

Palladium:

Investor dreams and industrial nightmares

Dr. Jonathan Butler
Mitsubishi Corporation

**IPMI Europe Chapter Seminar
November 2017**

Mitsubishi Precious Metals Business Services



Mitsubishi RtM offers a broad range of trading services in **Precious Metals** designed to add value and create international business opportunities **utilizing over 40 years of experience** in Precious metals business.

Through its extensive relationships across a wide range of industries, Mitsubishi RtM provides clients with a **“Value Chain” of precious metals services**: from raw metal supply and secondary recycling to the provision of credit and financial risk management.

Mitsubishi RtM offers a range of risk management products which can be customized to develop strategies that best suit our clients' requirements:

- **Global coverage** of Au, Ag, Pt, Pd, Rh, Ru & Ir markets;
- **Spot, average and forward Pricing with global logistics**;
- **Leases and consignments**;
- Futures, options, financially settled swaps, location swaps;
- Financial commodity products for Investment (Index Linked Notes, ETFs).



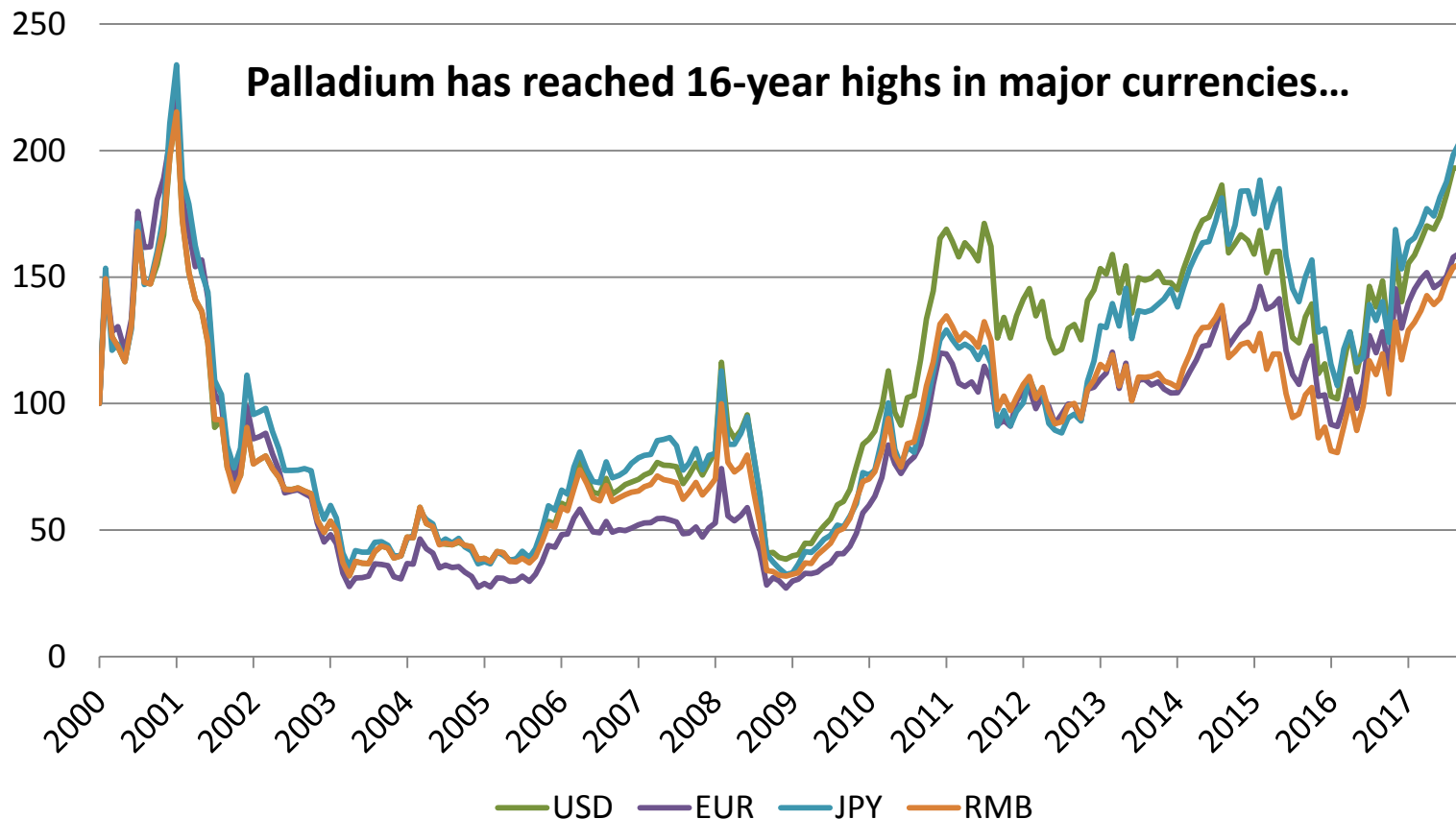


Contents

- 1. Recap on palladium in 2017**
- 2. Short term: tight market conditions and getting tighter**
 - Supply-demand deficits now beginning to bite
 - Investor and also industrial driven tightness
 - China – it's a terminal market
 - Getting tighter in short to medium term
- 3. Longer term uncertainty when biggest demand area is in question**

Recap on palladium in 2017

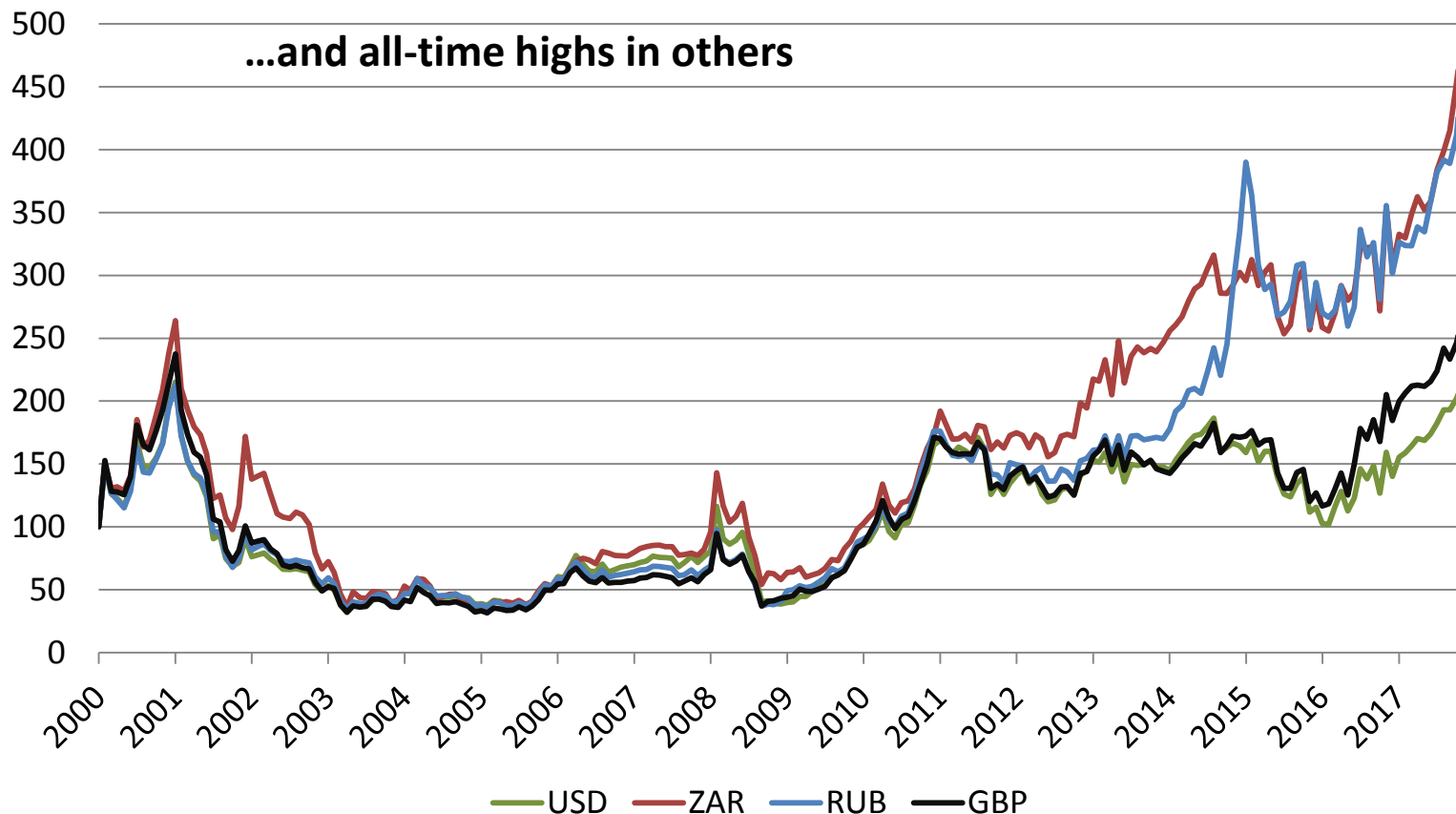
Palladium priced in various currencies (rebased to January 2000 = 100)



Source: Mitsubishi from Bloomberg

Recap on palladium in 2017

Palladium priced in various currencies (rebased to January 2000 = 100)

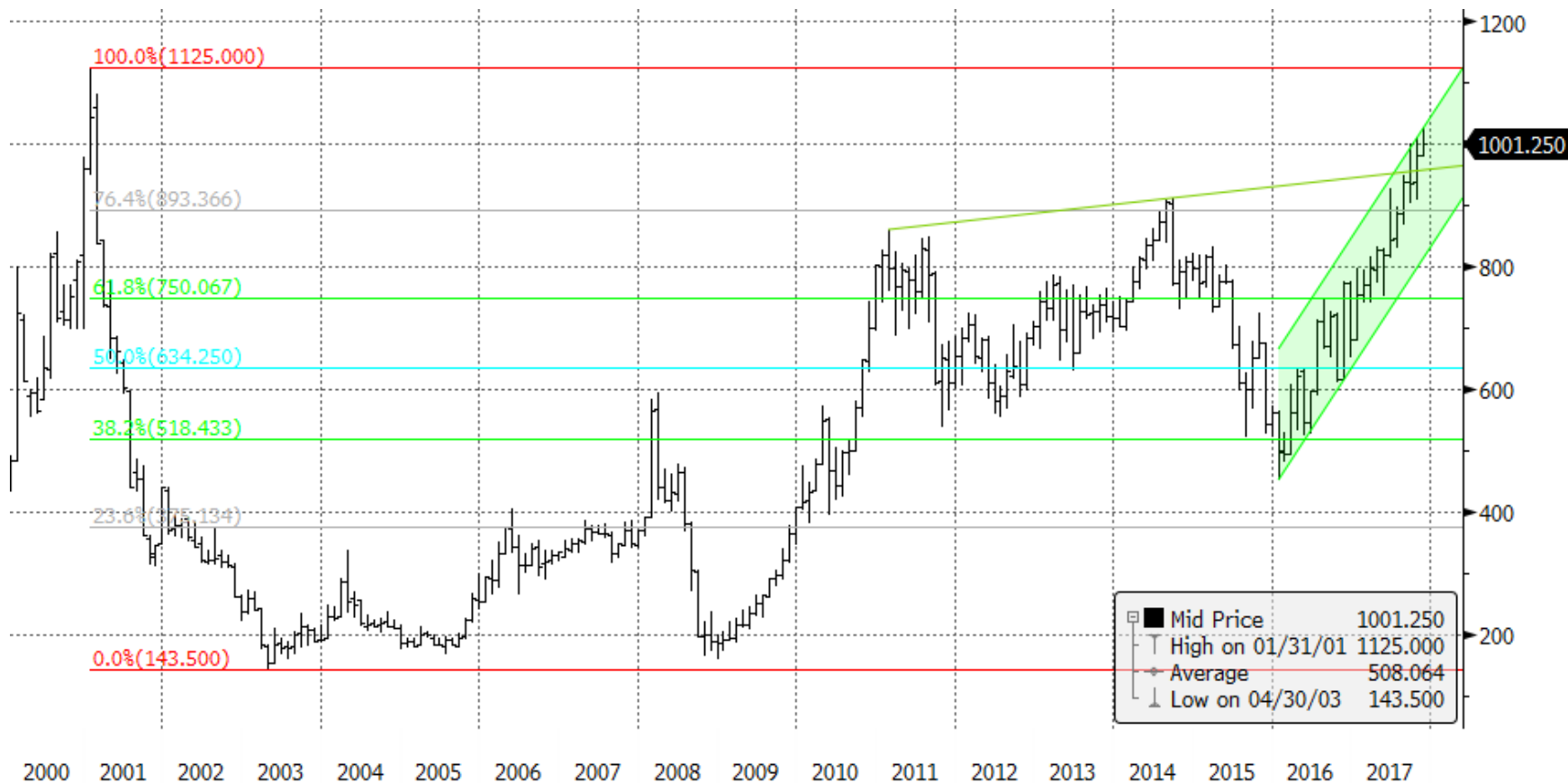


Source: Mitsubishi from Bloomberg

Recap on palladium in 2017

USD prices have broken up beyond long term resistance...

Palladium priced in USD/oz



Source: Mitsubishi from Bloomberg

Palladium: Platinum ratio

USD palladium prices are at a 16-year high against platinum ...

US\$/oz price ratio



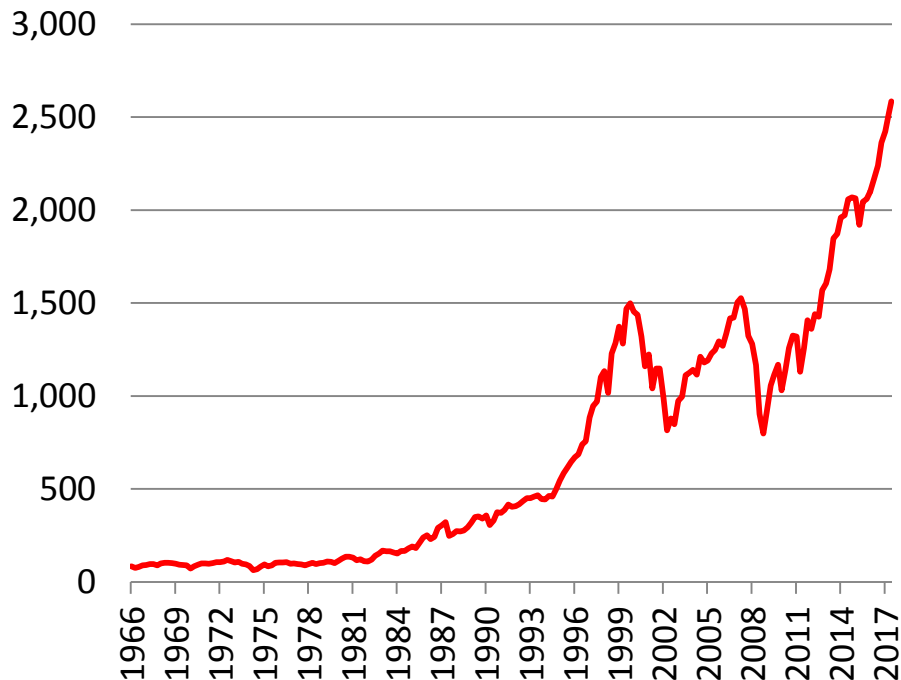
Source: Mitsubishi from Bloomberg

Macro conditions

Supportive of pro-growth, industrial assets

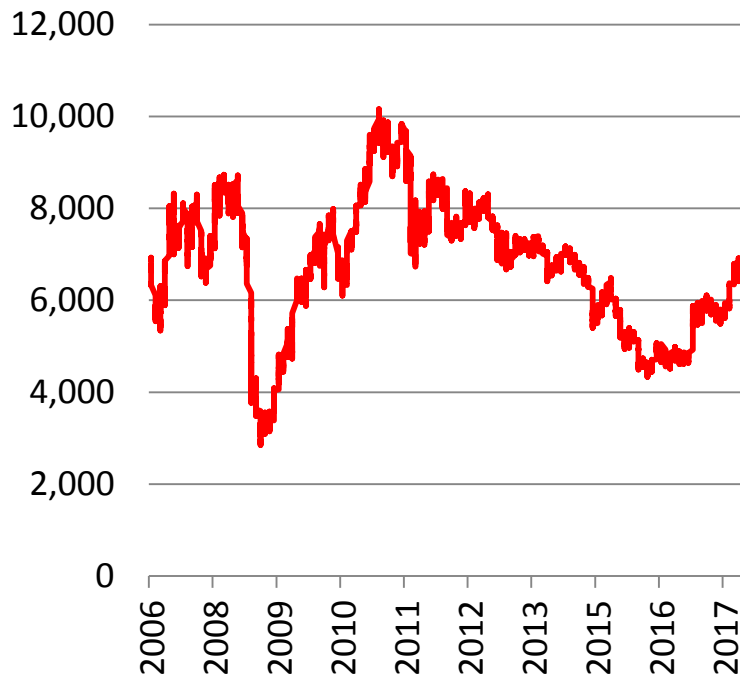
US equities have reached all-time highs:

SPX 500 Index



Copper has reached 3-year highs

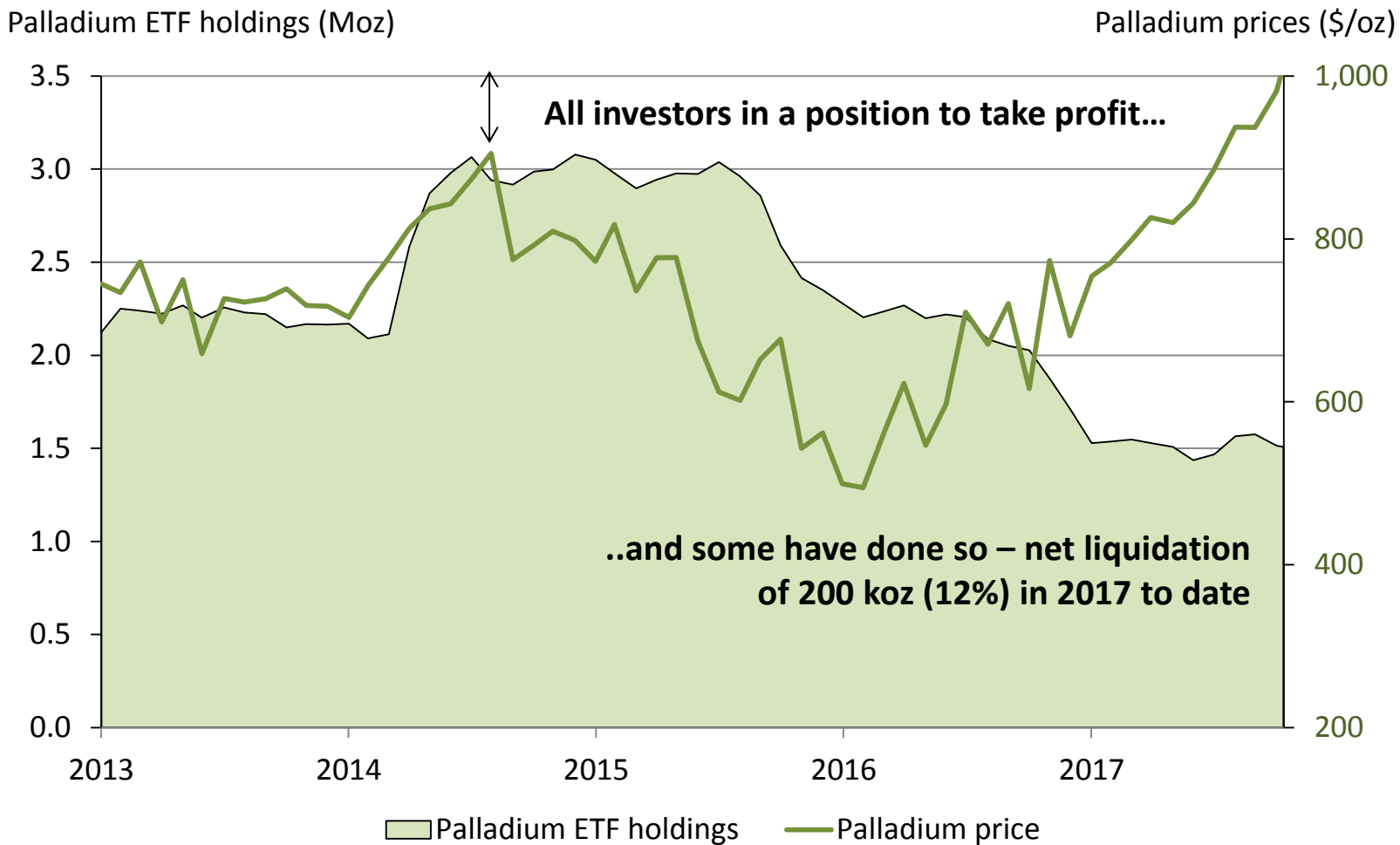
LME Copper (\$/t)



Source: Mitsubishi from Bloomberg

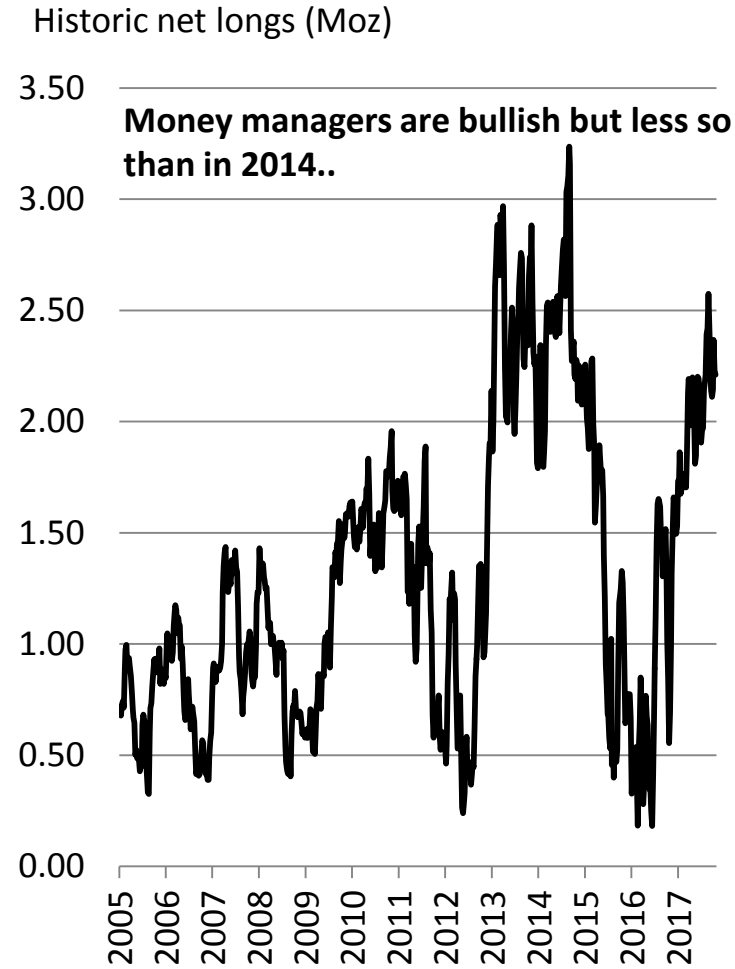
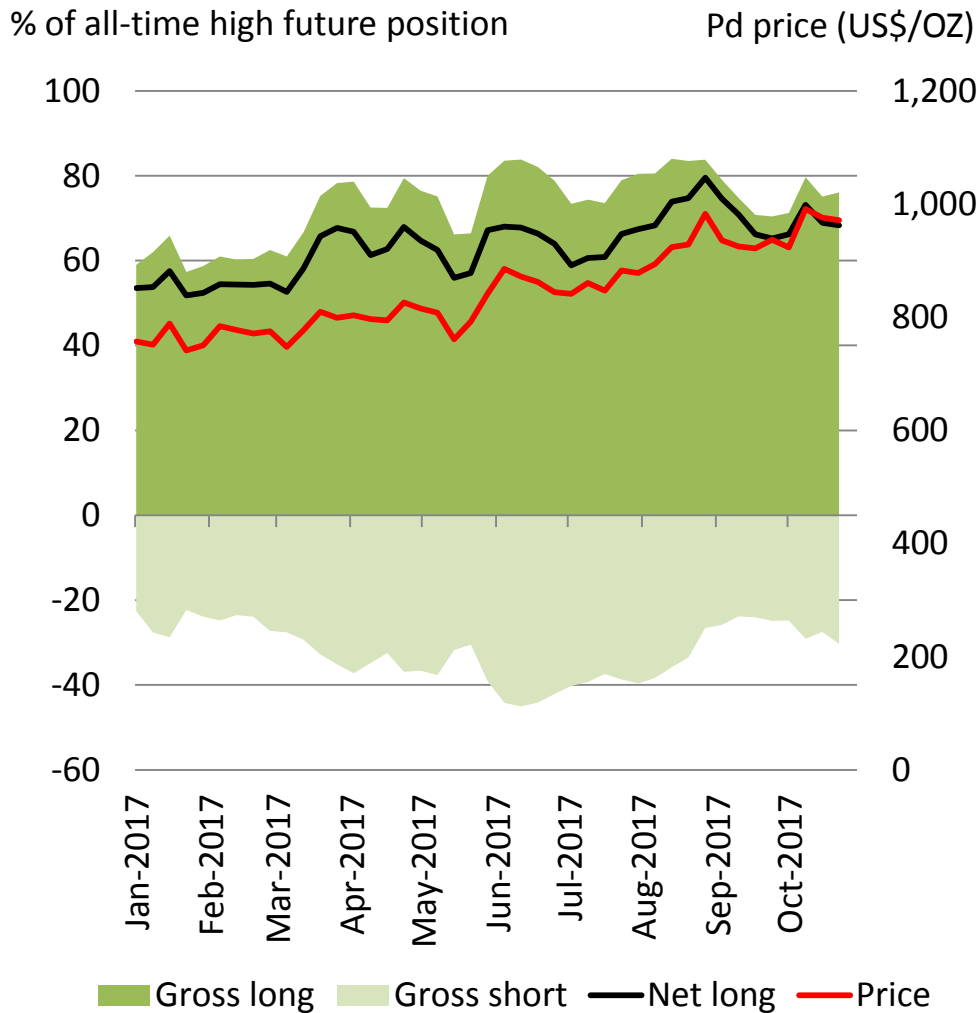
Investor dreams

Great news for ETF investors



Investor dreams

Speculative futures market: bullish but unexceptional positioning

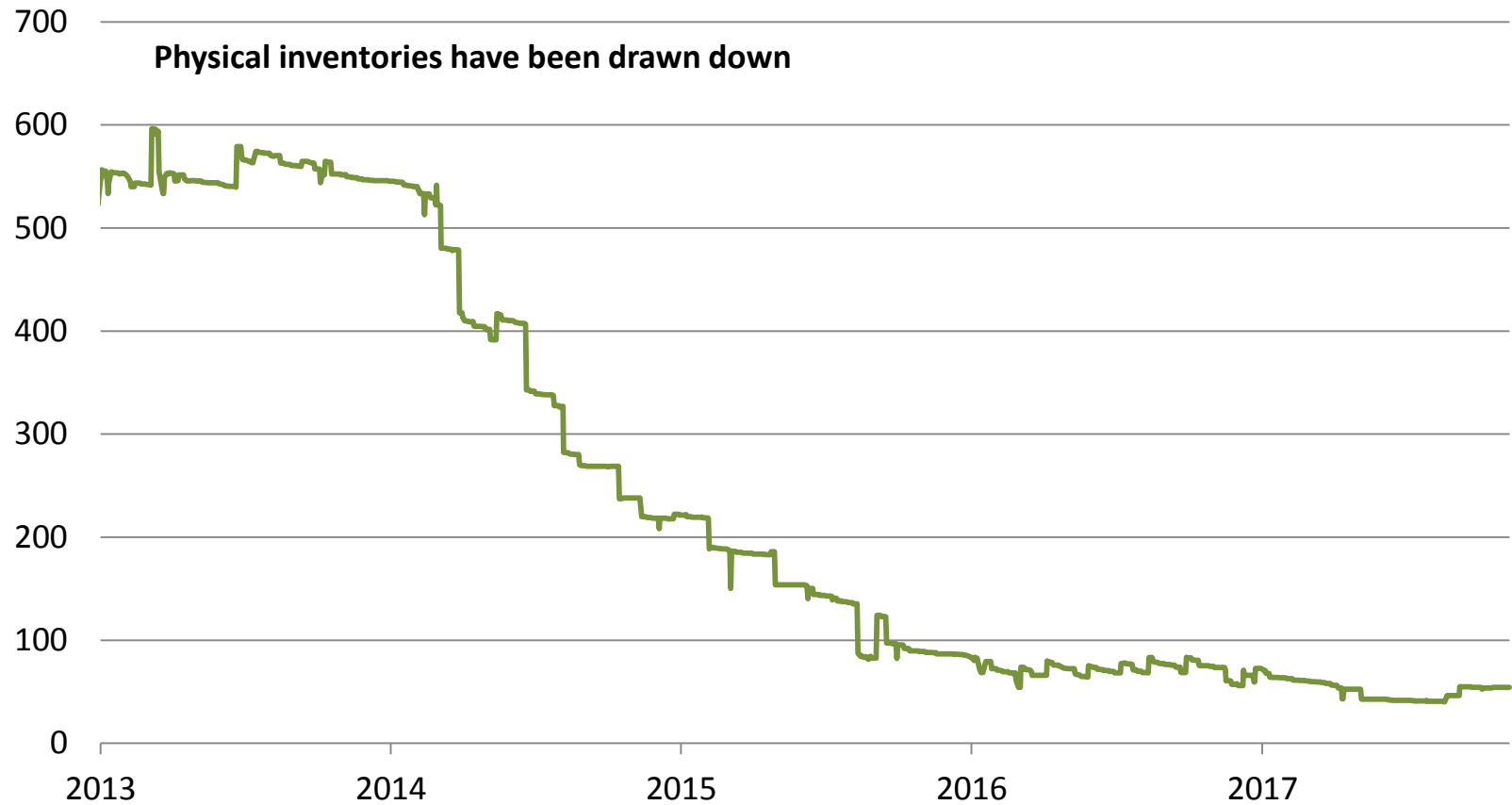


Source: Mitsubishi from CFTC / NYMEX

Investor dreams

Warehouse inventories are depleted

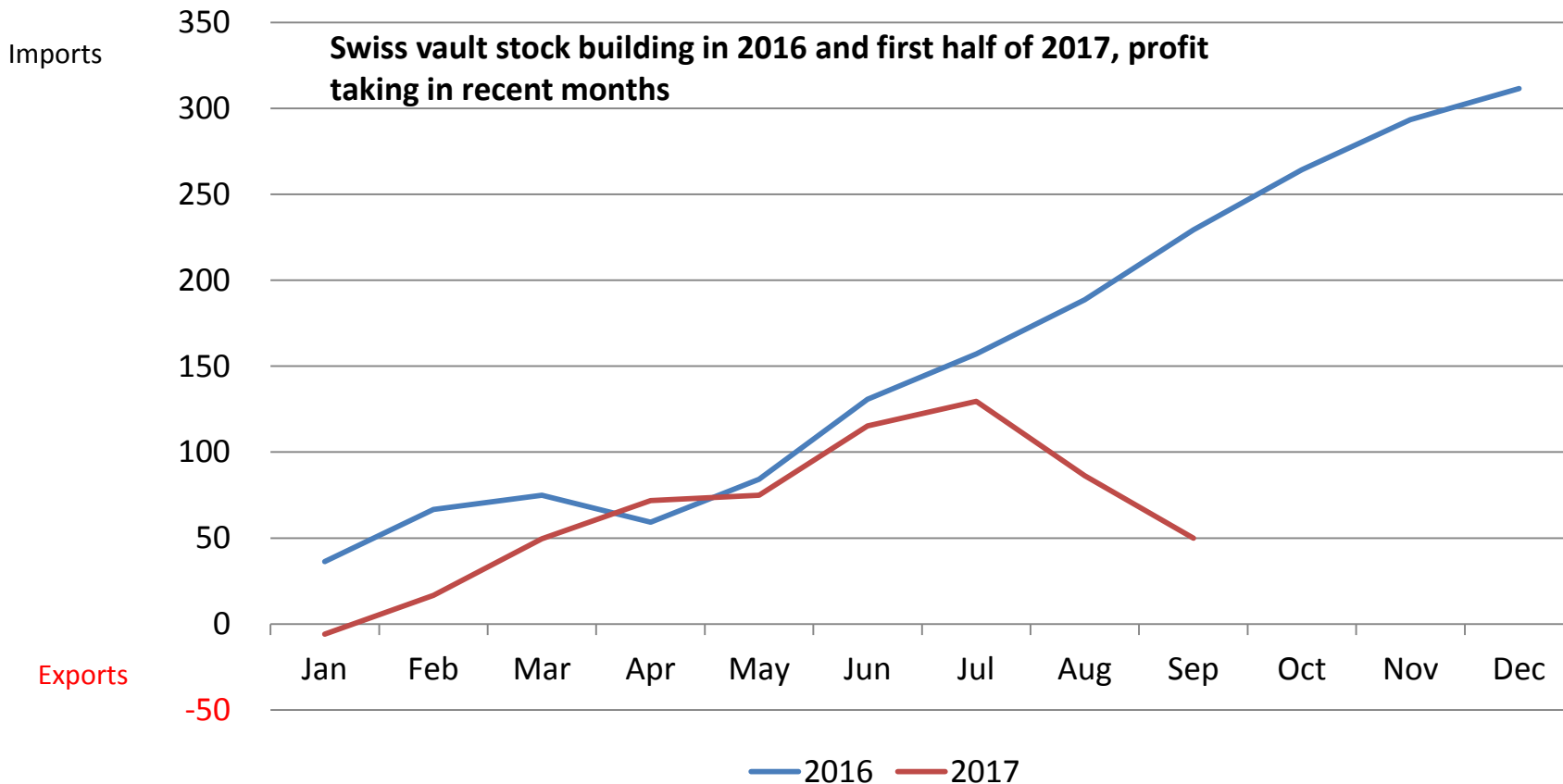
NYMEX palladium inventories (koz)



Source: Mitsubishi from Bloomberg

OTC market has seen position building

Swiss net imports/exports of palladium (koz)

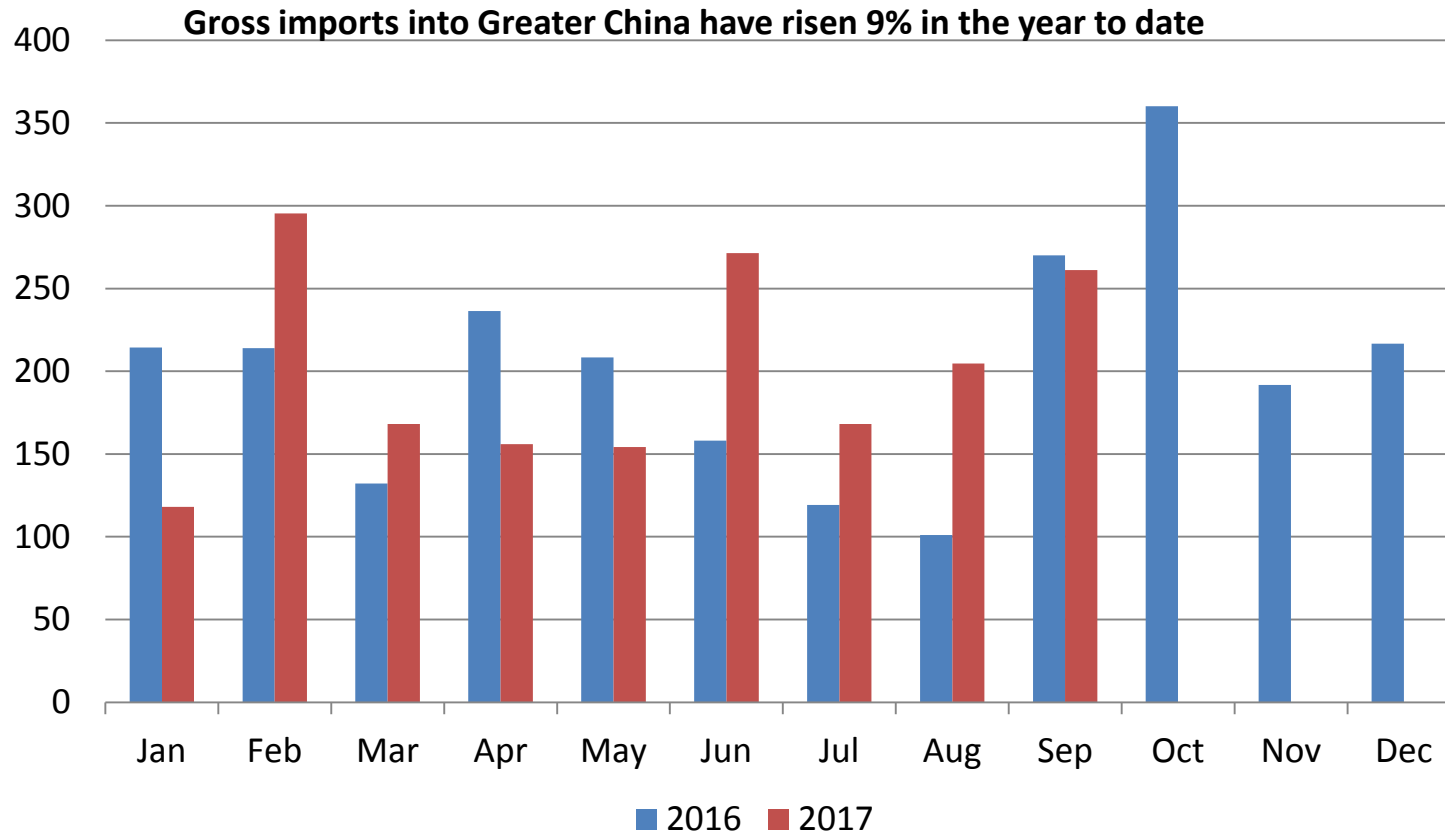


Source: Mitsubishi from Swiss Federal Customs Administration

Where is all the palladium going?

China is key

Gross imports of palladium into greater China (koz)



Source: Mitsubishi from GTIS

Where is all the palladium going?

China is key

Gross imports of palladium into Greater China vs autocatalyst Pd demand (Moz)

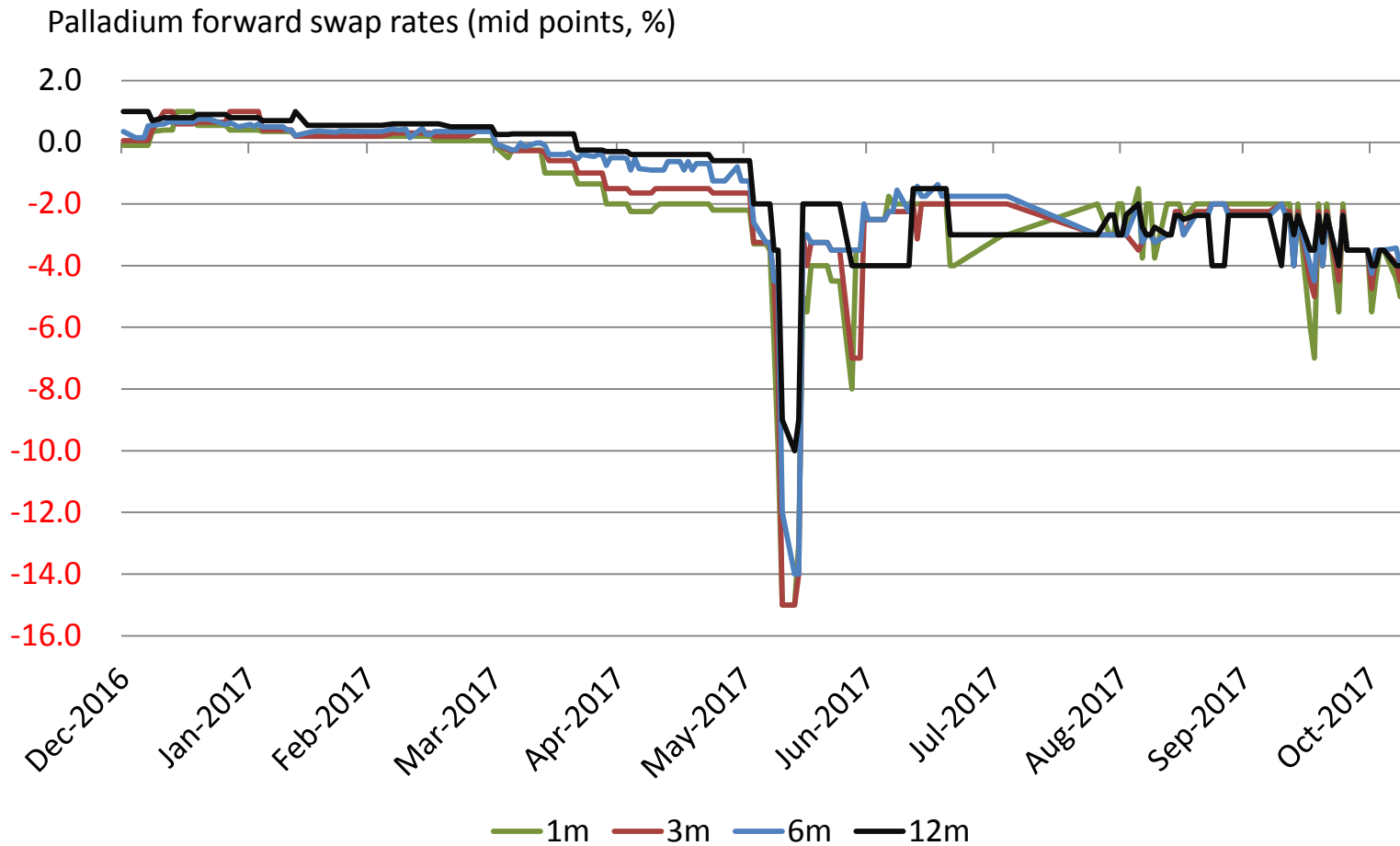
Implied Pd loading (g/vehicle)



Source: Mitsubishi from GTIS, Johnson Matthey

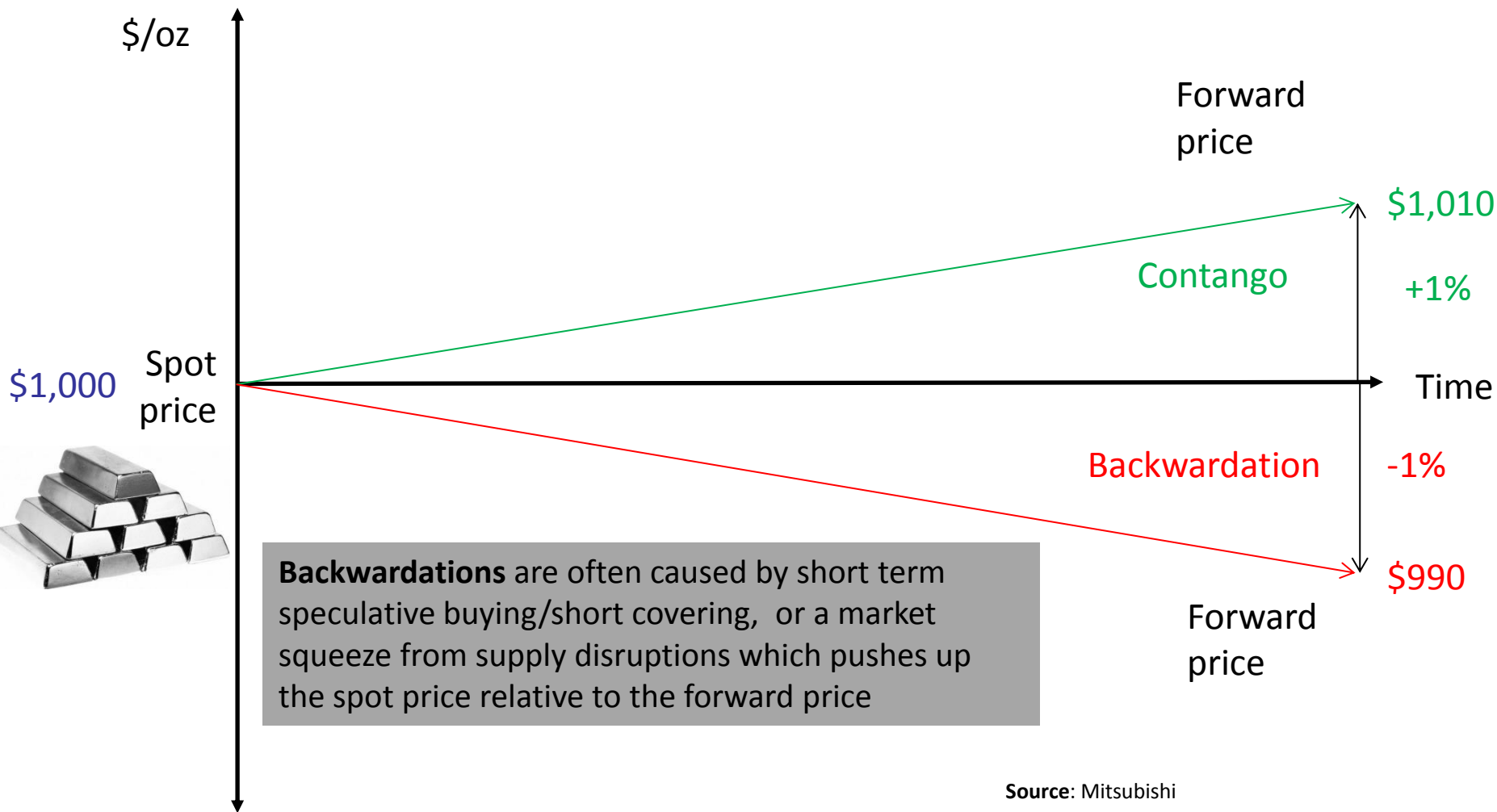
Industrial nightmares

Tight market conditions



Source: Mitsubishi from Bloomberg

Forward market



Lease rates

$$\text{Lease rate (\%)} = \text{LIBOR (\%)} - \text{Metal Forward Rate (\%)}$$

2 key variables:

- **Cost of borrowing USD (LIBOR)** which generally moves in line with US interest rates
- **Metal forward rate** which generally remains in positive territory, providing something of an offset to the cost of borrowing dollars

Industrial nightmares

Physical availability exceedingly tight

Palladium 3m indexed lease rate indications (% , where 1st January 2017 = 100)



Source: Mitsubishi estimates

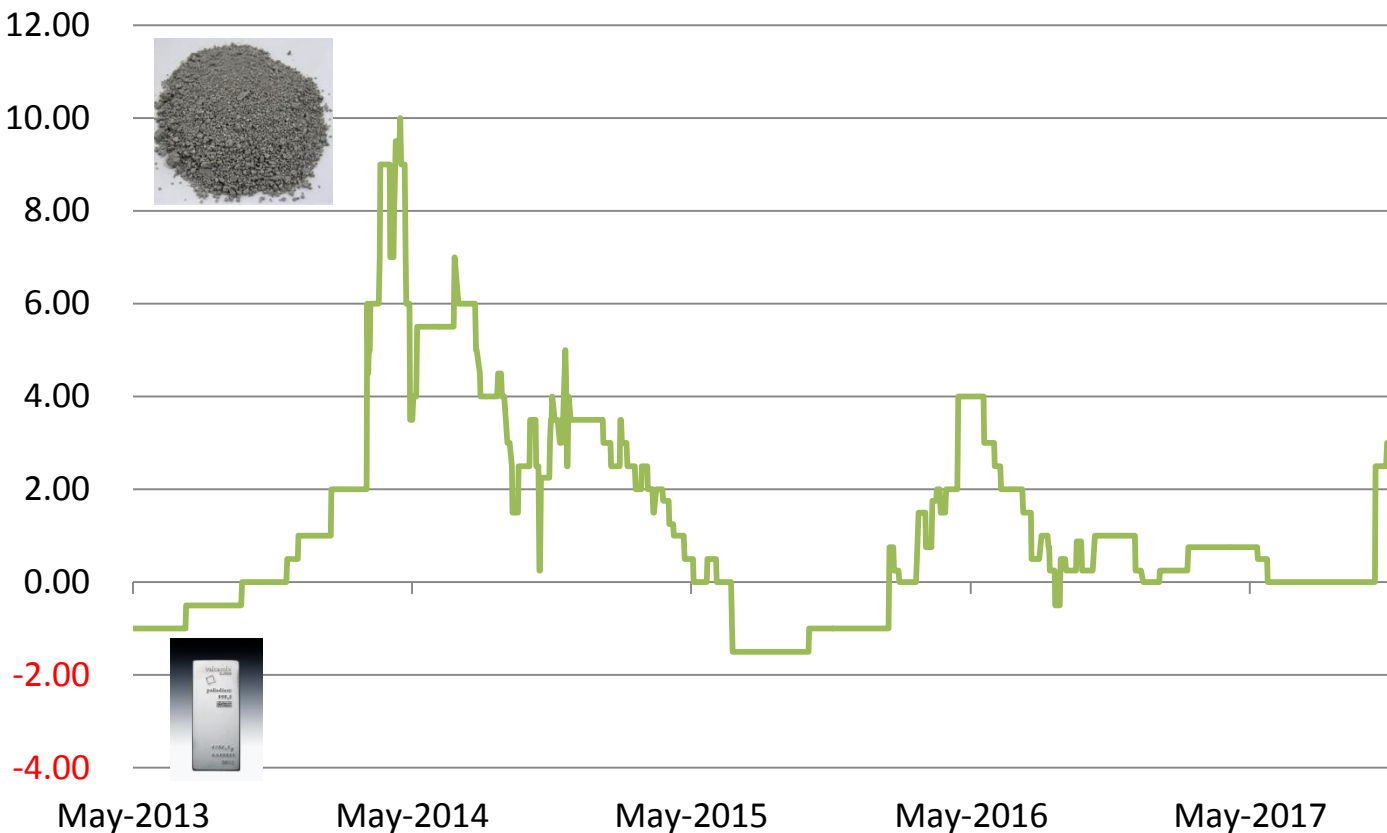
Industrial or investment driven tightness?

Palladium sponge market

Palladium sponge premium (USD/oz)

Palladium sponge is at a premium to ingot – signals strong industrial demand

Palladium sponge is at a discount to ingot – signals strong investor demand

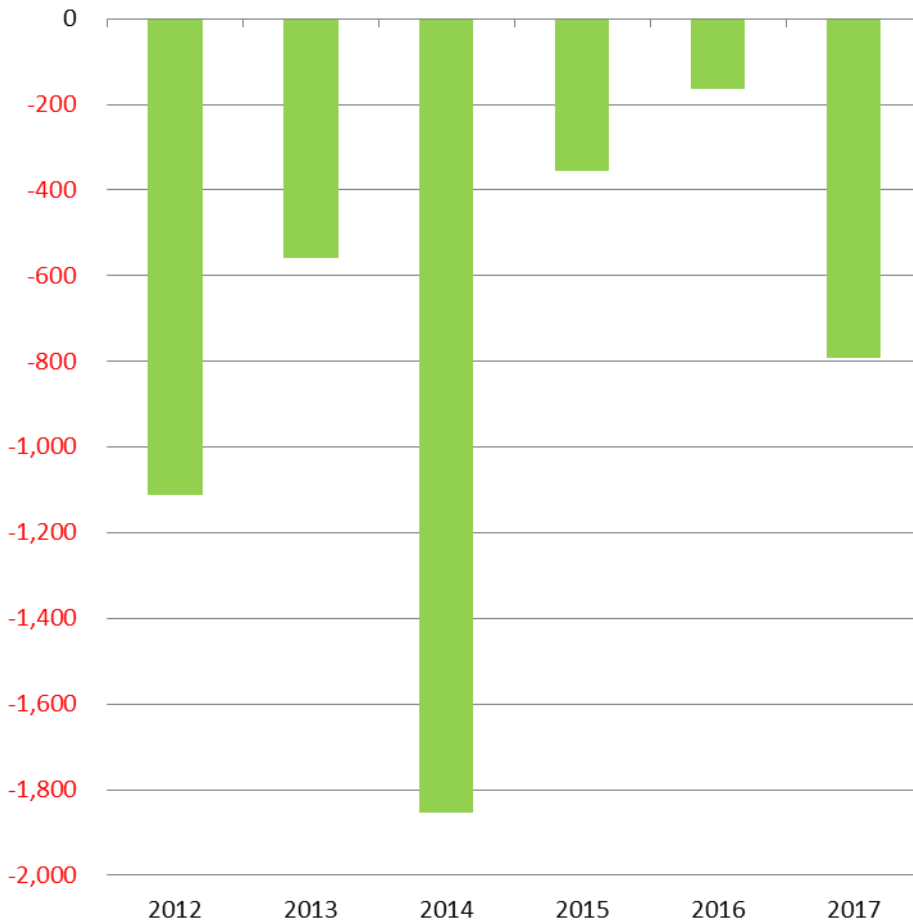


Source: Mitsubishi estimates

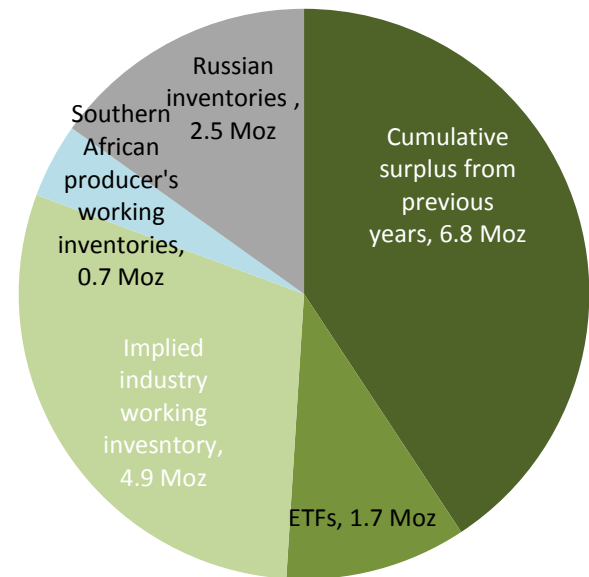
Palladium market balance

Palladium has been in a supply-demand deficit for 5 years

Palladium balance (koz)



Total estimated near market above ground stocks of palladium, end of 2016: 16 Moz

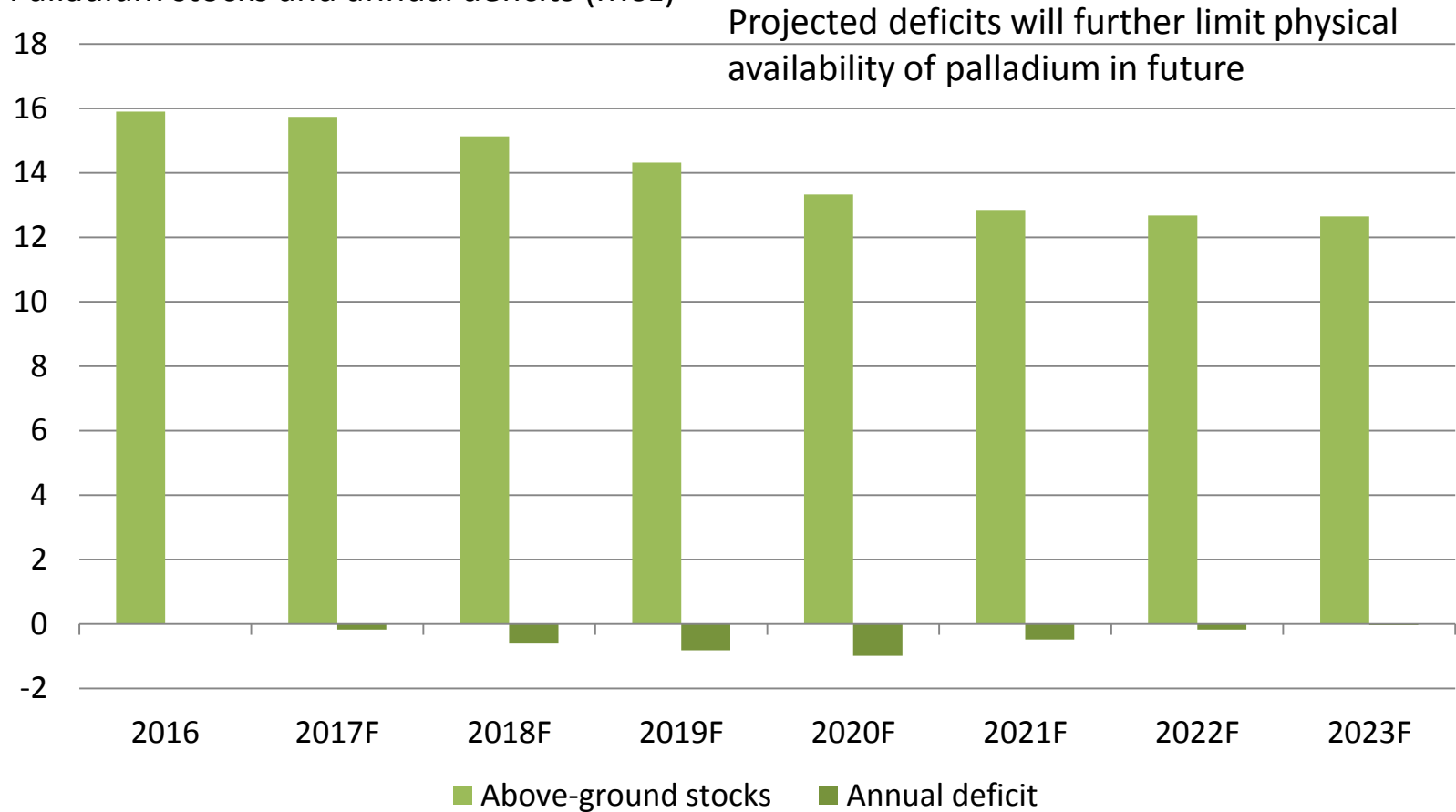


Source: Mitsubishi from Johnson Matthey

Palladium market balance

Projected market deficits will draw down near-market above-ground stocks

Palladium stocks and annual deficits (Moz)



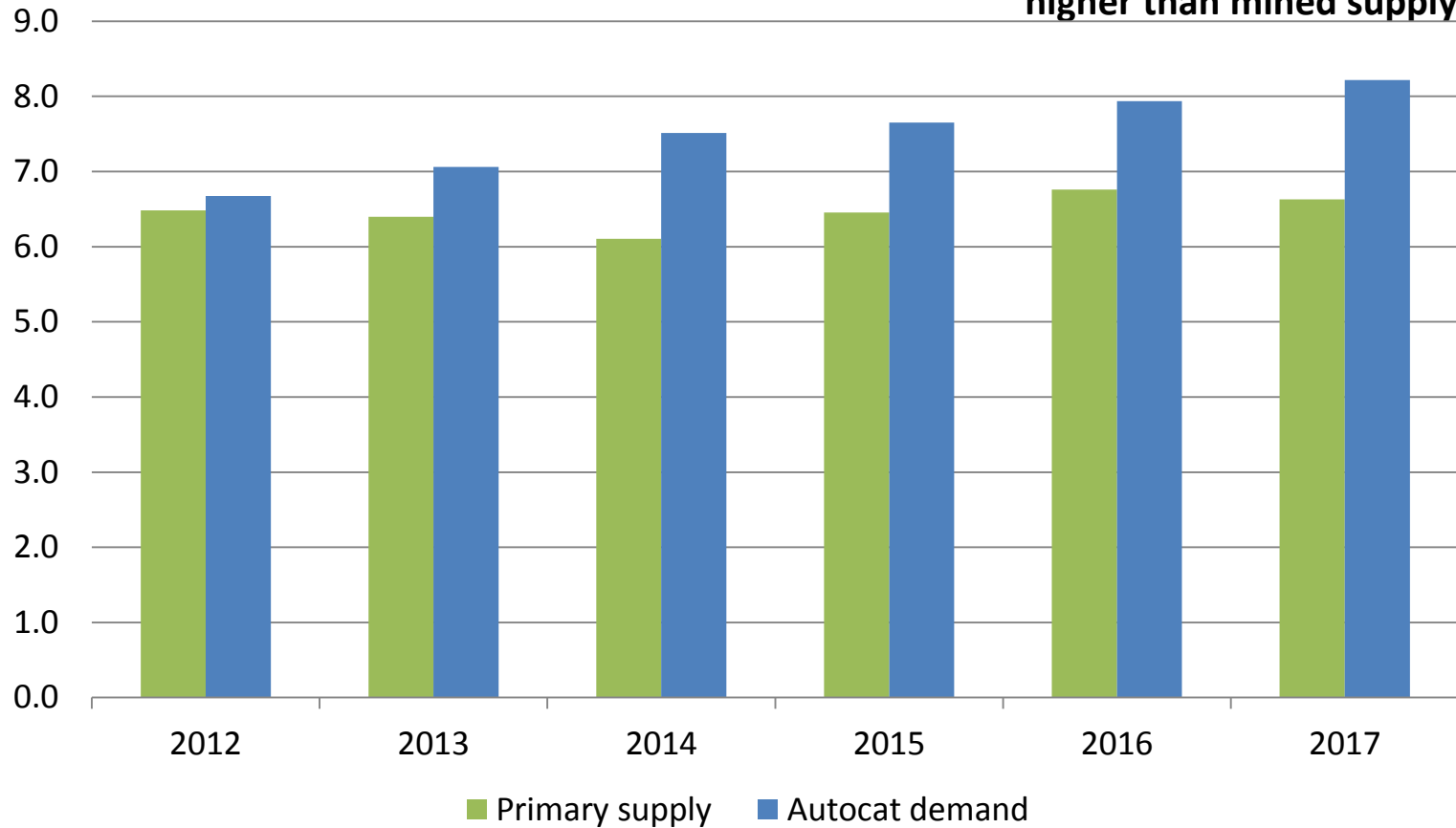
Source: Mitsubishi from Johnson Matthey

Autocat demand vs supply

Palladium is a one trick pony

Palladium stocks supply and demand (Moz)

Autocatalyst demand is around 20% higher than mined supply

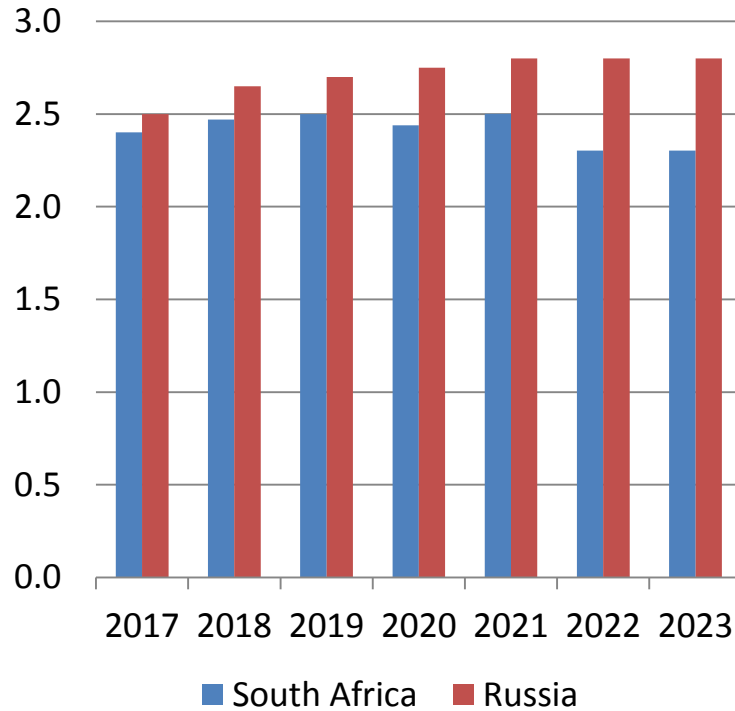


Source: Mitsubishi from Johnson Matthey

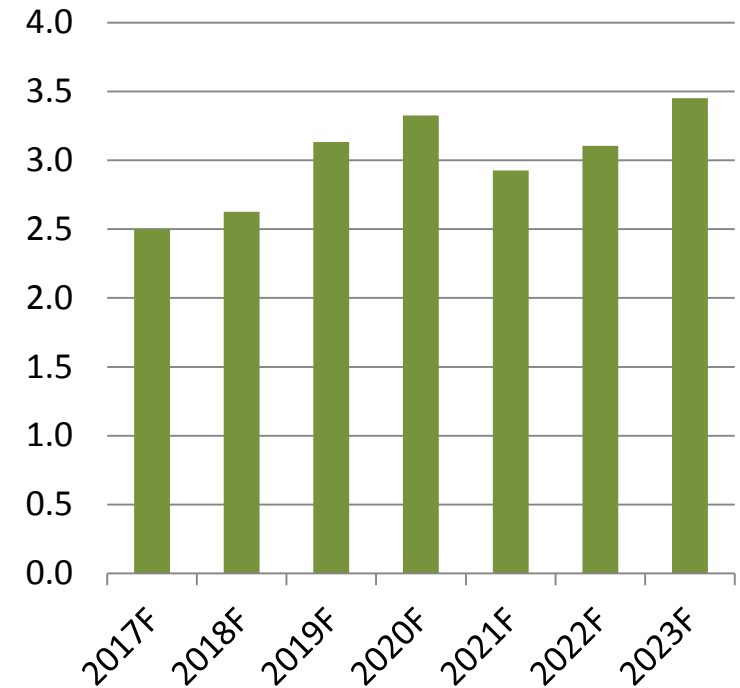
Supply side

Risks are to the downside on primary mining, recycling could surprise to upside

Palladium supply forecast (Moz):



Autocatalyst recycling forecast (Moz)



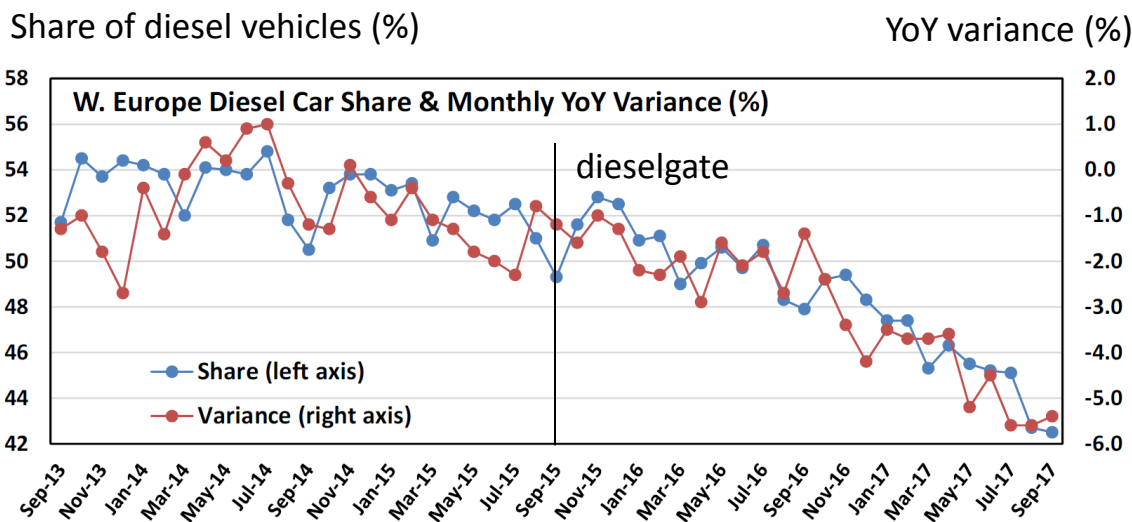
More autocatalyst recycling in future

Source: Mitsubishi estimates

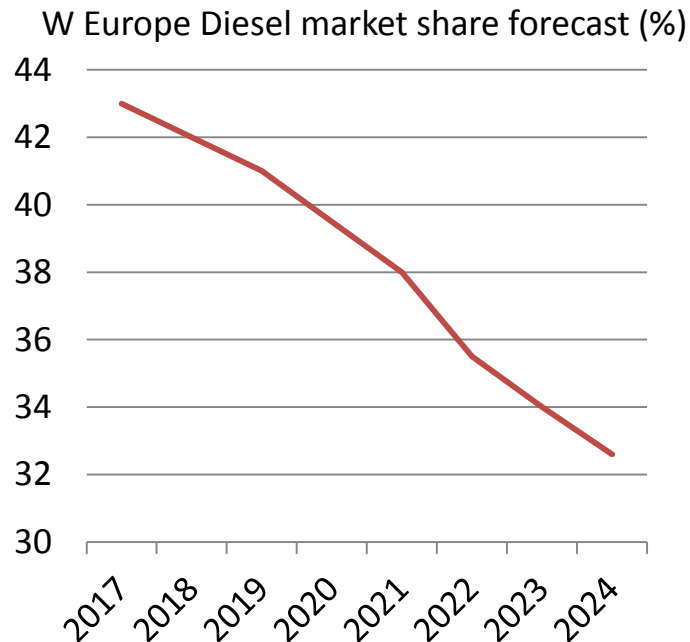
Auto demand

Diesel in terminal decline?

Decline of diesel benefits gasoline, therefore Pd demand:



Source: LMC Automotive



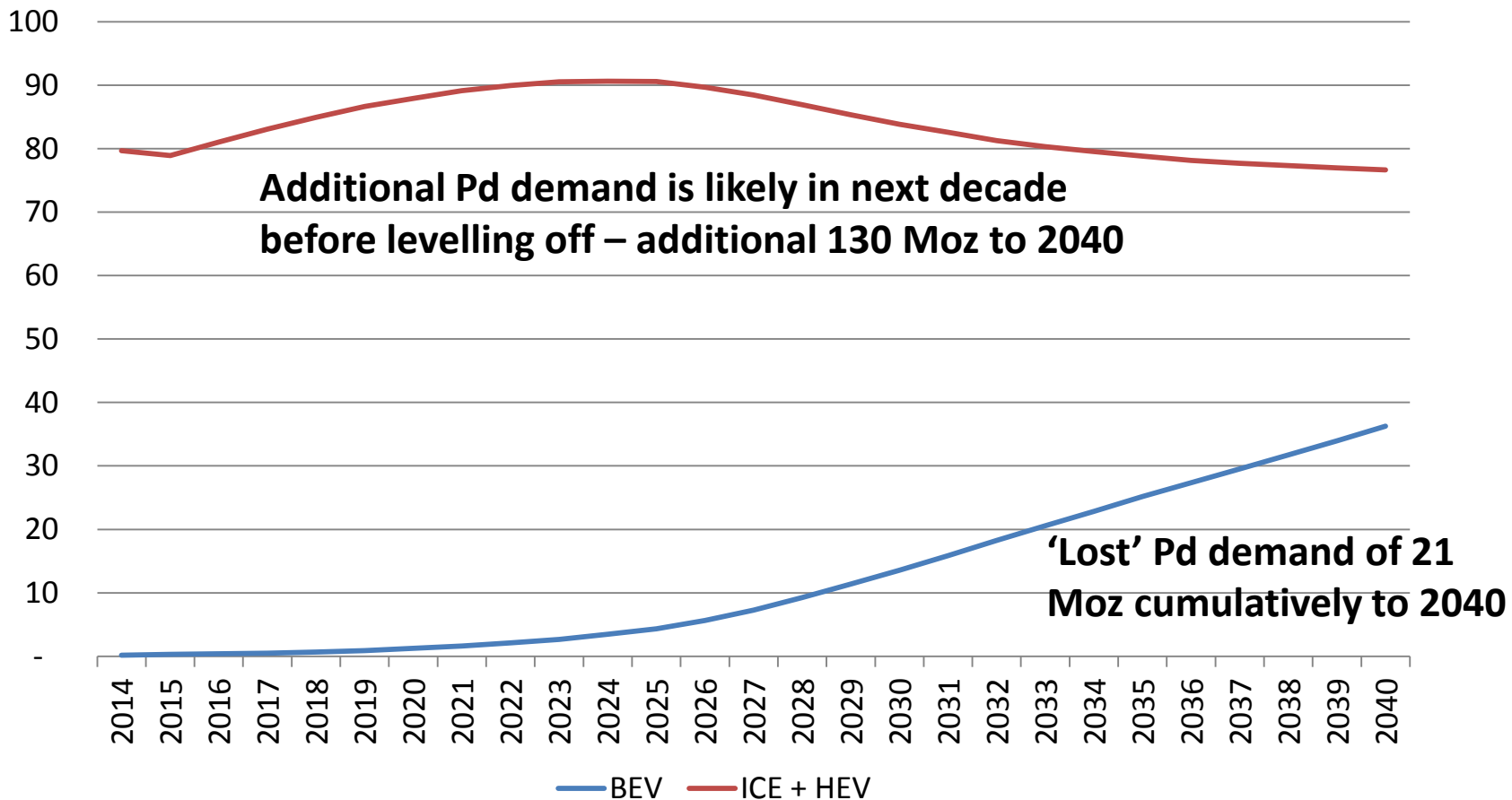
Source: LMC Automotive (base case scenario)

But diesels will remain around a third of the European fleet due to their CO₂ benefits to meet upcoming regulation, plus platinum may see some usage e.g. in gasoline filters

Vehicle electrification

No engines = no PGM demand

Forecast of engine based and pure BEVs (millions)



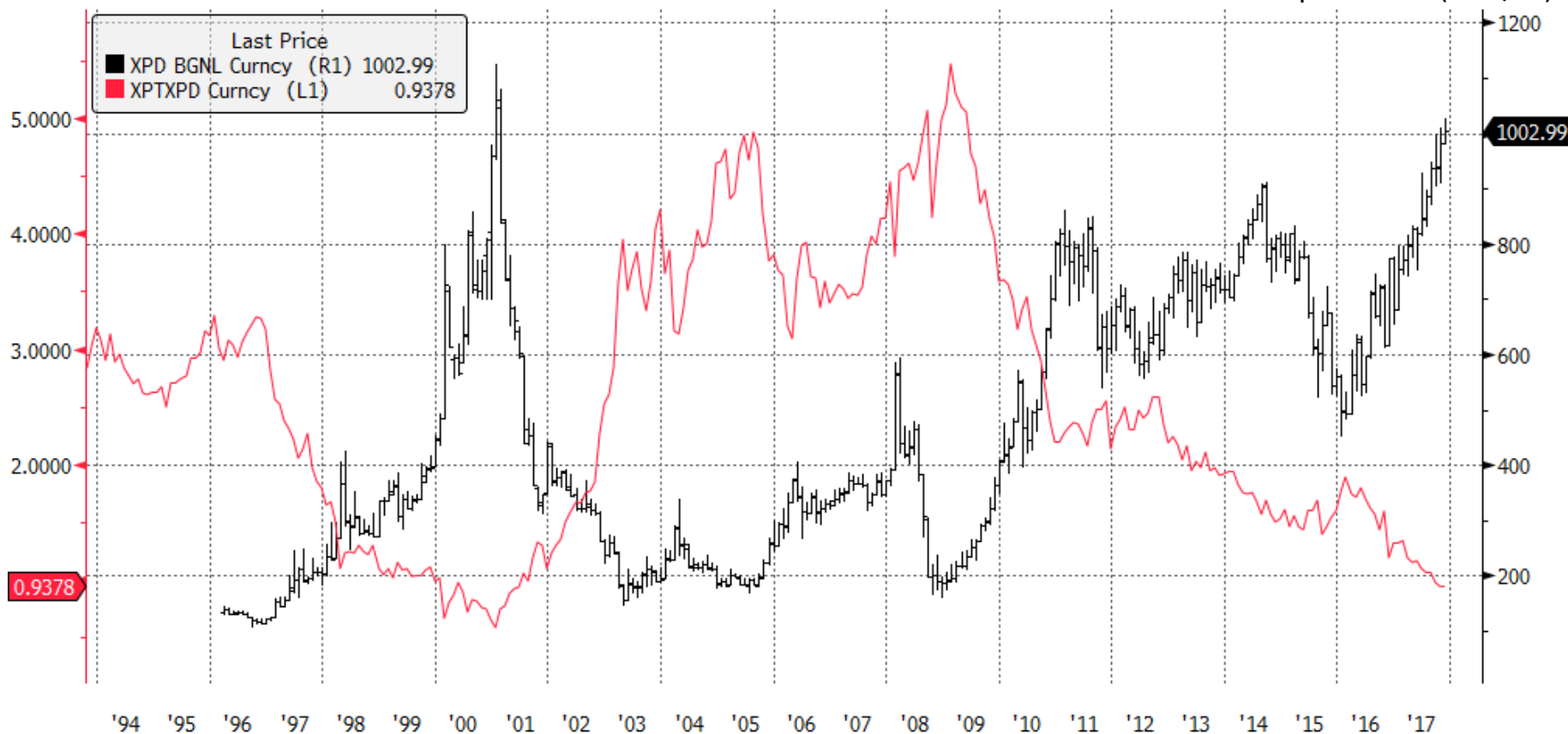
Source: Bloomberg New Energy Finance

Lessons from history?

Long term nominal average price: \$460/oz, 2.5x premium in platinum

Platinum/Palladium ratio (USD/oz)

Platinum price ratio (USD/oz)



Source: Mitsubishi from Johnson Matthey

Summary

Industrial dreams or investor nightmares?

Is palladium's price /premium sustainable?

- **No:**

- It's a biproduct
- It's a one-trick pony
- It has a large above ground stock
- It's volatile
- Historically it's been at a discount

- **Yes:**

- Primary and secondary supply is constrained
- Demand is strong
- China is a terminal market
- Speculators remain interested

Industrial users prefer steady prices...unlikely to get them any time soon...

Disclaimer

This document is not and should not be construed as an offer to sell or the solicitation of an offer to purchase or subscribe for any investment. Mitsubishi Corporation has based this document on information obtained from sources it believes to be reliable but which it has not independently verified; Mitsubishi Corporation makes no guarantee, representation or warranty and accepts no responsibility or liability as to its accuracy or completeness. Expressions of opinion are those of Mitsubishi Corporation only and are subject to change without notice.

Mitsubishi Corporation assume no warranty, liability or guarantee for the current relevance, correctness or completeness of any information provided within this Report and will not be held liable for the consequence of reliance upon any opinion or statement contained herein or any omission. Furthermore, we assume no liability for any direct or indirect loss or damage or, in particular, for lost profit which you may incur as a result of the use and existence of the information provided within this presentation.

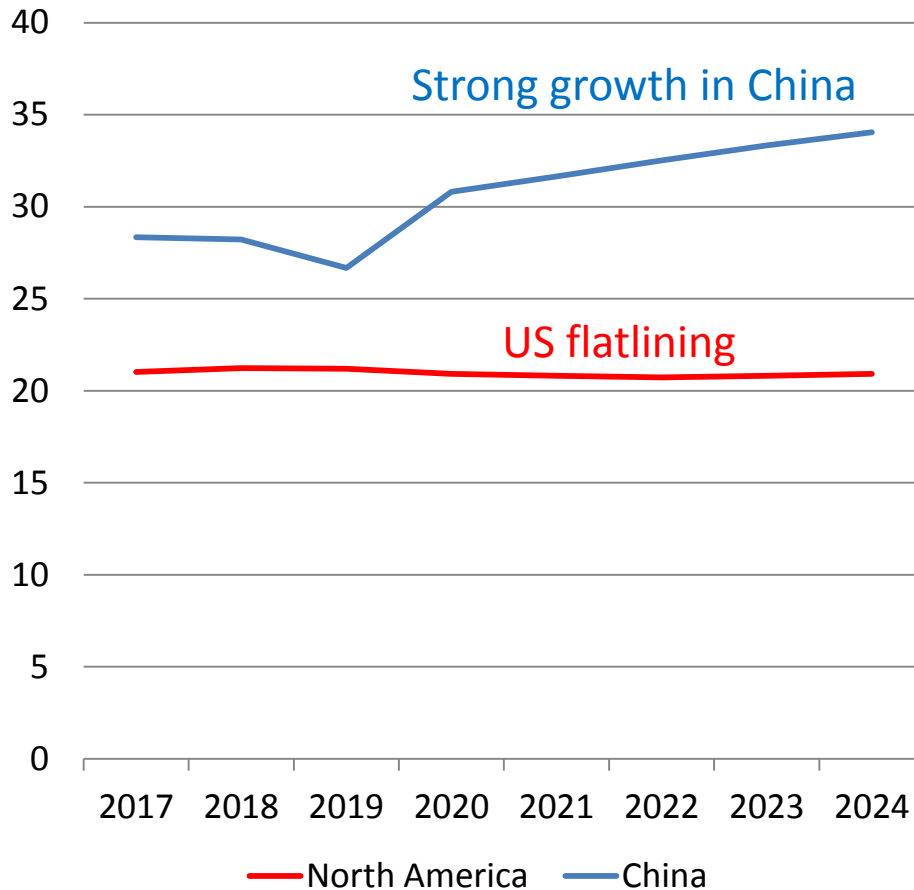
The content of this Report is the property of Mitsubishi Corporation and is protected by copyright and other intellectual property laws. **You agree not to reproduce, re-transmit or distribute the content of this Report to anyone without the prior written consent of Mitsubishi Corporation.**

© Mitsubishi Corporation International (Europe) Plc, 2017

Vehicle sales forecasts

Growth in China, US flatlines

Light duty vehicle sales forecast (millions)



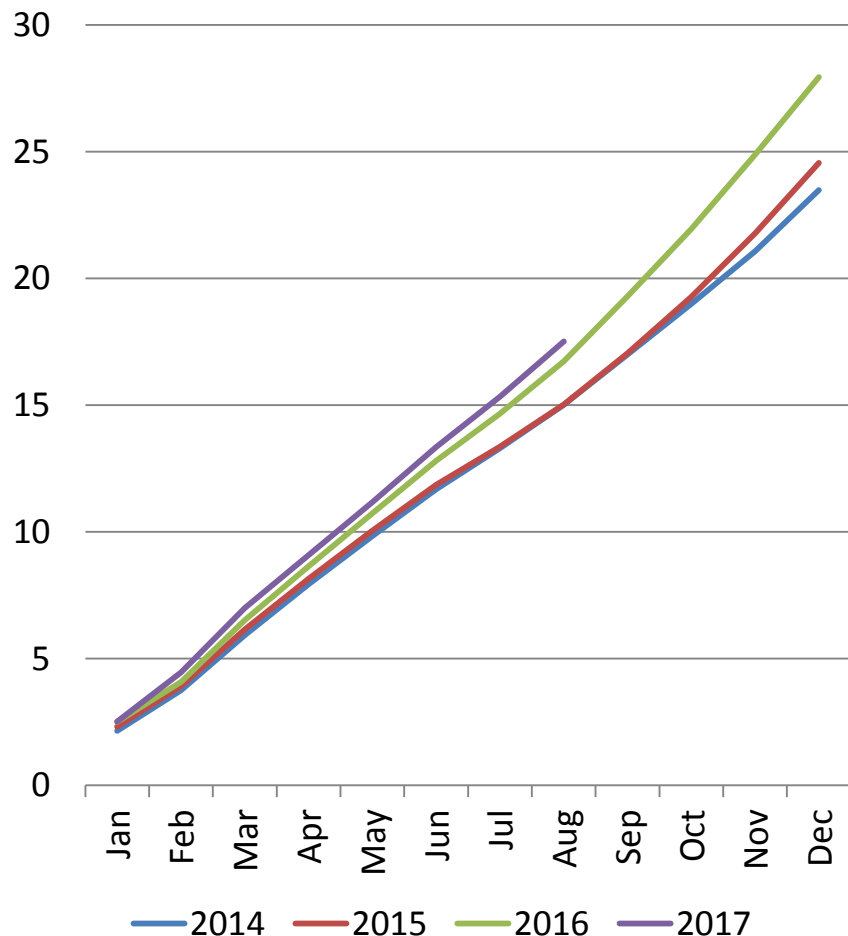
- Vehicle ownership as a portion of the population is <10% in China. In the US it is around 80% - China therefore has many years of structural growth in car ownership ahead
- The US is a saturated market and is at risk from the millennial generation no longer wanting to own cars and instead opting for ride-sharing, which may be accelerated by the move to autonomous vehicles.

Source: Mitsubishi from IHS Markit

Autocatalyst demand for palladium has reached record highs

Chinese demand is positive but outlook clouded by uncertainty over EVs

Chinese car sales (millions)



- Growth in Chinese auto sales in 2017 despite the reduction of **tax** incentives
- 2017 is the first year of Euro 5 equivalent **legislation** being in force nationwide which should increase average PGM loadings across the fleet
- Threat from **electrification**: China is a leading producer of battery electric vehicles and government efforts to promote these vehicles may damage Pd demand in the longer term

Source: Mitsubishi from China Auto Info Net