

PLATINUM ESSENTIALS

Platinum Above Ground Stocks (AGS) are low relative to historic levels as well as those of palladium and rhodium and should not deter further investment in platinum



In this edition of *Platinum Essentials*, we present Above Ground Stocks (AGS) for platinum, including an analysis of estimating AGS and a comparison with AGS estimates of palladium and rhodium.

Commodity market price analysis typically focusses on changes in supply and demand and the resultant impact on inventories in any particular year. In most commodity markets, numerous estimates of inventory/stock, future demand and supply, represent key market metrics used to aid price discovery. However, for Platinum Group Metals (PGMs) markets, there is no granular, freely published data widely accepted as indicative of AGS levels. **The most widely used approach to estimate total PGM AGS levels is the residual derived from the long-term cumulative differences between annual supply and annual demand, in other words the net of market surpluses and deficits over time.** Methodologies for calculating annual supply demand balances vary across different data providers, with the result that AGS definitions and therefore estimates vary significantly. This difference between one definition of AGS and another is exaggerated over time if a component of supply or demand is excluded each year from the calculation of one of the market balances. For platinum, public references to anecdotal estimates of total platinum AGS can vary by as much as c.7 moz or c.90% of annual platinum supply. A new investor considering platinum may conclude that if the results of expert analysis vary by such large amounts then the risk of valuing platinum is higher than they would expect. We believe this is not the case and offer insights to place these differences in context.

WPIC defines Above Ground Stocks or AGS as *the year-end estimate of cumulative platinum holdings not associated with ETFs, metal held by exchanges or working inventories of mining producers, refiners, fabricators, and end-users.* This definition quantifies the most opaque component of stocks, namely unpublished vaulted metal holdings. WPIC estimates platinum AGS were 2.4 moz at the end of 2020; these stocks are expected to fall to 2.1 moz at the end of 2021.

Cumulative net investment demand represents a significant component of the differences in platinum AGS estimates from various data providers when investment demand is excluded, partially or in its entirety, from annual supply demand balances. To illustrate, the 2020 end-of-year WPIC AGS estimate would increase from 2.4 moz to 6.2 moz if the most transparent form of investment demand, ETFs, were excluded.

Using the cumulative residual of published Johnson Matthey (JM) market balances for palladium and rhodium, results in AGS levels, that match the WPIC platinum AGS definition, of 4.5 moz for palladium and c.0.8 moz for rhodium. Public references to anecdotal estimates of total palladium AGS can vary by as much as c.9 moz. These AGS levels have not impeded the significant recent price increases of either metal.

AGS are a natural part of physical metal markets. High estimated levels of AGS have not prevented high prices for PGMs when market deficits have resulted from demand growth, inclusive of investment, that exceeds supply growth. **Platinum AGS are relatively lower than those of palladium and rhodium and modest compared to current and potential future annual platinum demand.**

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WPIC's *Platinum Essentials* is a publication which explores topics affecting platinum as an asset class. This is different to *Platinum Perspectives*, which is a monthly publication which looks at a specific topic affecting supply demand dynamics for platinum and gives our view.

The exclusion of all investment from demand hides platinum's significant annual investment demand and distorts platinum's investment case by presenting an inflated AGS value and showing that the market is in surplus. This perplexing contra-indication was starkly illustrated in 2019 and 2020 when ETF holding increases of 990 koz and 498 koz and net bar and coin buying of 283 koz and 629 koz respectively, (2.4 moz in total) would be excluded from demand and merely increase AGS determined in this manner.

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Introduction

Background

Platinum is a high-value metal that is precious but also strategic to many industrial applications. In automotive applications for example, a vehicle that uses platinum to control emissions cannot be manufactured and sold legally unless that platinum is present. This binary aspect ensures that the short and long-term supply and demand characteristics of platinum are considered at the automaker executive level. The Dieseltgate scandal in 2015 heightened the strategic importance of platinum and indeed PGMs. The current historically very high prices of rhodium and palladium have further heightened their and their substitute metals' role in automakers risk and profit considerations.

For over 60 years, Johnson Matthey (JM) has been the largest fabricator of platinum-containing industrial products, including vehicle autocatalysts, jewellery alloys, investment bars and a myriad of industrial components including for example, medical equipment used for surgery, medical in-body devices and fuel cell catalysts. Since 1975, Johnson Matthey has been researching and freely publishing annual global platinum supply and demand data.

JM's chosen approach to identifying the annual global platinum market balance is to measure compatible annual data that would provide the basis for price discovery. This identifies metal sales by mining producers and recyclers and platinum purchases by end users, for both stock and manufacturing. The difference between sales and purchases represents the platinum volume that must flow from or to metal stock at a price that incentivises such flow. JM does not attempt to identify the owners of this stock.

Recycling of autocatalysts occurs long after the manufacture of a vehicle, typically when the vehicle reaches the end of its life, with ownership of the catalyst changing several times. This is defined by JM and widely known as open-loop recycling.

Many industrial users of platinum own more platinum than is installed in their particular industrial application. This is to ensure that a full industrial catalyst or catalyst load can be replaced when required and while the new catalyst or catalyst load is manufactured. This is defined by JM and widely known as closed-loop recycling.

JM captures net demand for such closed-loop industrial uses but gross demand for open-loop automotive applications, with automotive recycling data published separately and recognised as supply.

JM also includes net purchases of platinum bars and coins as well as net purchases of platinum bars that back platinum ETFs as annual demand.

Modelling and definitions

Commodity market price analysis typically focusses on changes in supply and demand and the resultant impact on inventories or stocks in any particular year. For most commodity markets, numerous estimates of inventory or stock levels, and projections of future demand and supply represent the key market metrics used to aid price discovery. However, for Platinum Group Metals (PGMs) markets, there is no granular, freely published data widely accepted as indicative of the level of above ground stocks (AGS). The most widely used approach to estimate PGM AGS levels is the residual derived from the long-term, cumulative differences between annual supply and annual demand, or the net of market surpluses and deficits over time.

The WPIC defines Above Ground Stocks (AGS) as the *year-end estimate of cumulative platinum holdings not associated with ETFs, metal held by exchanges or working inventories of mining producers, refiners, fabricators, and end-users*. Typically, unpublished vaulted metal holdings from which a supply-demand shortfall can be readily supplied or to which a supply-demand surplus can readily flow. This definition focuses on a quantified estimate of the most opaque component of stocks, unpublished vaulted metal holdings, which historically have been the most liquid. The flow of this metal is how the market clears or balances at spot metal prices.

The WPIC adopted the same data categorisations, definitions and protocols for platinum supply and demand components as JM upon launch in 2014. This ensured that the WPIC and JM annual platinum supply and demand data would be compatible and allow investors to consider new annual WPIC data together with JM's prior to 2013. WPIC was adding, uniquely, from 2014 new quarterly supply demand data, also compatible with WPIC and JM annual data.

Because the JM and WPIC annual data is compatible, the long-term net residual of market surpluses and deficits over time provides an AGS estimate that matches the same AGS definition as that of the WPIC. This is (as above) *the year-end estimate of cumulative platinum holdings not associated with ETFs, metal held by exchanges or working inventories of mining producers, refiners, fabricators, and end-users*. JM do not have a definition of AGS, nor do they publish AGS estimates. While the net cumulative residual totals will differ if JM data is used from 1975 to current versus using JM's from 1975 to 2012 and WPIC's from 2013 onwards, both methodologies will produce an AGS estimate that meets the same AGS definition. Where a data series is used, for example, that excludes ETF demand from annual demand, the resultant AGS will be much larger and contain the cumulative annual net ETF demand from 2007 (when platinum ETFs were launched) to current.

Consequently, using JM data from 1975 is appropriate for identifying current total above ground stocks. However, as AGS levels in 1975 were not published by JM, determining a current AGS level does require modelling. As AGS levels are not able to be negative, (i.e., the market could not clear) the starting AGS level in 1975 is adjusted to ensure that AGS do not become negative in any of the subsequent years. Using this modelling approach, the net cumulative value of surpluses and deficits over time is indicative of the current AGS level. However, using cumulative values from a long time series can compound inaccuracies in annual data. Because JM was the largest fabricator of PGMs over the full time series from 1975 onwards and had a wide exposure to nearly all PGM applications as well as recycling and refining, this risk is reduced as consistent directional bias is unlikely. However, while the calculated AGS estimate remains imperfect, the value is sufficiently accurate as a basis to monitor the size and annual changes of AGS and to consider their possible influence on annual price discovery.

To place AGS in context in this note we have analysed platinum, palladium and rhodium stocks using JM data from 1975 to 2019 with a WPIC estimate for 2020, and WPIC platinum data from 2013 to 2020. We discuss the results to provide further insight into platinum AGS.

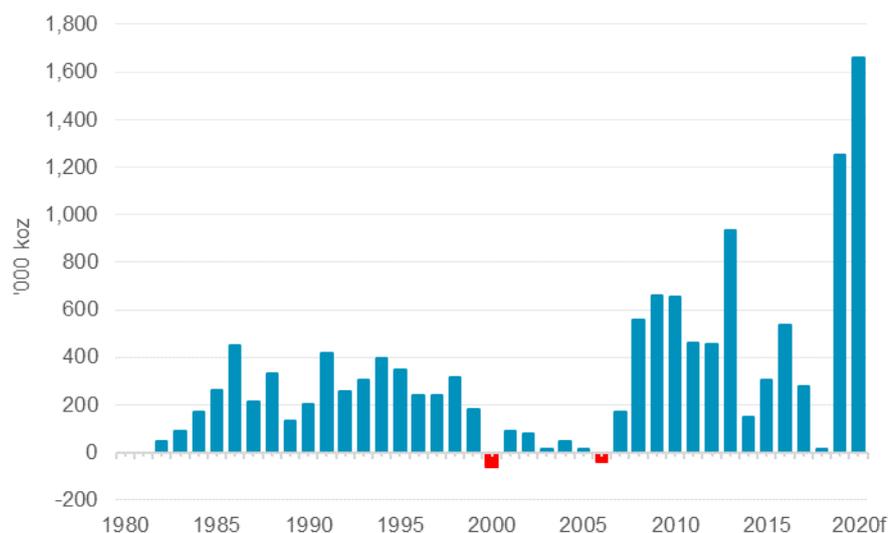
Some market analysis can include data that differs from that of JM, particularly where it is assumed that more of a particular demand or use for platinum, is recycled, and sold than JM have published. This additional recycled supply assumes JM data is not accurate and is then allocating to AGS, further compounding the size of the differences between different AGS estimates. We do not support these approaches as we believe JM's expertise and rigour has accurately captured supply and demand over time, inclusive of stock building and reduction as well as recycled metal sold. Where, for example, sales from Russian state stocks occurred, of platinum

in the 1990's and similar significant sales of palladium from 2015 to 2019, JM identified and included these sales in their supply data. JM has not ever published an AGS estimate as part of their annual review of supply and demand.

Should physical investment holdings be excluded from AGS estimates?

Central to whether or not total platinum investment holdings are included in AGS definitions and therefore estimates depends on how annual investment demand is treated in supply-demand analysis. WPIC assesses investment, whether via physically backed ETFs or in the form of bars and coins, as a source of physical demand for metal, and as a potential source of supply if the investor decides to sell the metal.

Figure 1. Annual platinum investment has seen positive physical investment uptake in 38 of the last 40 years



Source: Johnson Matthey (1980-2012), SFA (Oxford) (2013-2018), Metals Focus (from 2019), WPIC Research

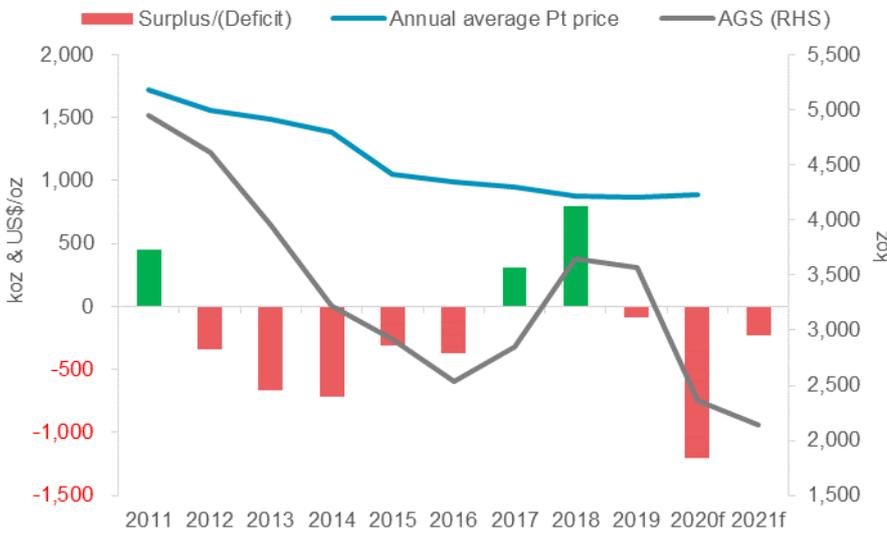
This approach to analysing investment demand is the same as analysis of other sources of platinum demand, for example, automotive demand becomes recycled supply once the vehicle reaches its end of life. Similarly, platinum jewellery can be recycled, for cash in Western markets but often to fund the purchase of another piece of platinum jewellery in Asia. Just as platinum auto catalysts in use, and platinum jewellery in use, are not treated as an element of platinum AGS, neither should platinum in use as physical assets in investment funds, whether backing ETFs or as bar and coin, be included in assessment of AGS. It should be noted that in the past 40 years there have been only 2 years where net physical disinvestment has occurred, in 2000 and 2005.

Bar and coin demand has dominated investment accumulation, with holdings tending to be long-term, with ownership frequently passed intergenerationally. Indeed, WPIC, as do most analysts, believes bar and coin is very sticky and regular so should be included not only in past demand analysis, but also future demand forecasts. On average, investors have added c.230 koz a year to physical bar and coin holdings since 1980. ETF investment holdings, since first launched in 2007, have seen positive uptake in 11 of the subsequent 14 years, with an average uptake 270 koz a year. These investment trends suggest that investors typically buy and hold platinum for long periods of time. Indeed, investor holdings appear to be tightly held, relatively illiquid and do not ebb and flow to clear the market.

Platinum AGS estimates

To ensure the best possible compatibility of annual supply and demand and AGS, the WPIC decided at launch in 2014 to use the best AGS estimate from its provider of independent, third-party supply and demand data. This was SFA (Oxford) from 2013 to 2018 and Metals Focus from 2018 onwards. These AGS estimates are based on the net of market surpluses and deficits, adjusted on a proprietary basis to correct for known errors using proprietary stock reconciliations. WPIC published platinum AGS were 2.4 moz at the end of 2020, with these stocks forecast to further contract to 2.1 moz by the end of 2021 as the platinum market experiences a third consecutive annual deficit. From a supply risk perspective, WPIC's platinum AGS estimate represents a little over 4 months' worth of annual primary mine supply (at c.6 moz) or 1.2 times annual recycling supply (c.2 moz pa). Relative to platinum's total expected 2021 supply of 7.9 moz and demand of 8.1 moz, this end-2020 estimated AGS level cannot easily be described as excessive, nor as a material negative risk to price.

Figure 2. WPIC platinum AGS estimates, annual platinum market balance and platinum price



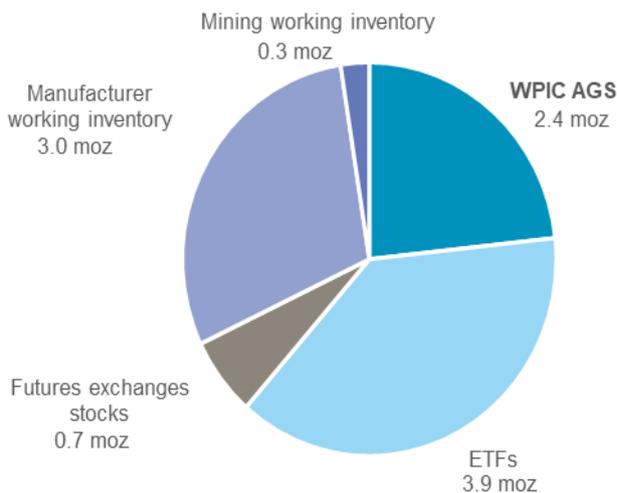
Source: Bloomberg, Johnson Matthey (to 2012), SFA (Oxford) (2013-2018), Metals Focus (from 2019), WPIC Research

Methodologies for calculating PGM supply, demand and resulting stock levels, vary significantly across market participants and commentators, resulting in a wide range of PGM AGS estimates. The range is exacerbated by different approaches taken over some elements of demand and supply. The most significant difference is in the treatment of investment demand, where some analysis excludes physically backed ETF growth or decline from annual demand. Conversely however, most analysis includes net retail bar and coin purchases in demand assessments due to the regular nature of purchases and the very long-term timeframe of such holdings. Different approaches are also seen in the treatment of mining producer, automotive, jewellery and industrial manufacturer working inventory where some analysis excludes changes in these inventories as demand, and may include the inventories as being part of AGS. In addition, estimates of tightly held state-owned stocks (e.g., Russian state held stocks) are included in AGS estimates in some analysis and not included in others.

The different treatment of elements of demand and supply by analysts clearly results in differences in annual flows and annual balances. For platinum, the difference in calculation methodologies leads to a wide range in AGS definitions and therefore estimates from c.2.4 moz, to c.10.1 moz if ETFs, miner, and manufacturer working inventories are included as elements of AGS assessments. However, working inventories, whether at

miners or product manufacturers, are not price sensitive, but are driven by operational considerations and therefore have limited variation over time. These stocks would not readily flow to clear the market or influence price. Some analysis results in platinum AGS estimates higher than the range above by including estimates of Russian State platinum stocks. However, we believe Russian State platinum stocks to have been depleted more than a decade ago.

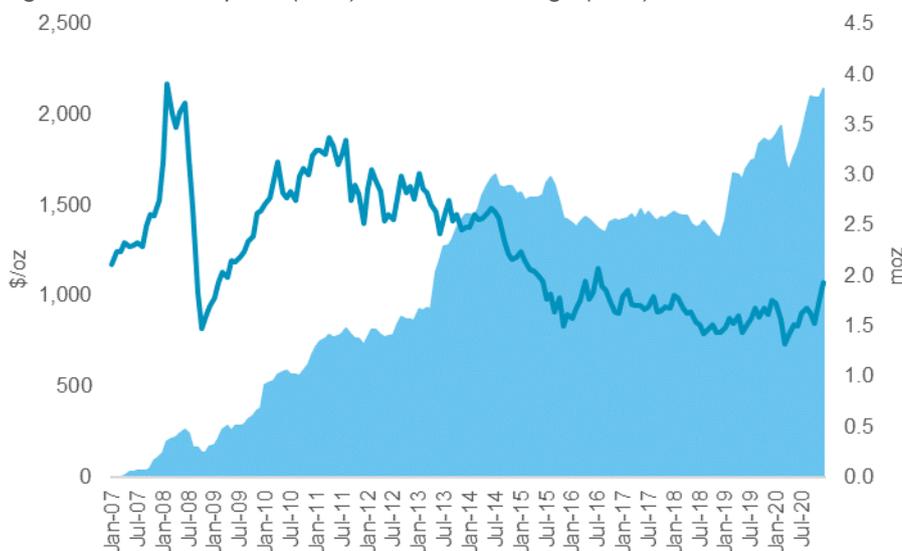
Figure 3. Platinum AGS levels can vary widely from 2.4 moz to 10.1 moz if stable, less liquid components are included as shown



Source: Johnson Matthey, Metals Focus, WPIC Research. Note: estimates at the end of 2020

The wide range of AGS definitions and therefore estimates is unhelpful for investors considering platinum, as it could potentially lead to the incorrect conclusion that if the results of expert analysis vary by such large amounts then the risk of valuing platinum is higher than they would expect. The exclusion of all investment from demand hides platinum’s significant annual investment demand and distorts platinum’s investment case by presenting an inflated AGS value and showing that the market is in surplus. This perplexing contra-indication was starkly illustrated in 2019 and 2020 when ETF holding increases of 990 koz and 498 koz and net bar and coin buying of 283 koz and 629 koz respectively (2.4 moz in total) would be excluded from demand and merely increase AGS determined in this manner.

Figure 4. Platinum price (\$/oz) and ETF holdings (moz)



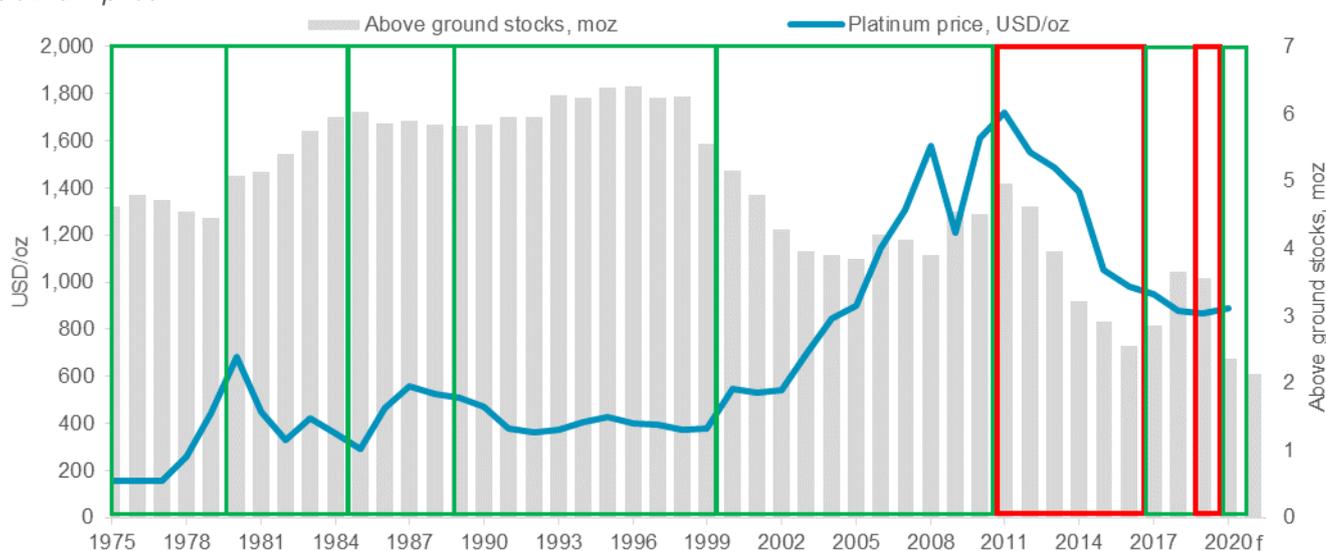
Source: Bloomberg, WPIC Research

The practice of excluding investment from demand only appeared in 2014 mainly because the platinum price fell despite a material market deficit. During 2014, for example, a protracted 5-month strike in South Africa removed more than 1 moz of mine production yet the platinum market appeared to remain adequately supplied and the price weakened. Johnson Matthey had included investment demand from 1975 and their market balance analysis, and correlation with price trends appeared robust over that period. However, the decline in the platinum price between 2014 to all-time lows relative to palladium and gold in 2020 may have led some new investors to conclude that high levels of platinum stock may stifle price discovery or indeed may reduce future prices. We believe such a conclusion to be incorrect for the reasons we present in this note.

ETF holdings of platinum are published and can be transparently tracked over time. It should be noted that since their inception in 2007, net outflows from ETFs have occurred in only 3 out of 14 years. ETF volumes continued to grow in 2020, up 498 koz over the year, an important factor helping to push the platinum market further into deficit. WPIC believes ETF demand is also likely to grow, due to the nature of investors owning ETFs, and particularly when demand growth potential looks strong. With ETFs widely held in most global jurisdictions, the rationale for buying and selling is likely to be different at different times. WPIC market analysis and promotion efforts should gear the growth of ETF holdings to when demand growth occurs such as now.

Figure 5, below, highlights WPIC defined AGS over time, extending back to 1975. It should be noted that WPIC AGS data is based on the WPIC published 2020 estimate, produced by Metals Focus, with historic estimates based on WPIC and JM market balances from prior years. Consequently, there may well be differences between WPIC and Metals Focus historic estimates due to different approaches in assessing market developments and to measurement.

Figure 5. Platinum Above Ground Stocks (AGS) and average annual platinum price

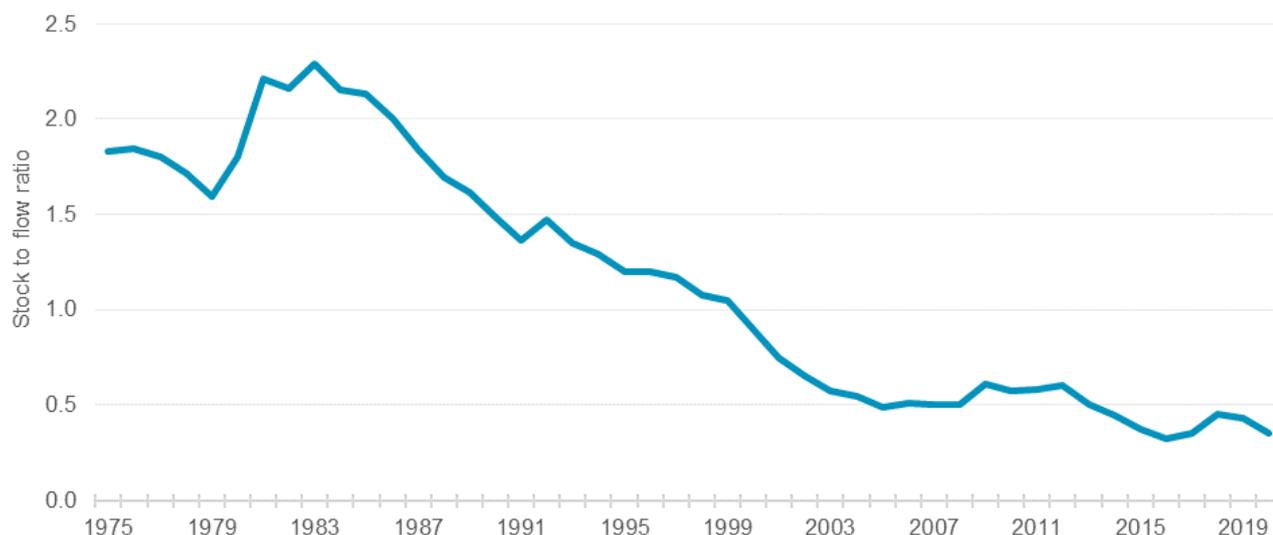


Source: Bloomberg, Johnson Matthey (1975-2012), SFA (Oxford) (2013-2018), Metals Focus (from 2019), WPIC Research

The periods highlighted in green show expected behaviours where rising AGS is associated with surpluses and falling price and falling AGS with deficits and rising price. Between 1998 and 2008 for example, estimated AGS fell from 6.1 mozt to 3.7 mozt, while annual average platinum prices rallied from \$373/oz to \$1,613/oz. The first period in the red box, 2011 to 2016, shows the anomaly where falling AGS, down from 4.8 mozt to 2.5 mozt, coincided with annual average prices falling from \$1,721/oz to \$984/oz. During this period, it appears that negative sentiment led to

significant sales from AGS that depressed price. The second red box period, during 2019, again shows falling levels of AGS without a corresponding pick-up in price, suggesting that as with the earlier period, negative platinum sentiment prompted sales from AGS. Platinum's current level of AGS of 2.4 moz at the end of 2020, and projected 2.1 moz by the end of 2021, cannot easily be described as excessive, nor as a market overhang, based on historic AGS trends.

Figure 6. Platinum stock-flow ratio 1975 -2020 has shown a steady decline since 1983



Source: Johnson Matthey, SFA (Oxford), Metals Focus, WPIC Research

Analysing AGS on a stock-flow ratio basis, a measurement used by many investors to gauge the relative abundance or scarcity of a particular commodity, indicates current AGS levels are close to historic lows. The ratio is defined as the years of inventory of a commodity relative to its annual supply. For platinum, this ratio has declined steadily since 1983, from 2.54 to a low of 0.32 in 2016. At the end of 2020 platinum's stock-flow ratio remained close to historic lows at 0.35, a level that still indicates more severe platinum AGS scarcity than is the case for other PGMs. For palladium, for example, end-2020 estimates of stock-flow ratios, based on the WPIC definition of AGS, was 0.49, 40% higher than for platinum.

From a metal price formation perspective, a comparison of the estimated level of AGS theoretically available to the market during periods that exhibit price spikes is highly relevant. In platinum's case, two such periods stand out, firstly during the late-70's when autocatalyst demand began to accelerate, and secondly the South African power crisis in 2008 which reduced mine supply by c. 500 koz. AGS are estimated at 6.1 moz in 1980 when the platinum price peaked above \$2,500/oz (in real terms) and are estimated to have been around 3.7 moz in 2008 when the platinum price peaked at just over \$2,200/oz. In both cases, it was demand growth outstripping supply that resulted in deficit markets, combined with expectations of strong future demand growth and further deficits, that created price tension.

In 2019, strong physical investment demand growth, driven principally by ETF demand for metal, returned the platinum market to a deficit of c.90 koz, following consecutive surpluses in 2017 and 2018. In 2020, strong bar and coin demand, positive ETF uptake, plus the impact of South African supply losses, pushed the market further into deficit, at -1.2 moz. AGS were assessed to have fallen from 3.7 moz to 3.5 moz between 2018 and 2019 and to 2.4 moz by the end of 2020. However, unlike the late 1970s or 2008, actual deficits and downward revisions of AGS estimates have not yet created sustained price tension due in part to investor uncertainty in

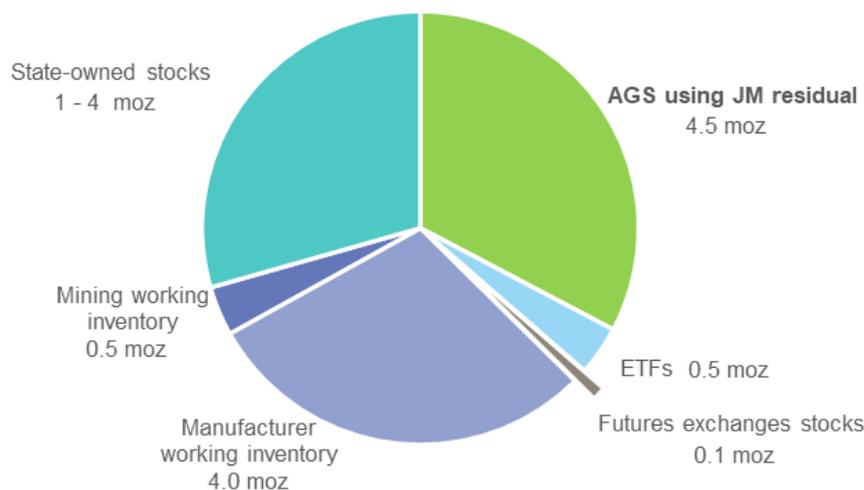
relation to platinum's demand outlook. However, the growing realisation of platinum's strong demand growth potential, from substituting palladium for more cost-effective emissions reduction in gasoline vehicles under tightening emissions regulations and in decarbonising transport and heavy industry by facilitating the growing green hydrogen economy, is providing investors with a strong incentive to build platinum exposure.

In contrast to platinum AGS estimates, those for palladium, outlined below, are higher in both outright ounce terms and on a stock/flow basis, yet the palladium price traded to record highs of c.\$2,800/oz in early 2020 on the back of persistent annual market deficits over the previous eight years. The rhodium price also recently surged through 2020, reaching highs of over \$20,000/oz in early 2021. This rally is despite a clear accumulation of inventory since Johnson Matthey began publishing Rhodium supply-demand data in 1985. AGS are a natural part of the physical metal markets. As such, despite relatively higher estimated AGS levels compared to those of platinum, levels have not proved an impediment to higher prices for either palladium or rhodium.

Palladium AGS estimates

WPIC does not compile or publish palladium supply, demand and AGS data. However, using the residual of cumulative annual palladium surpluses and deficits published by Johnson Matthey between 1980 and 2019 with a WPIC estimate for 2020 show AGS of c.4.5 moz at the end of 2020. This estimate would represent the minimum possible level of palladium AGS as using a zero starting volume in 1980, does not see the AGS level fall below zero in any subsequent year. (This methodology is described more fully in Platinum AGS estimates above).

Figure 7. Palladium AGS levels can vary widely from 4.5 moz to 13.6 moz if stable, less liquid components are included as shown



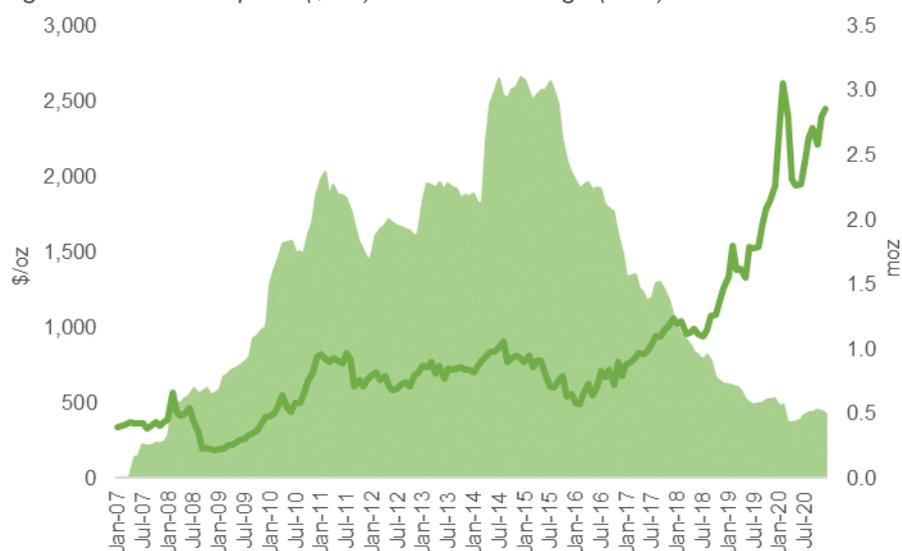
Source: Johnson Matthey, WPIC Research. Note: estimates at the end of 2020

There is a wide range of palladium AGS definitions and estimates that reflect different supply-demand assessments and different approaches to what elements are included in them. For palladium, the major differences are driven by different approaches in dealing with miner and manufacturer working inventories, and differing state-owned stock estimates, rather than investment. Inclusion of such elements produces a range of between 4.5 moz and 13.6 moz for palladium AGS. However, working inventories, whether at miners or product manufacturers, are not price sensitive, but are driven by operational considerations and therefore have limited variation over time. These stocks would also not readily flow to clear the

market or influence price. In the case of state-owned stocks, anecdotal evidence suggests Russian state holdings are not available for sale, with Johnson Matthey reporting no sales since 2013 despite sharply rallying palladium prices. Some analysis may well have higher palladium AGS estimates than the above range in part due to higher legacy estimates of Russian State stocks. In spite of these high and wide-ranging palladium AGS assessments, investors have not been deterred from focussing more on palladium's demand growth and very low supply response to price (as it is mainly a by-product) when taking a value view.

ETFs represent the most transparent element of the difference in AGS assessments. Palladium ETFs were first launched in 2007 and saw assets under management rising rapidly from early 2010 until mid-2015, when physically backed ETF holdings reached 3.03 moz. However, since this peak, palladium in ETF holdings have fallen by almost 80%, with c.500 koz held at the end of 2020. ETFs net sales supplied 3.57 moz of palladium since the July 2015 peak, presumably due to profit-taking induced by the rapid more-than-doubling of the palladium price. The combination of negative net ETF demand and metal outflow from AGS have been necessary to supply the cumulative palladium deficits. ETF net sales have been more than sufficient to cover the market deficits that have occurred since ETF holdings peaked in mid-2015. However, since the palladium market first moved into significant deficit in 2012, at least c.6 moz of metal has had to flow from AGS from 2012 to 2020 for the market to clear.

Figure 8. Palladium price (\$/oz) and ETF holdings (moz)

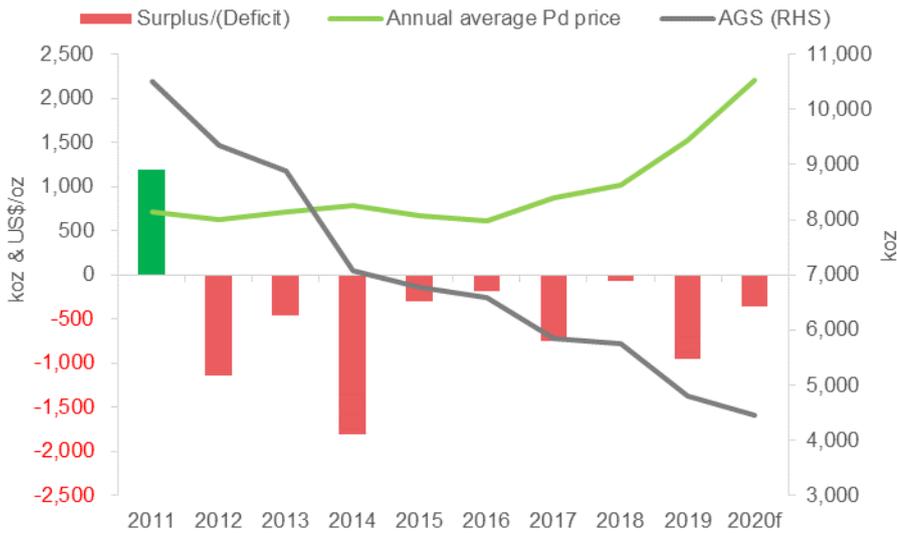


Source: Bloomberg, WPIC Research.

The reduction in palladium ETF holdings appears counter-intuitive from an investment point of view, as normally an investor would want to hold or increase a position where the underlying asset is rising in value. We believe this ETF disinvestment reflected profit taking by investors who had typically doubled the value of their holding in a commodity that had very few features of all other commodities. Being almost totally a by-product, to platinum and nickel, determining in isolation the value of palladium is a significant challenge, making it a difficult investment proposition. The case to hold after the price doubled would have been particularly hard to motivate.

Palladium AGS peaked in 2011, with the market experiencing sustained deficits from 2012 onwards. At their 2011 peak, estimated AGS volumes, based on JM data, were c.10 moz. Nine consecutive years of deficits up to 2020 have drawn the level down to c.4.5 moz by the end of 2020.

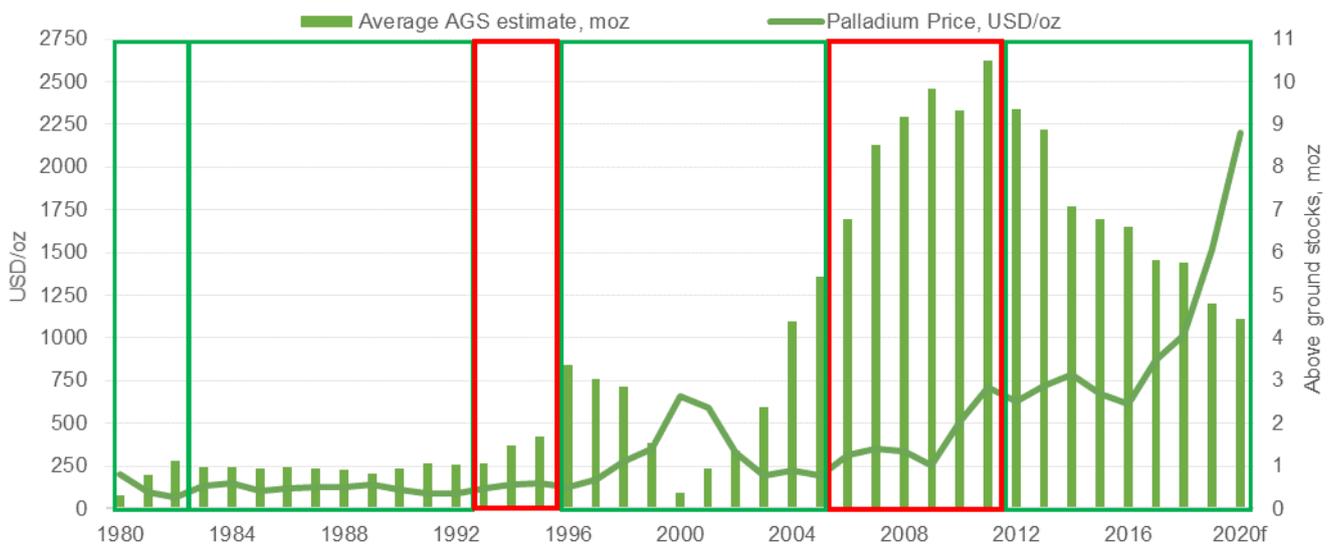
Figure 9. Palladium AGS estimates, annual market balance and metal price



Source: Bloomberg, Johnson Matthey, Metals Focus, WPIC Research

As with platinum AGS trends, the palladium market has shown periods of normally expected AGS, surplus/deficit and price behaviour, as indicated by the green boxes in Figure 10. Palladium has also exhibited anomalous periods of rising AGS and rising prices, marked by red boxes. Between 2005 and 2011, Russia sold c.7,730 koz of palladium into the global market. Over this period, palladium AGS rose by c. 6.1 moz, while annual average prices rose from c.\$220/oz to c.\$710/oz. Much of these metal sales from Russia accumulated in vaults in Switzerland and the UK. Johnson Matthey estimated that around 11.6 moz of palladium has been withdrawn from Swiss and UK vaults since 2007. However, it is believed that some of this metal was simply being moved to other storage locations rather than being sold into the market for consumption purposes.

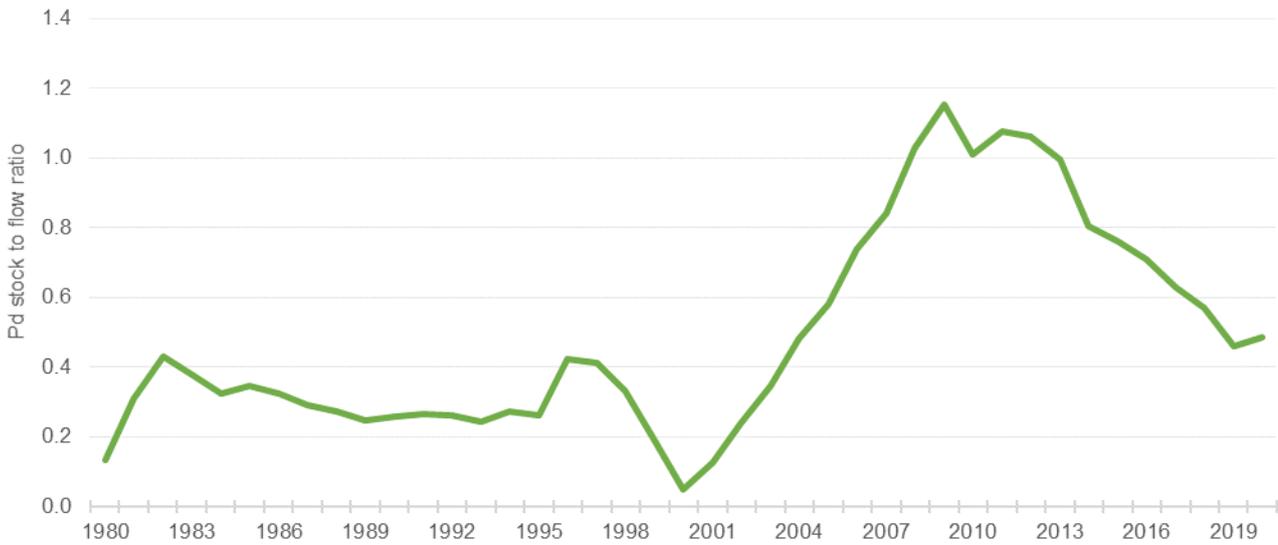
Figure 10. Palladium Above Ground Stocks (AGS) and average annual palladium price



Source: Johnson Matthey, Bloomberg, WPIC Research

On a stock-flow ratio basis, palladium’s assessed AGS levels were 0.49 at the end of 2020, this represents a significantly higher level than was the case for platinum at the end of last year. In addition, where platinum AGS levels and stock-flow ratios are now at historic lows, levels for palladium remain well above historic lows of 0.05 which occurred in 2000.

Figure 11. Palladium stock – flow ratio estimates rose steadily post 2000 as Russian strategic stocks were sold into the market



Source: Johnson Matthey, SFA (Oxford), Metals Focus, CPM Group, Bloomberg, WPIC Research

Despite palladium’s higher levels of estimated AGS than those of platinum, the palladium market clearly is in tension, with prices setting new highs above \$2,800/oz in February 2020 prior to the global onset of the COVID-19 pandemic. The absolute number for estimated palladium AGS appears to be less of a factor in creating price tension than the actual trajectory of those AGS estimates. Additionally, expectations of continued strong demand growth are likely to be a factor in prompting AGS to be more tightly held, creating price tension.

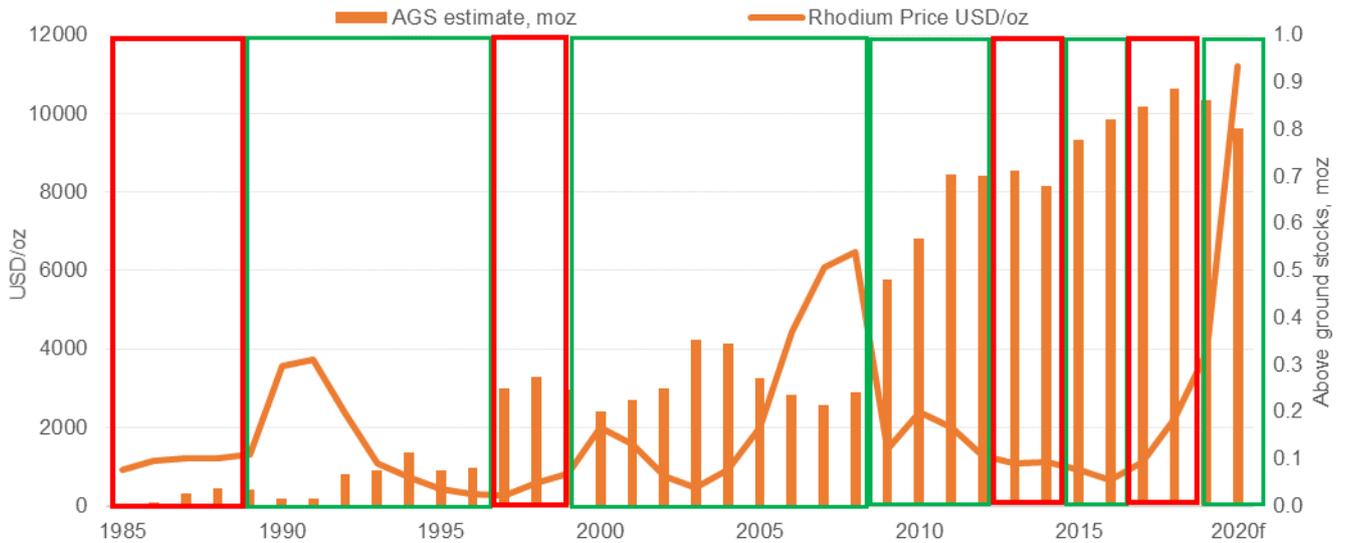
Rhodium AGS estimates

There is very little published analysis or estimates of rhodium AGS, however analysis of historic JM supply-demand balances indicate AGS of at least c.800 koz, considering data since 1985 and including a WPIC estimate for 2020. An illiquid spot metal market, low visible investor market participation and the relatively small market size makes estimating rhodium AGS a difficult exercise. Nevertheless, rhodium’s estimated AGS and, in particular its price spikes are instructive. The opaque nature of the rhodium market is perhaps an important reason for the significant number of periods where the normal inverse relationship between estimated AGS levels and price movement has not occurred. As with Figures 5 and 9 above, the red boxes in Figure 10 below indicate those periods of time when rising estimated rhodium AGS have coincided with rising rhodium price levels.

Despite a physical market that is close to being in balance, the rhodium price has spiked to levels well above previous highs seen in 2008. As with our palladium observation above, the existence of potentially large rhodium AGS have not prevented the price rising in what is clearly a metal market in tension. No matter the size of estimated rhodium AGS today, what is clear from the metals’ price changes is that this inventory is not all freely available to the physical market even at extremely high metal prices.

On a stock-flow ratio basis, rhodium appears to be the least scarce of the three main pgms, with an estimated ratio of 0.87 at the end of 2020, in comparison to 0.49 for palladium and 0.35 for platinum.

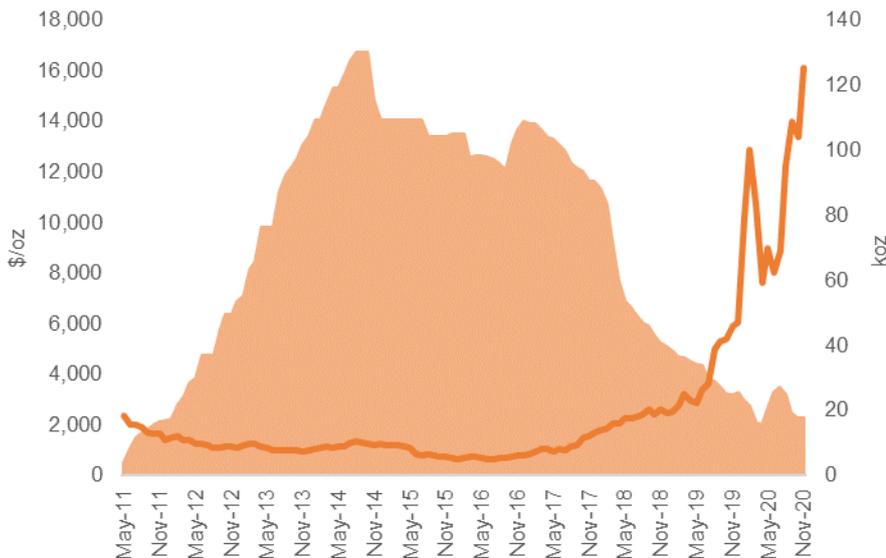
Figure 12. Rhodium Above Ground Stocks (AGS) and average annual rhodium price



Source: Johnson Matthey, Bloomberg, Consensus Forecasts (2020), WPIC Research

As with palladium, ETF net negative demand has seen holdings decline from above 100 koz in 2014 to c.16 koz at the end of 2020 as the rhodium price increased from below \$1,000/oz to over \$20,000/oz.

Figure 13. Rhodium price (\$/oz) and ETF holdings (moz)



Source: Bloomberg, WPIC Research

Conclusion: Above Ground Stocks are a normal physical characteristic of PGM metal markets

AGS remain a natural part of PGM physical metal markets. They have not proved an impediment to higher prices for palladium and for rhodium, nor should they for platinum. AGS represent an opaque metal inventory owned by a disparate collection of owners that are difficult to identify, as is their value strategy. However, historically they are far less likely to sell metal in a rising price environment, and pose a low risk to price unless there are extreme price movements.

Unpublished AGS, however defined, do exist, but ascertaining their true volume and availability to the market at a specific metal price or at any single point in time can only be a speculative view. Historically, seemingly high levels of AGS have not prevented high prices for PGMs when the

market has moved into tension as a result of demand growth in excess of supply (palladium and rhodium at present). In comparison to other PGMs, platinum AGS appear relatively benign compared to potential platinum demand. Platinum's stock flow ratio, or inventory over annual supply, at the end of 2020 is 0.35 compared to palladium and rhodium of 0.49 and 0.87 respectively. Indeed, it is the growing realisation that platinum's strong demand growth potential is likely to create market deficits, and this is driving investors to build platinum exposure.

Figure 14. Platinum, palladium and rhodium prices (\$/oz)



Source: Bloomberg, WPIC Research. Note prices as of 5th Feb 2021

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