

44 <b>Ru</b> Ruthenium 101.07	45 <b>Rh</b> Rhodium 102.9055	46 <b>Pd</b> Palladium 106.42	47 <b>Ag</b> Silver 107.8682
76 <b>Os</b> Osmium 190.23	77 <b>Ir</b> Iridium 192.217	78 <b>Pt</b> Platinum 192.217	79 <b>Au</b> Gold 196.9666

# PRECIOUS METALS PRICES 2018 YEAR IN REVIEW

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Consultant

Precious Metals Commodity Management LLC

# 2017-2018 PRECIOUS METALS FIX SUMMARY

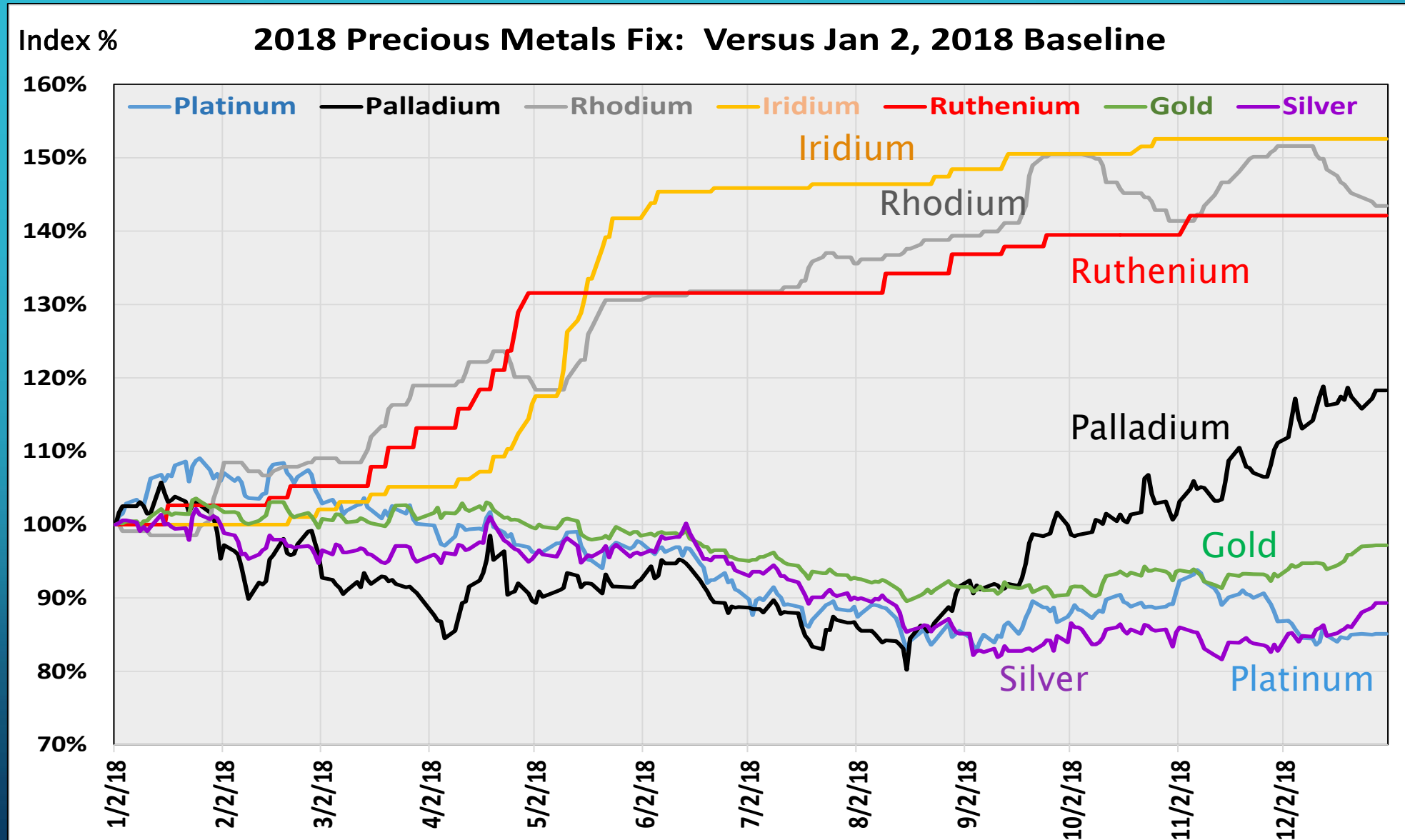
		2017			2018			2017-18
		2-Jan-17	29-Dec-17	2017 % Change	2-Jan-18	31-Dec-18	2018 % Change	2017-18 % Change
Ruthenium	Ru	\$ 40	\$ 190	375.0%	\$ 190	\$ 270	42.1%	575.0%
Rhodium	Rh	\$ 770	\$ 1,715	122.7%	\$ 1,715	\$ 2,460	43.4%	219.5%
Iridium	Ir	\$ 675	\$ 970	43.7%	\$ 970	\$ 1,480	52.6%	119.3%
Palladium	Pd	\$ 689	\$ 1,070	55.3%	\$ 1,077	\$ 1,264	17.4%	83.5%
Gold	Au	\$ 1,152.10	\$ 1,302.86	13.1%	\$ 1,316.88	\$ 1,287.83	-2.2%	11.8%
Osmium	Os	\$ 400	\$ 400	0.0%	\$ 400	\$ 400	0.0%	0.0%
Silver	Ag	\$ 16.03	\$ 16.95	5.7%	\$ 17.15	\$ 15.48	-9.7%	-3.4%
Platinum	Pt	\$ 911	\$ 933	2.4%	\$ 940	\$ 800	-14.9%	-12.2%

*Au/Ag Heraeus USD fix, Pt/Pd/Rh/Ru/Ir Johnson Matthey USD fix, Os BASF USD fix*

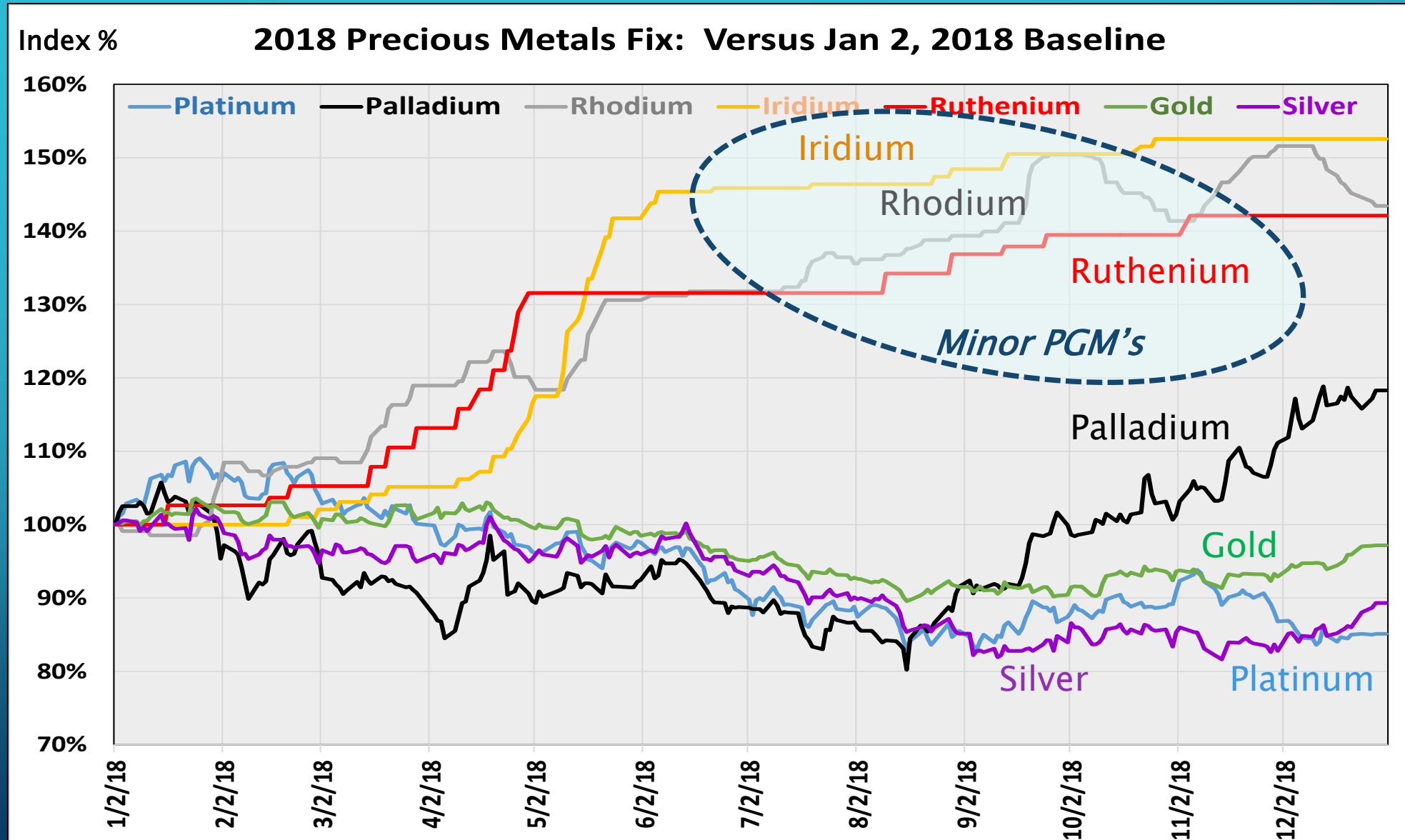
2018: Gold, Silver and Platinum fixes all declined.

2018: Palladium and Minor PGM's Rhodium, Ruthenium & Iridium fixes all increasing.

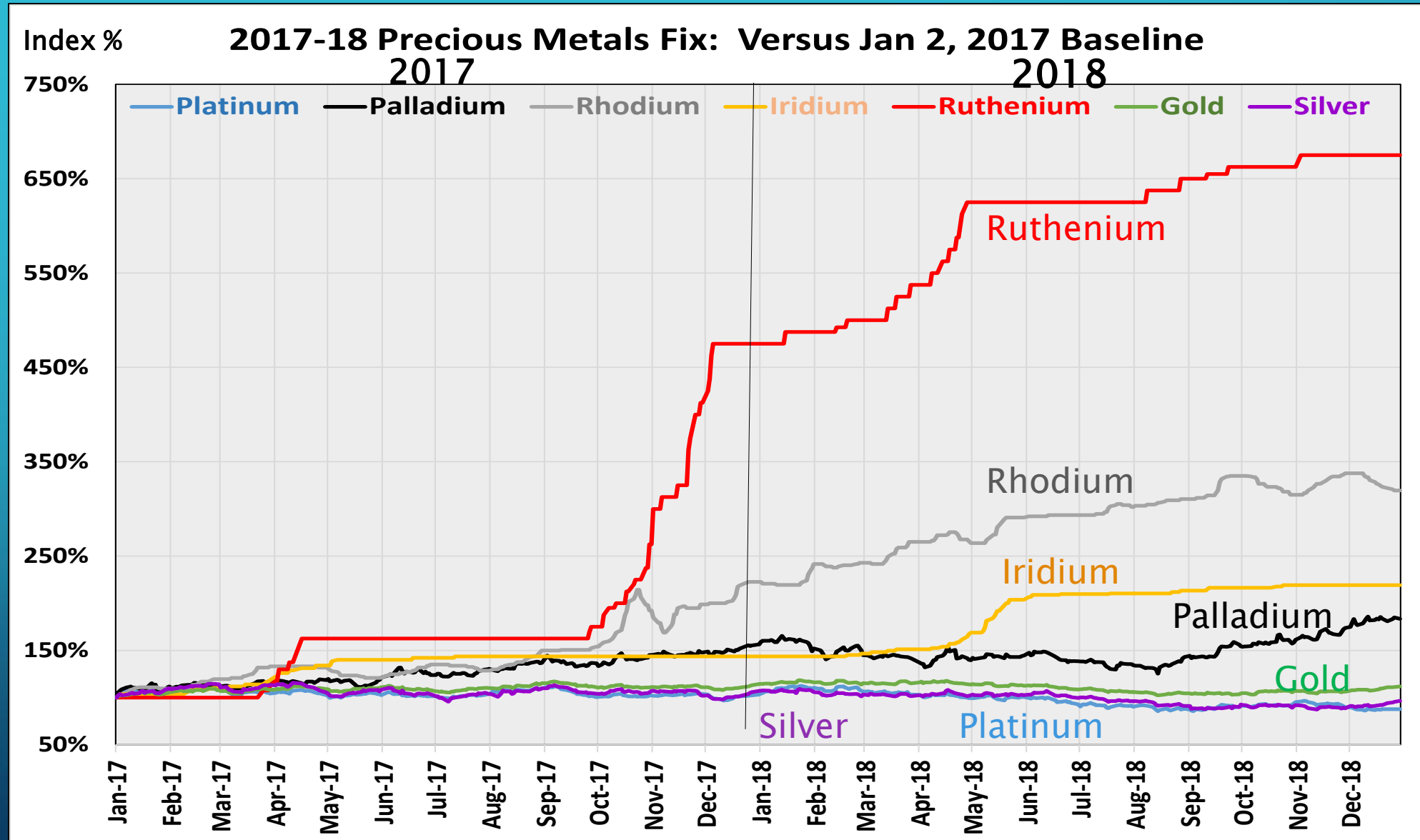
# Precious Metals 2018 Fix Index: Year Of the Minor PGM's



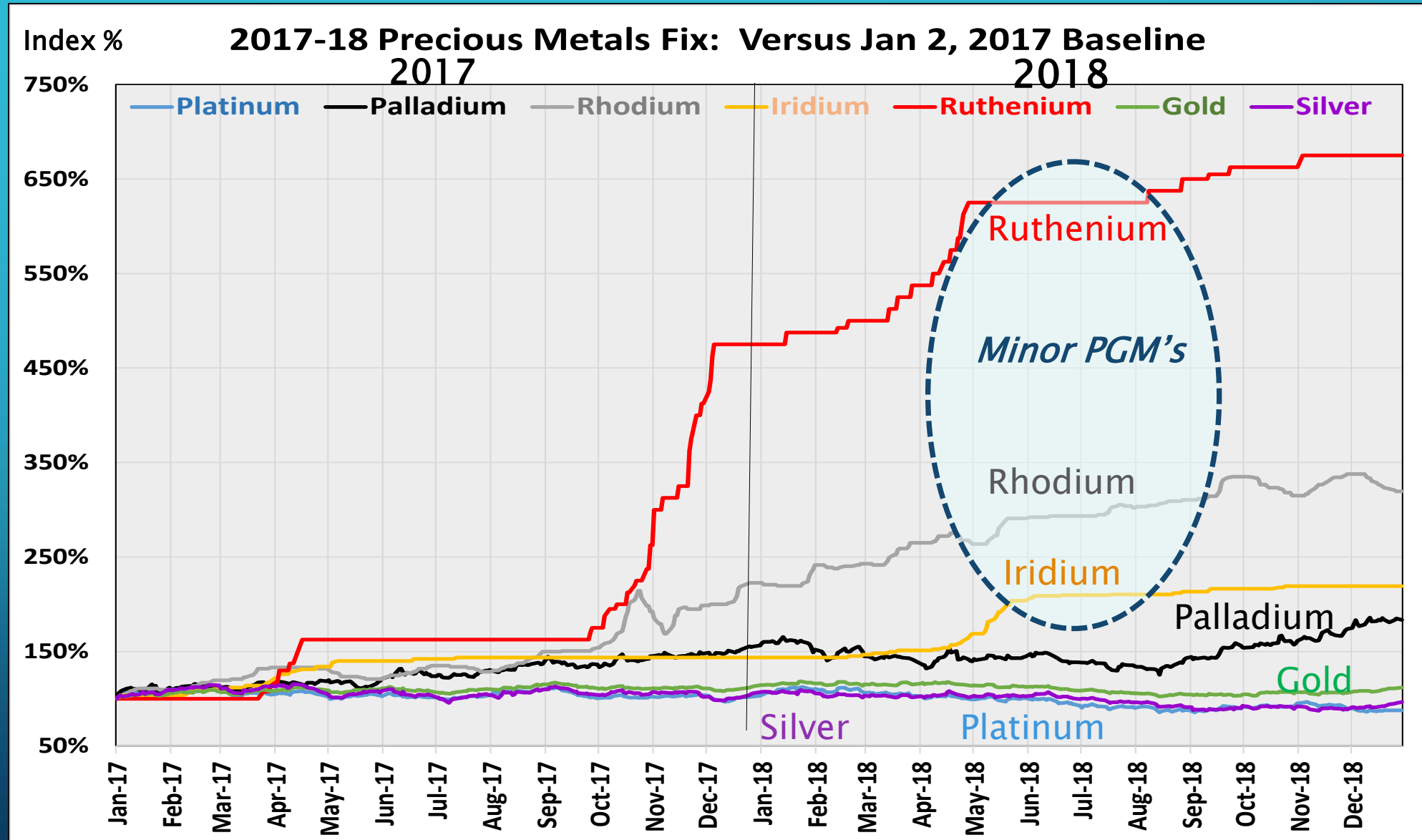
# Precious Metals 2018 Fix Index: Year Of the Minor PGM's



# Precious Metals 2017-18 Fix Index: 2-Year Trend

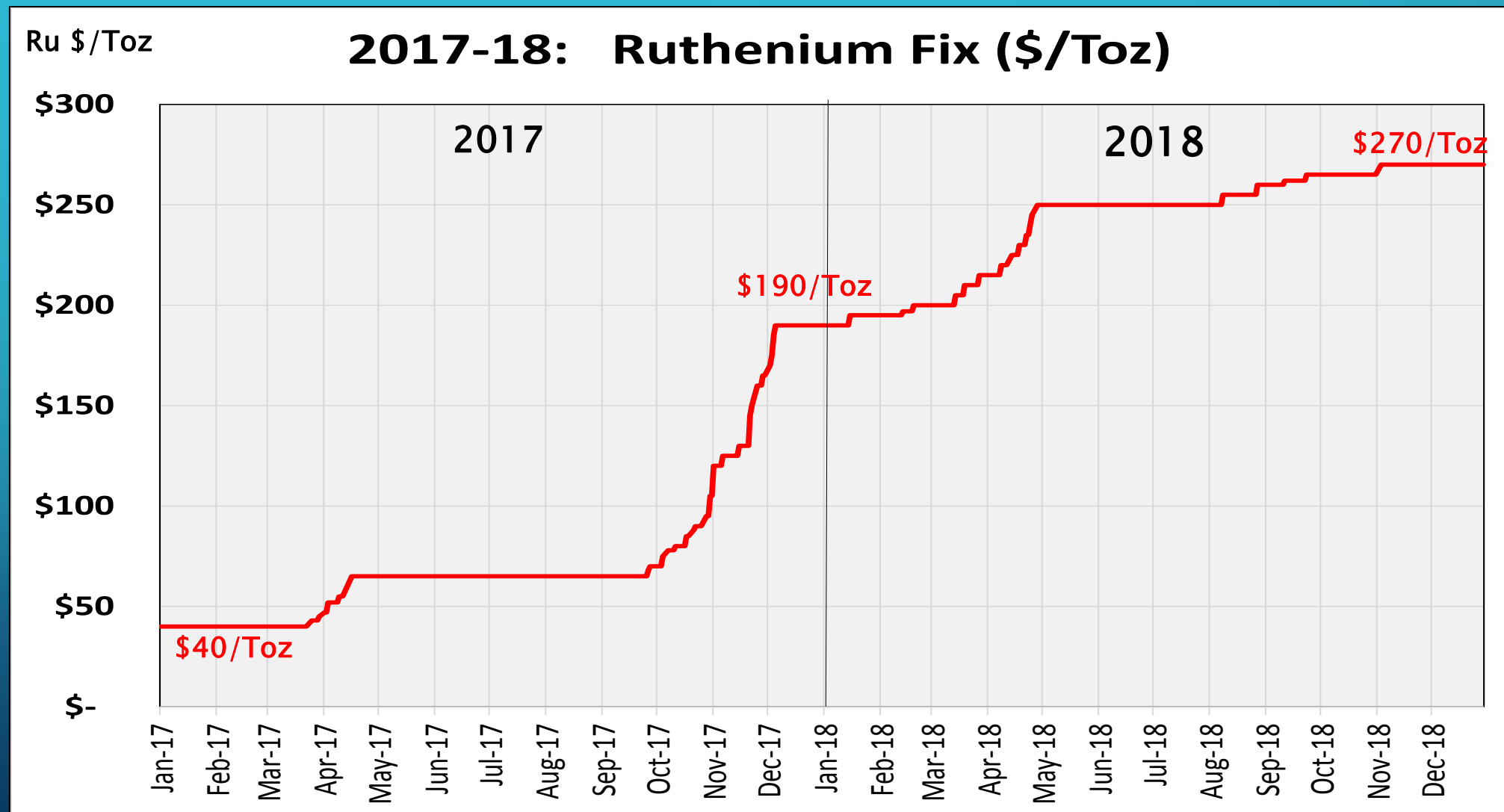


# Precious Metals 2017-18 Fix Index: 2-Year Trend



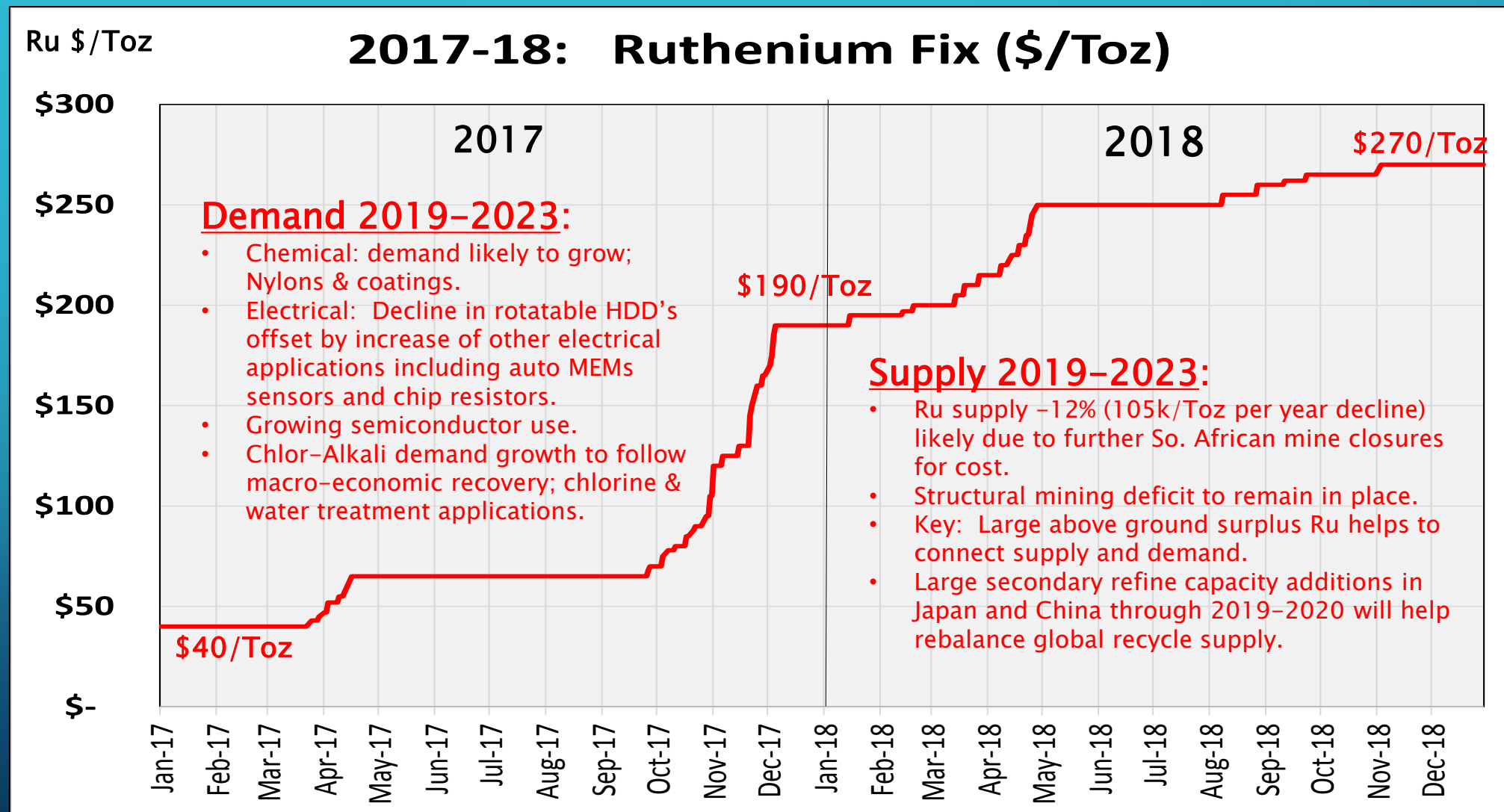
# RUTHENIUM +575%: <1M TOZ YEAR MINED

CONNECTING DEMAND USING PREVIOUS YEARS SURPLUS, & SHIFTING SECONDARY REFINING CAPACITY



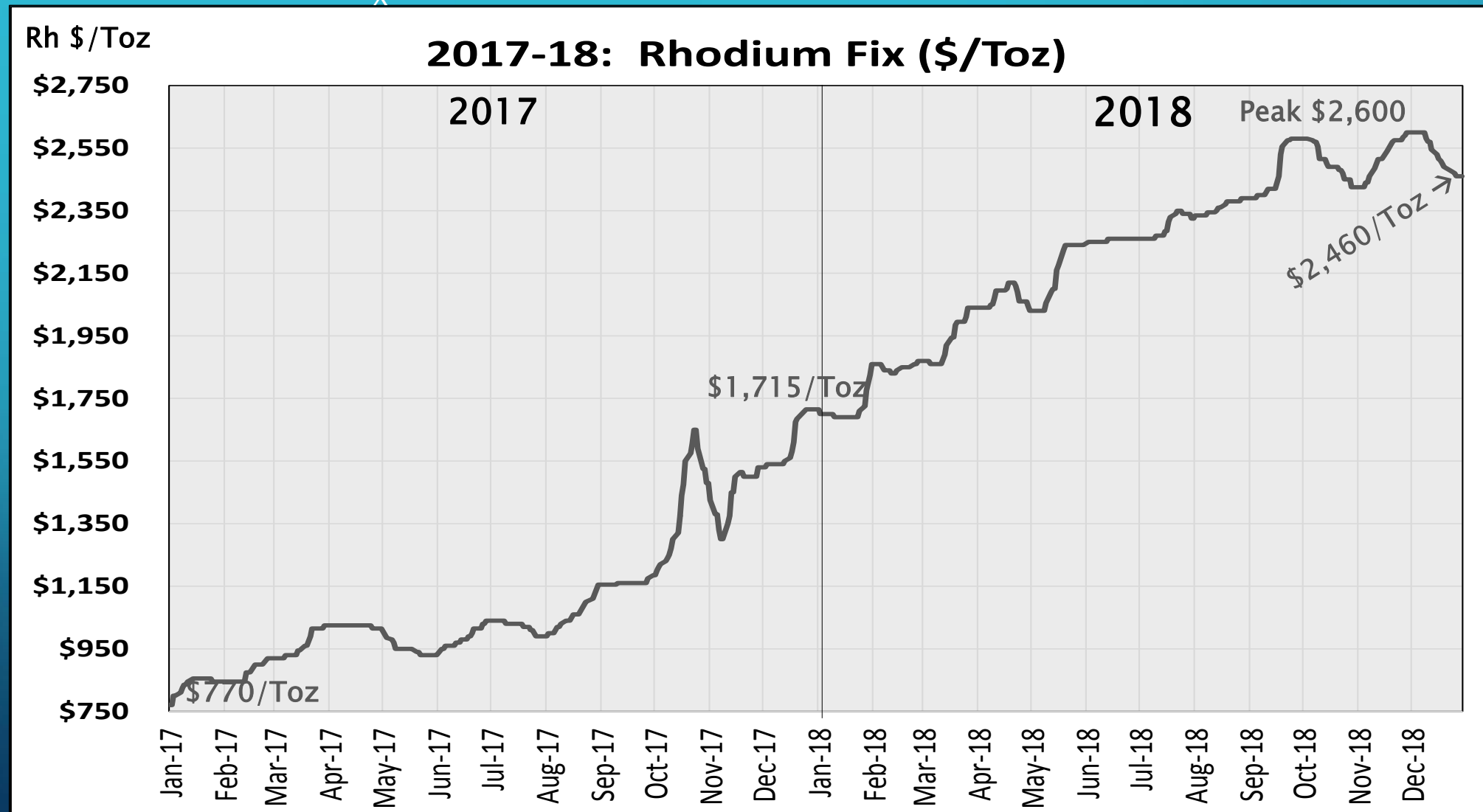
# RUTHENIUM +575%: <1M TOZ YEAR MINED

CONNECTING DEMAND USING PREVIOUS YEARS SURPLUS, & SHIFTING SECONDARY REFINERY CAPACITY



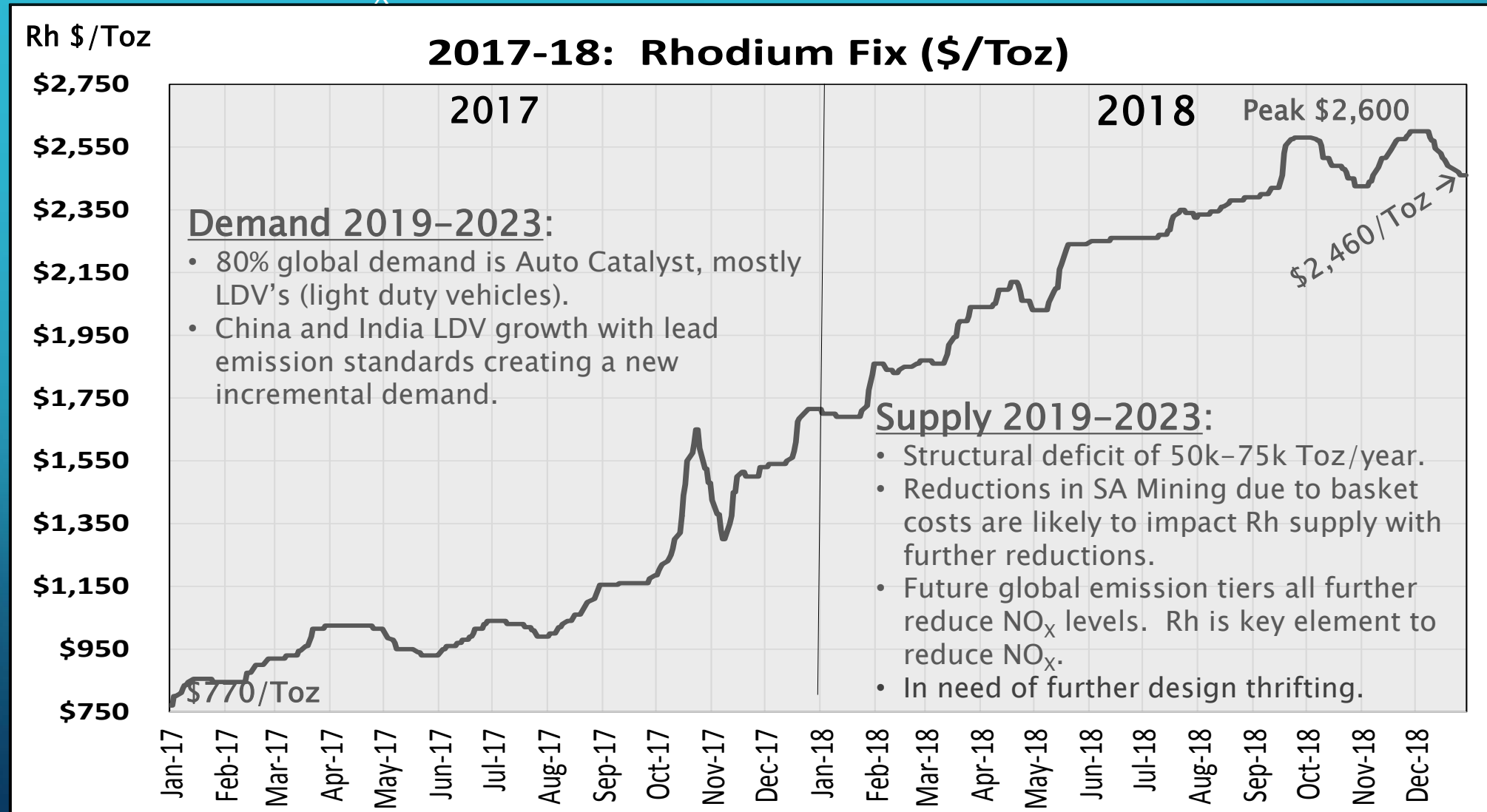
# RHODIUM +220%: ~960K TOZ YEAR MINED

~30 METRIC TONS MINED. DEMAND IS DOMINATED BY ONE APPLICATION,  
AUTO CATALYST: NO<sub>x</sub> EMISSION CONTROL. NO EASY DESIGN WORK AROUND.



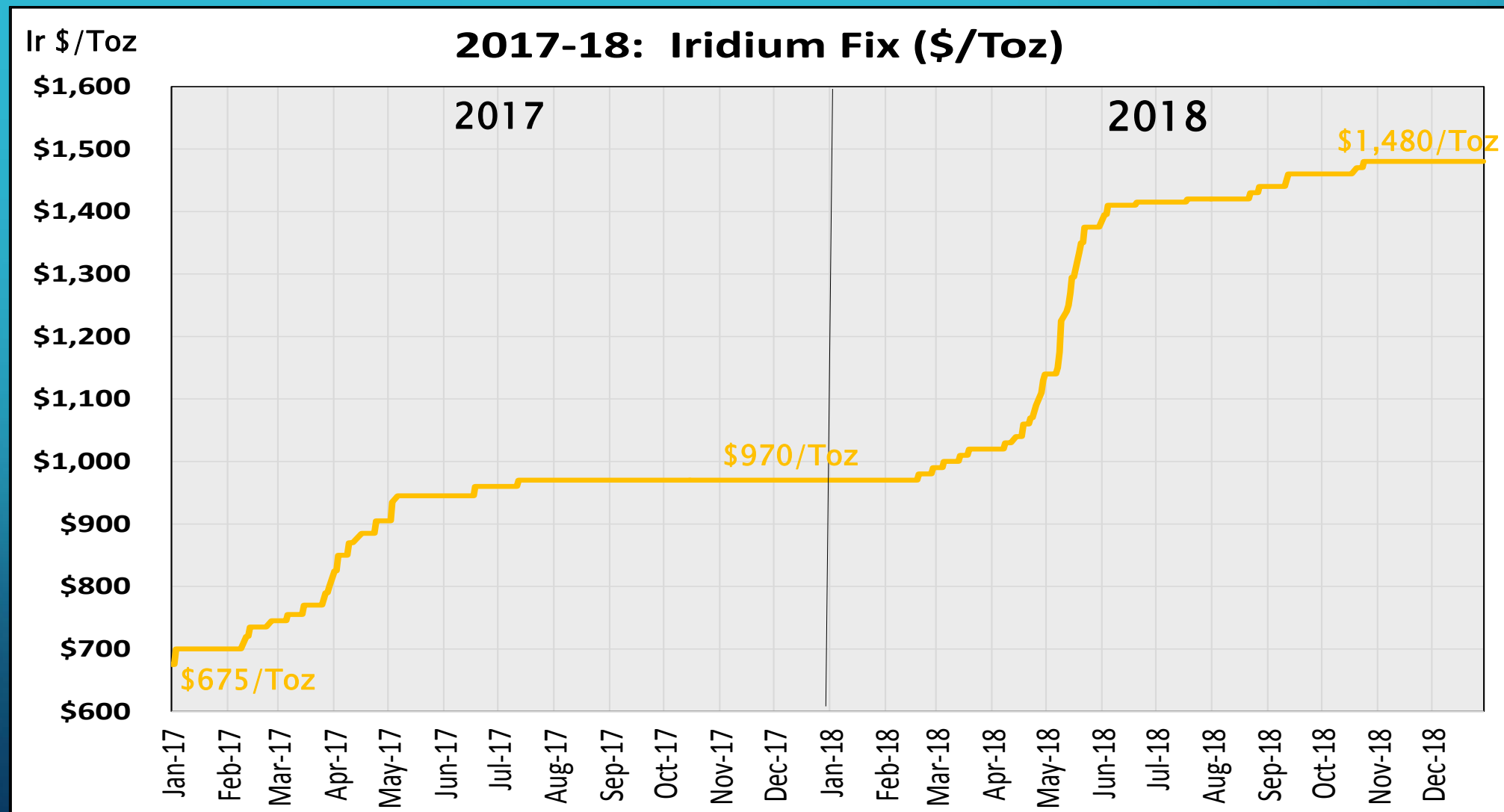
# RHODIUM +220%: ~960K TOZ YEAR MINED

~30 METRIC TONS MINED. DEMAND IS DOMINATED BY ONE APPLICATION, AUTO CATALYST: NO<sub>x</sub> EMISSION CONTROL. NO EASY DESIGN WORK AROUND.



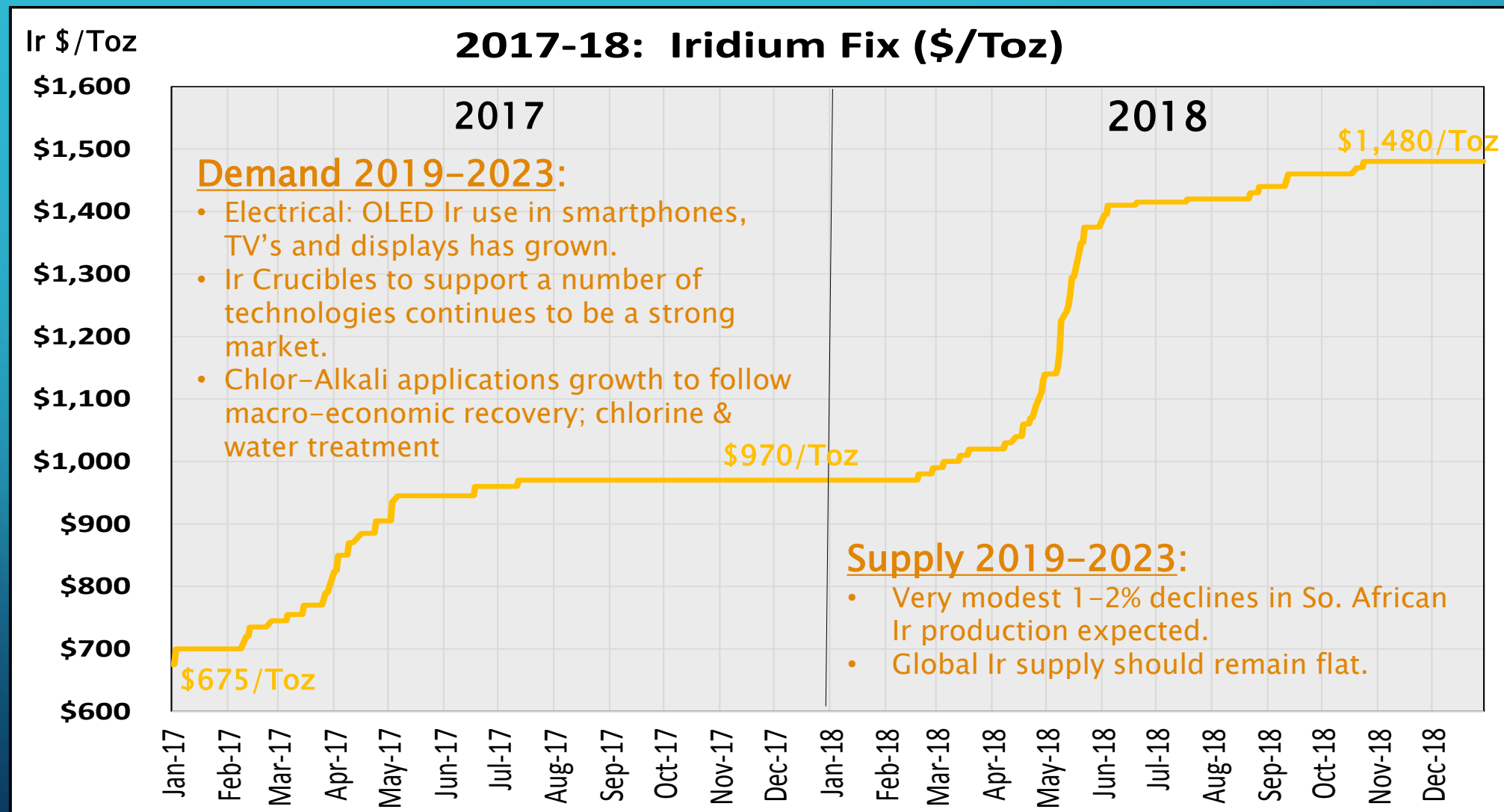
# IRIDIUM +119%: <400K TOZ YEAR MINED

INDUSTRIAL USES ARE CLIMBING AGAINST A STEADY BUT SMALL SUPPLY



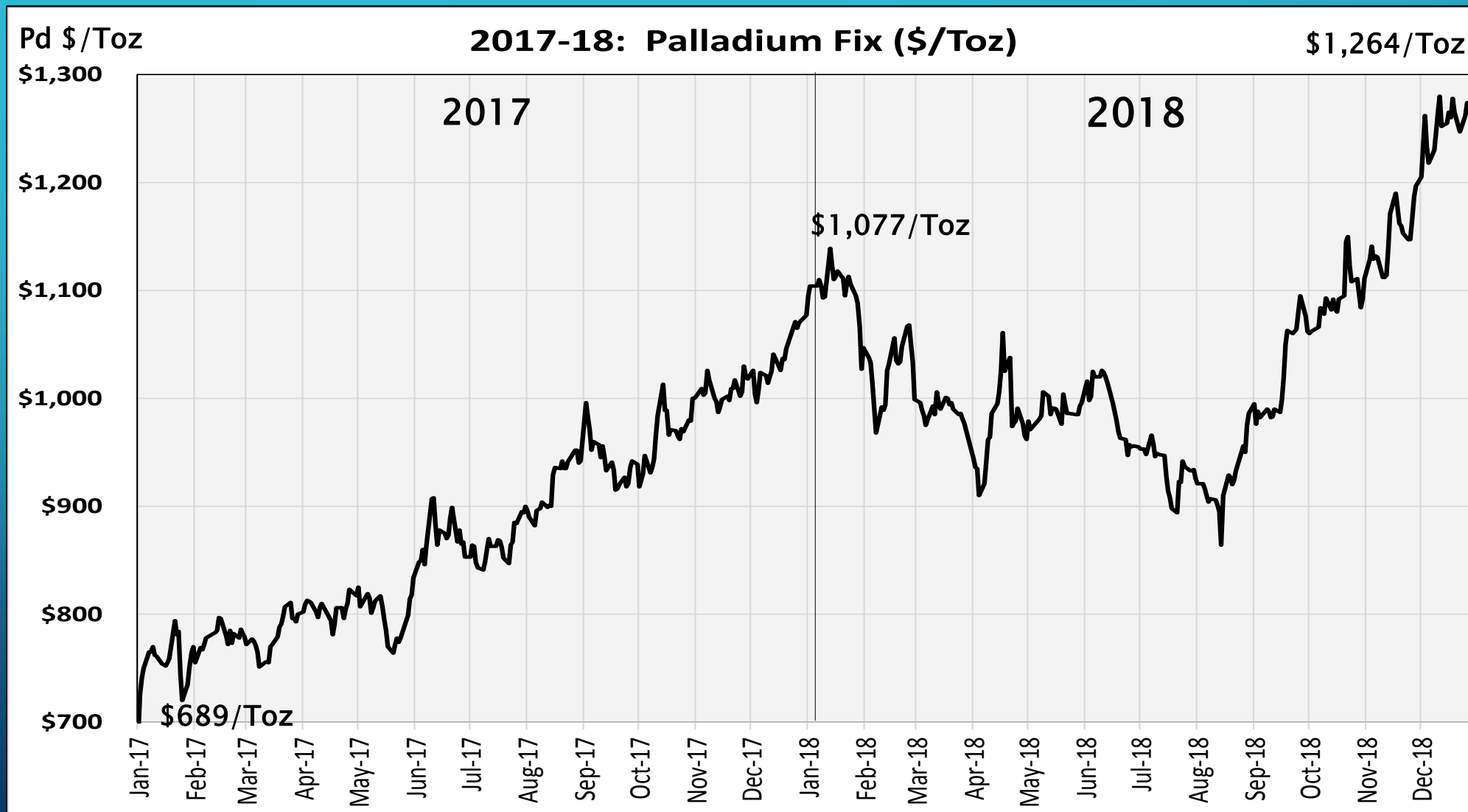
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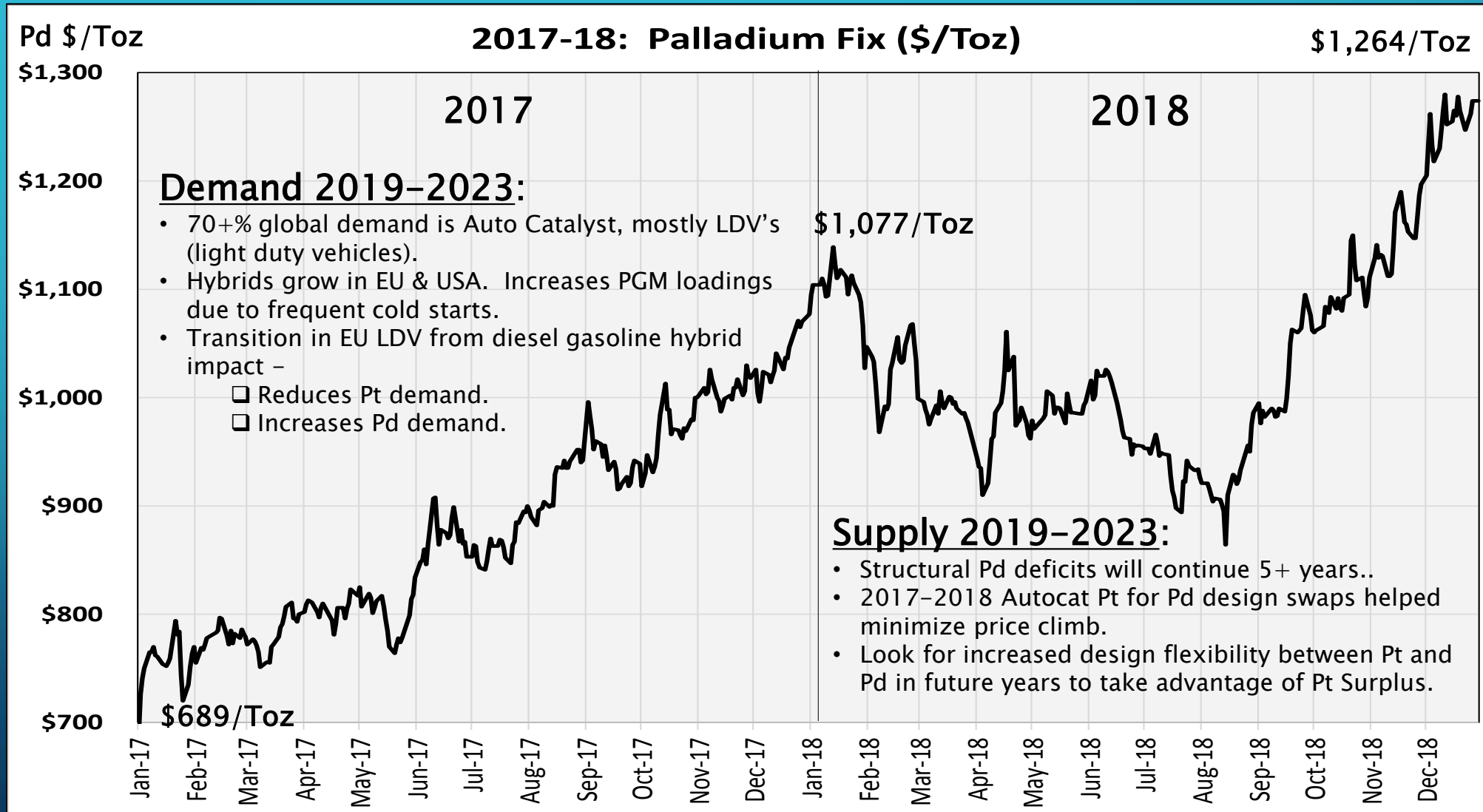
# PALLADIUM +84%:

STRUCTURAL DEFICITS CONTINUE. 70+% OF DEMAND IS FOR AUTO CATALYST. HYBRID LOADINGS SLIGHTER HIGHER THAN CONVENTIONAL ICE ENGINE DUE TO FREQ. COLD START



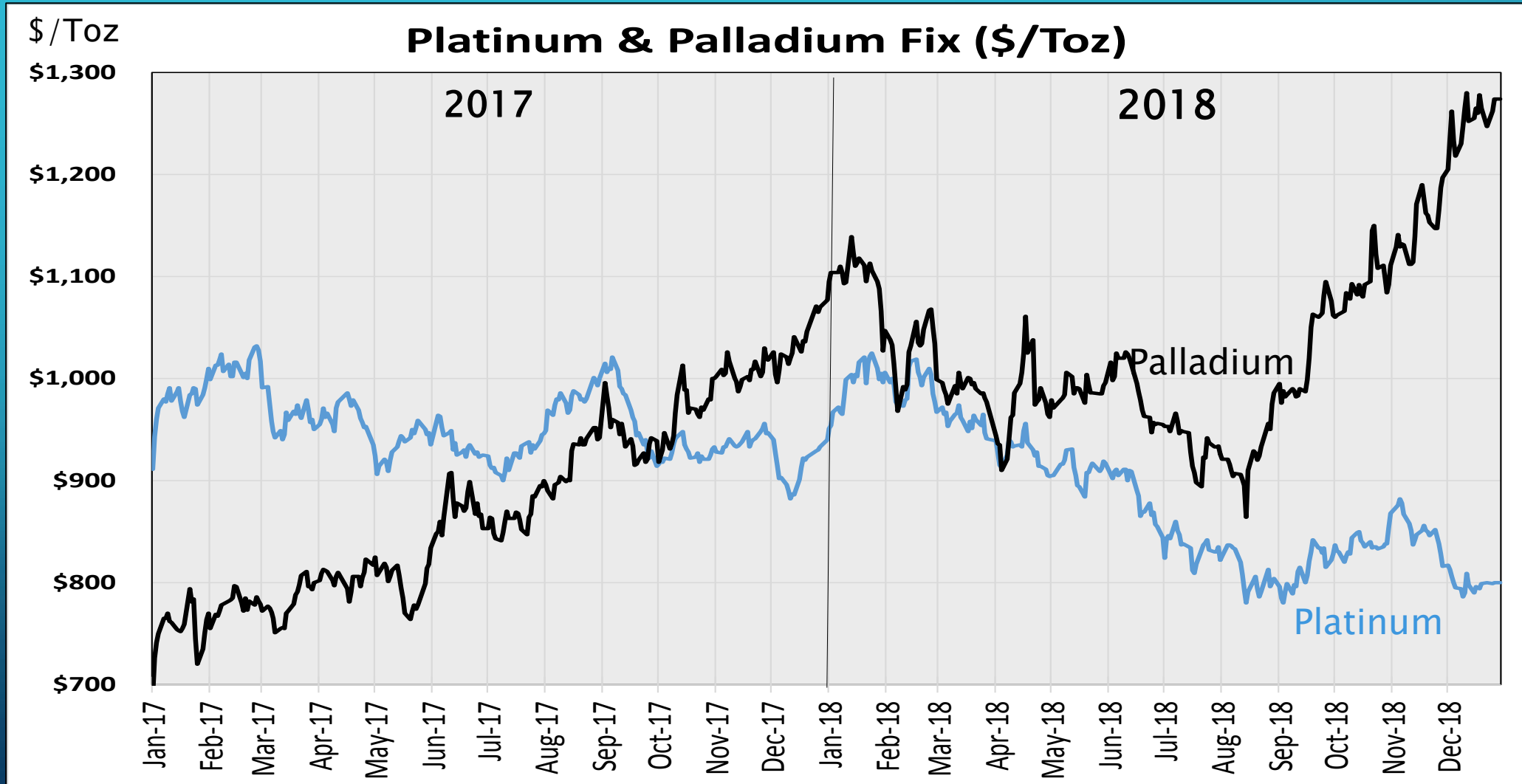
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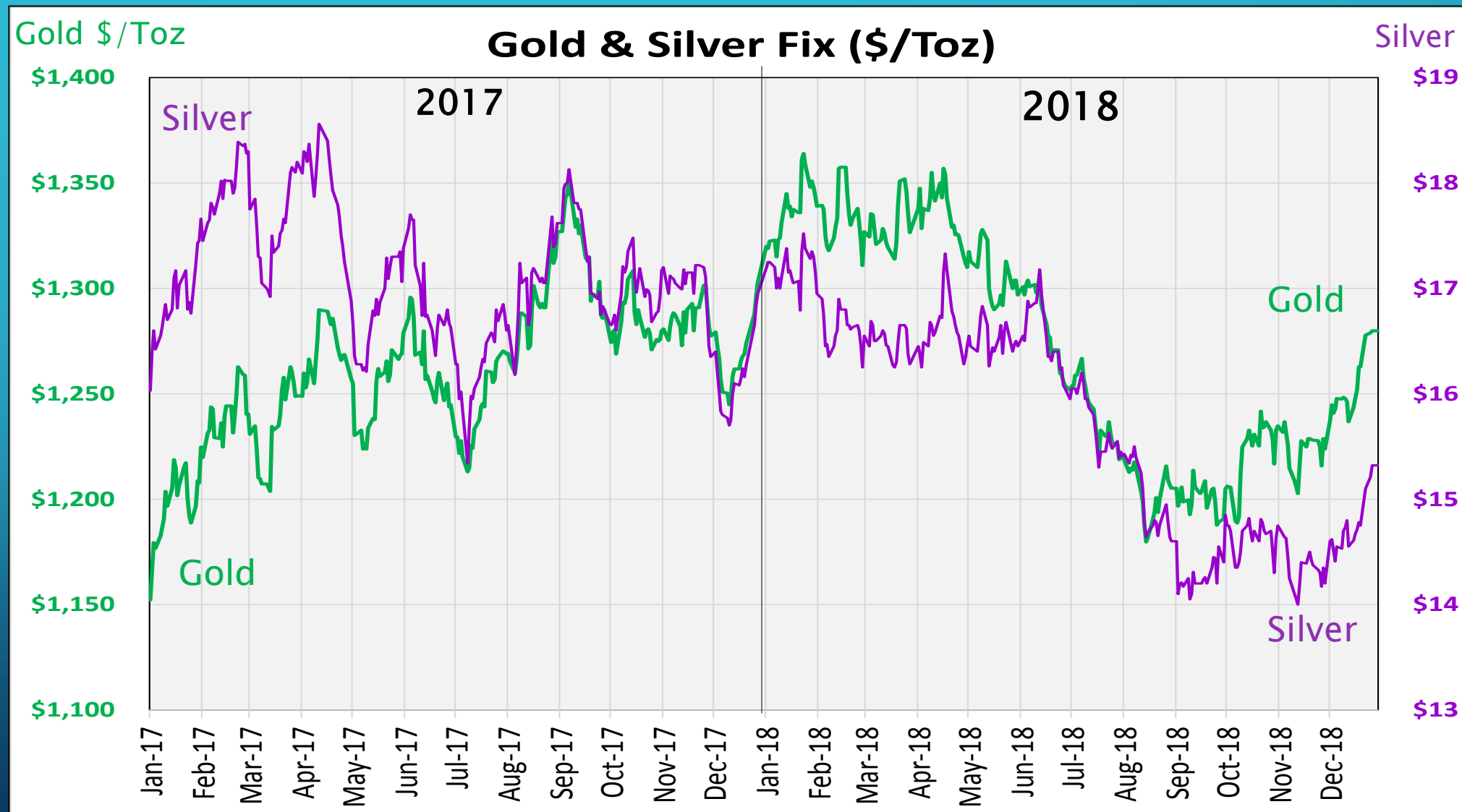
# THE PLATINUM & PALLADIUM FLIP-FLOP

Globally 36% PT and 75% PD USED IN AUTO CATALYST; AND THEY CAN BE DESIGN SWAPPED AND STILL WORK, BUT NOTICE THE RECENT PALLIDIUM SEPARATION



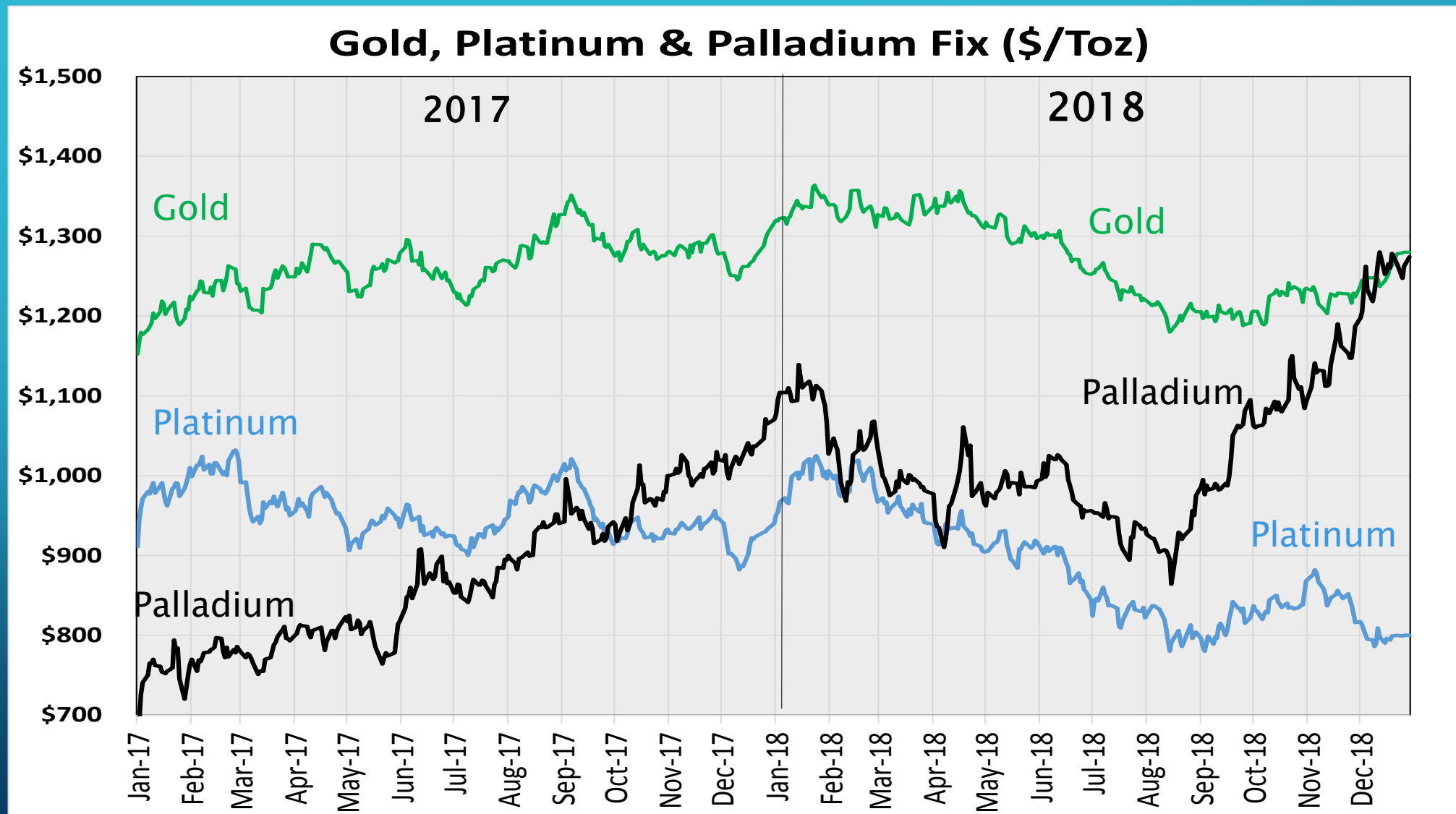
# THE GOLD & SILVER RATIO

THE GOLD/SILVER RATIO NEAR ALL TIME HIGHS, BUT STEADY PAST 2-YEARS.



# GOLD VS. PLATINUM & PALLADIUM

THE GOLD/SILVER RATIO NEAR ALL TIME HIGHS, BUT STEADY PAST 2-YEARS.



# GOLD VS. PLATINUM & PALLADIUM

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