Commission is evaluating plans to introduce more stringent emission legislation on diesel particulate emissions. Under the term of the proposal, emissions would be reduced to 5 milligrams per kilometre from 2010 - a major drop from the current Euro IV emission standard of 25 milligrams per kilometre (Platinumtoday, 2005). Johnson Matthey (2004) forecasts that Japanese autocatalyst demand for platinum will also rise as truck manufacturers launch models that meet new emissions regulations.

Platinum demand by application 2004
Total: 6.47 million oz

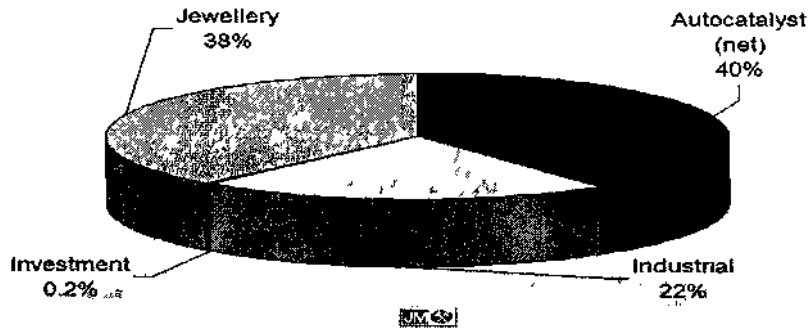


Figure 4 Platinum demand by application 2004 (Johnson Matthey, 2004)

However, demand for platinum from the jewellery industry is forecast to drop by 240,000 oz to 2.20 million oz, the lowest total since 1997, because of the high platinum price. This led to an increase in palladium demand, one of the PGM metals, in the jewellery sector which is considerably cheaper in comparison to platinum jewellery (figures 1 and 4).

Industrial demand for platinum continues to increase. This increase is supported by not only the

expansion of LCD glass manufacturing capacity in Asia but also more and more industrial applications requiring platinum, such as nerve gas detection technology and treatment of cancer (Platmumtoday, 2005). Demand for platinum in fuel cells continues to grow as fuel cell powered cars have already started taking market shares in the USA. The Japanese industry ministry has announced plans to fund research into extending the lifespan of fuel cells (Platmumtoday, 2005).

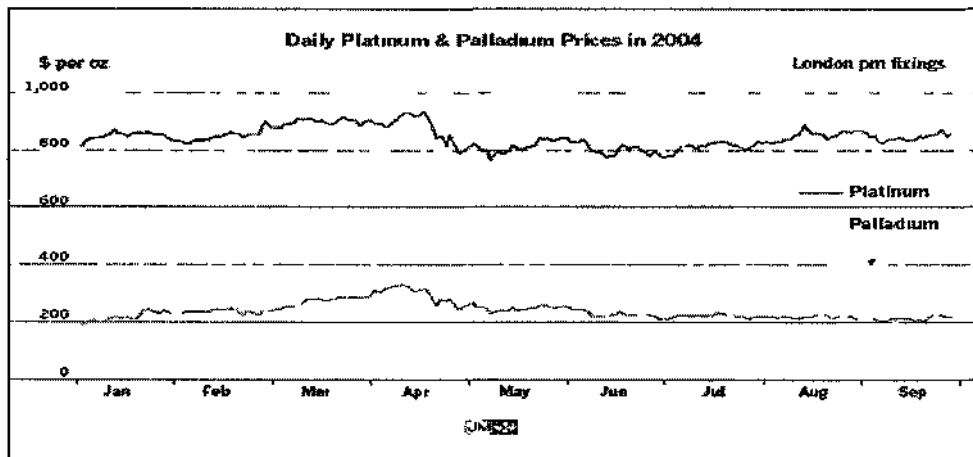


Figure 5 Daily platinum and palladium prices in 2004 (Johnson Matthey, 2004)

Palladium has platinum features and is also used as a catalyst, in jewellery as well as in electronics and dental applications. In the US, auto companies continue to move towards greater use of palladium-

based catalyst systems for gasoline vehicles. Platinum is the main component of diesel catalyst systems. In April 2004, Urmcore, a Belgian catalyst manufacturer announced that it had developed

technology (Steward & Tredway, 2004) that will allow palladium to replace some of the more expensive platinum in diesel autocatalysts, which will use 25 percent of palladium (Tredway, 2004). This news helped to push palladium price up to \$333 in April 2004 but the rally was short-lived. In November 2004 at the World Platinum Congress in Johannesburg, Johnson Matthey reported that a big US jewellery seller had stopped selling its palladium products because of all the returns. All these factors, in addition to a surplus supply of palladium, pushed the price difference between platinum and palladium to up to \$690 in February 2005, which indicated a 4.6 to 1 price ratio between platinum and palladium. (Figure 5) (Candy, 2005).

3.3 The ratio between US dollar - South African rand rates

The platinum prices for South African producers are highly sensitive to the ratio between the US dollar (USD) and the South African rand (ZAR). Platinum is traded predominantly in dollars and since 2001, the US trade and current account deficit have continued to widen the main reason behind US dollar weakness against all major currencies. The US current-account deficit stands over \$600 billion annually for 2004. The weak US dollar pushed the commodity prices higher (Sergeant, 2005).



Figure 6 US dollar versus South African rand 2001 - 2004

The strong rand had a major impact in mining operations in South Africa. In December 2004, the South African rand touched 5.61 to the US dollar, its best level since November 1998. The continuing strength of the rand against dollar over the last two years forced South African platinum mines to reconsider their future expansion plans. Angloplat, which supplies about 38 percent of the world's platinum output, announced in 1999 that it would expand platinum production from 2 to 3.5 million ounces per annum by 2006, but was forced in December 2003 to scale that back to 2.9 million ounces because of rand strength (Steward & Tredway, 2004). According to Angloplat results for the year ended 31 December 2004 which was published on 14 February 2005, the production

target for 2006 was cut furthermore to between 2.7 and 2.8 million oz. The fact that most of the SA platinum miners cost are mainly in rand while their revenues are wholly in US dollars makes USD versus ZAR ratio extremely important to the platinum mining industry. The strong rand has had huge implications over the last two years in particular where new projects became less viable; as a consequence the possibility of new job creation was stalled. Figure 6 shows ZAR and USD values between 2001 and 2004.

One of the most important implications of the strong rand is its impact on the amount of platinum supply to the market. South Africa's major producers, Angloplat and Impala Platinum, confirmed that platinum supply from South Africa

would be tempered by the strength of the rand (Candy, 2005) Candy (2005) also reported that Virtual Metals, the London-based precious metal consultancy believes that the strong rand will see a continued supply shortfall It seems as though the market is heading to a new era where the rand sets the platinum price Table 1 shows platinum price forecast for 2005 by the market leaders

Table 1 Platinum price forecast in USD for 2005

Institutions	Low	High	Average
Impala Platinum*	825	875	850
Johnson Matthey ^b	760	880	820
JP Morgan ^c	807	891	849
Barclays Capital ^d	750	950	850

Source a Candy, 2004, b Brown, 2004

3.4 Market cyclicalities

Davutyan and Roberts (1994), proved that most metal commodities "can be described as having some degree of cyclicalities, in the sense that there is a duration dependence on the length of phases" These phases or cycles are contractions or expansions in market prices and are clearly seen in platinum spot prices over a period of time Phases are defined as a period of prices occurring between a price peak and a price trough The former comprises a price which is higher than at least two years of preceding prices and the latter a price that is lower than at least two years of preceding prices The work by Davutyan and Roberts (1994) established that there is an increasing likelihood of a drop in the price of a commodity as a phase of relatively high prices for that commodity persists The cycles of commodities can be assessed over varying periods of time Davutyan and Roberts (1994) suggests long-term, moderate term and short term cycles usually exist for any one commodity

4 CONCLUSION

The future price of platinum will heavily depend on supply and demand patterns South Africa supplies almost 78 percent of the world's platinum output making it an important factor to consider when estimating the future price of platinum The continued strength in the South African rand will probably force the platinum price above the current rates in the short to medium term The challenge is to quantify all the supply and demand variables impacting on platinum prices and to derive a model for estimating future prices within reasonable confidence limits Such a model will be of great

benefit to platinum producers who firstly, must negotiate price agreements and secondly, plan optimal production capacity for the short, medium and long term

REFERENCES

- Anglo Platinum Results, (2005) www.angloplat.co.za, 14th February 2005
- Bailey, S and Tredway, G (2004) Angloplat Warns of Cutbacks www.mmeweb.net, 27 July 2004
- Bailey, S and Tredway G (2004) Palladium Longs Score on Umicore www.mmeweb.net, 4th April 2004
- Brown, J (2004) Platinum Firm in 2005 business.lafnca.com/news/400288.htm, 22nd December 2004
- Candy, J (2005) Platinum Same Old Story¹ www.mmeweb.net 14th January 2005
- Candy, J (2005) Record Pt Pd Price Ratio «w» mmeweb.net, 1st February 2005
- Davutyan, N and Roberts, MC (1994) Cyclicalities in Metal Prices, *Resources Policy*, Vol 20 (1) pp 49-57
- Hamilton, A (2000) Gold Going Platinum, *Ztal Intelligent*, www.zeallc.com/commentary/platinumrpf.htm, 2000, 12 December 2004
- International Platinum Association (2005) www.platmininfo.net 52 January 2005
- Johnson Matthey, (2004) Platinum - 2004 Interim Review www.platinum.matthey.com, 16th November 2004
- Mauve, AC (2000) The Platinum Market Fundamentals Affecting Supply and Demand *University of the Witwatersrand MSc Dissertation*, Johannesburg
- Platinumtoday, (2005) EC Evaluates New Diesel Emission Levels, www.platinum.matthey.com/media_joom/1107439203.htm, 3rd February 2005
- Platinumtoday, (2005) Hydrogen Vehicles Arrive in New York, www.platinum.matthey.com/media_room/1107172816.htm, 31st January 2005
- Platinumtoday, (2005) Platinum Cancer Compound Secures Marketing Approval www.platinum.matthey.com/media_room/1107874803.htm, 8th February 2005
- Platinumtoday, (2005) Platinum Helps Power New Nerve Gas Detector, www.platinum.matthey.com/media_room/1108119602.htm, 11th February 2005
- Platinumtoday, (2005) Japan to Fund Fuel Cell Research, www.platinum.matthey.com/media_room/1107334803.htm, 2nd February 2005
- Radetzki, M and Tilton, JE (1988) *Conceptual and Methodological Issues*, 1988, pp 13-34
- Sergeant, B (2005) Greenback to Keep on Falling, www.mmeweb.net 20th January 2005
- Tiltoa J E (1985) Economics of the Mineral Industries *Mining Engineering Handbook*, Chapter 2.1, USA
- Tredway, G (2004) Why Higher Oil Prices Are Better for Pt than Pd www.mmeweb.net, 18 November 2004

