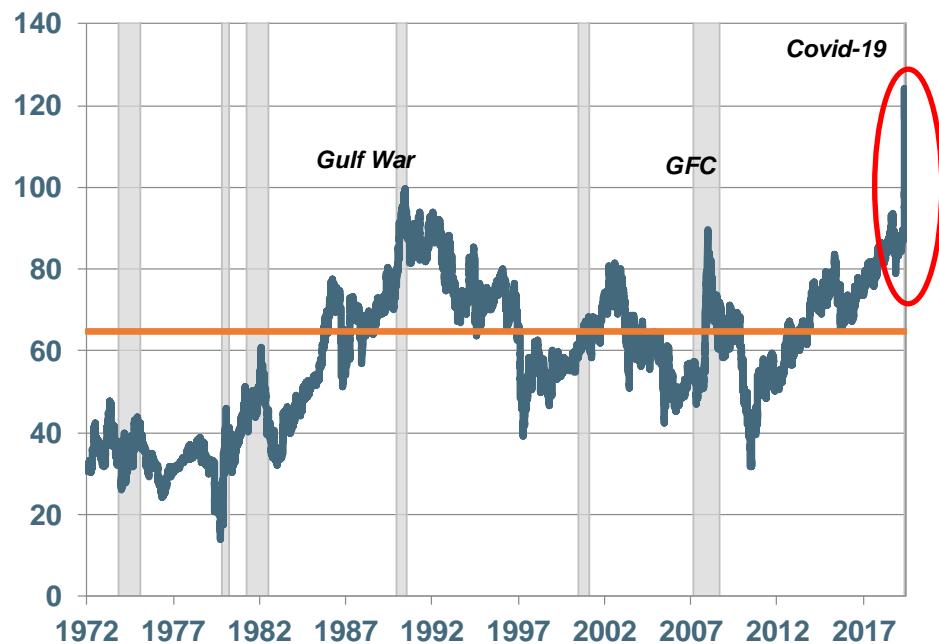


The Gold to Silver Ratio

The gold to silver ratio represents the number of ounces required to buy one ounce of gold, calculated by dividing the price of a gold ounce by the price of a silver ounce. This ratio tends to rally during periods of market crisis, disruption and instability and peaks generally during recessionary periods. Traders will monitor this ratio for spread trading opportunities, by entering into simultaneous positions that include buying at spot or a futures contract in one metal and selling at spot or a futures contract in the other metal. Under the premise that both gold and silver prices should generally move with some level of coordination, “extreme high or low” levels of the ratio, may signal opportunities to buy one metal and short the other.

As shown in Figure 1, the gold to silver ratio demonstrates significant periods of trending, thereby allowing traders to take a directional view and thus implement strategies on these. The ratio spiked in the early 1980s (as a result of rapid increases in interest rates by the U.S. Fed in conjunction with Russia's invasion of Afghanistan and the Iranian hostage crisis). The ratio also peaked in the early 1990s (towards the end of the 1st Gulf War) as well as early in Global Financial Crisis in 2008. Under the Covid-19 pandemic, the ratio just recently climbed to its all-time high of nearly 125, inferring it takes nearly 125 silver ounces to buy a single ounce of gold.

Figure 1: Gold to Silver Ratio



Source: Tom Brady and Murenbeek (Shaded areas correspond to NBER U.S. recessions).

This article explores the relationship of gold and silver prices in the attempt to further understand trends with the gold to silver ratio.

Gold and Silver Prices

Figure 2 displays gold and silver prices from 1972 onward. As shown, these prices have gone through periods of high correlation including in the 1970s and early 1980s due to the aforementioned macroeconomic and geopolitical events. Gold and silver were again highly correlated during the “Metals Super Cycle” (2002 – 2011) and its downside aftermath (2012 – 2016), where prices (as well as for most non-precious metals) climbed significantly due primarily

to demand in China and subsequently declined after the Global Financial Crisis. Importantly, correlations between gold and silver prices have also broken down. From 1996 through 2001, the correlation sank to 22% as gold prices were under significant pressure as its investment thesis was questioned resulting in many central banks selling their reserves. At the same time, silver prices experienced periods of significant investor interest. In 1997, Warren Buffet acquired over 130M ounces and prices climbed 50%. From 2017 onward, the correlation has again broken down with gold prices climbing nearly 30%, with silver prices declining almost 15% (and thus the recent spike in the gold to silver ratio).

Figure 2: Gold and Silver Prices

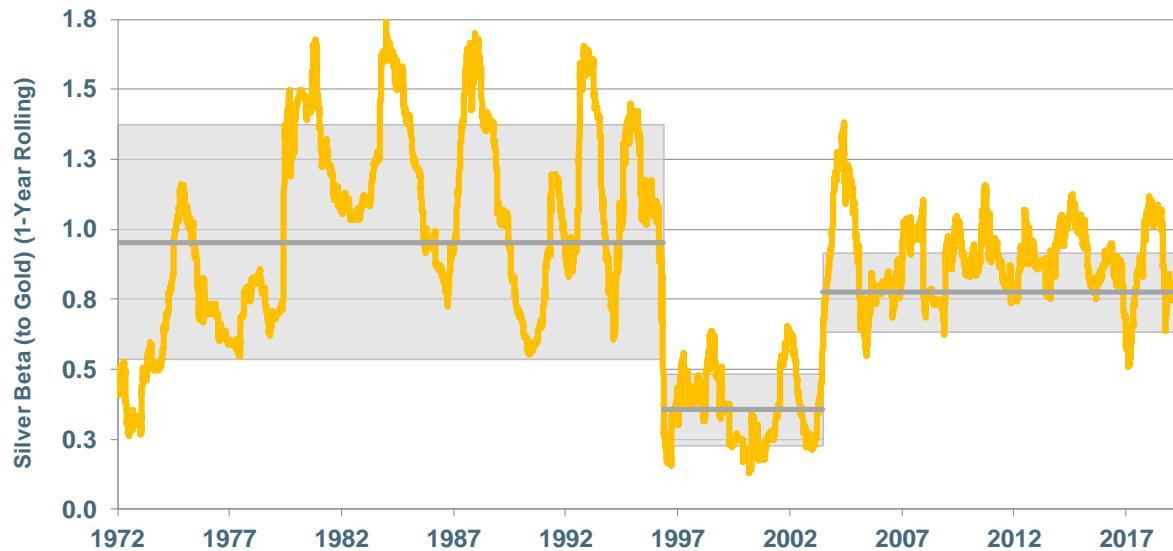


Source: Tom Brady and Murenbeed.

Silver betas (measuring price sensitivities)

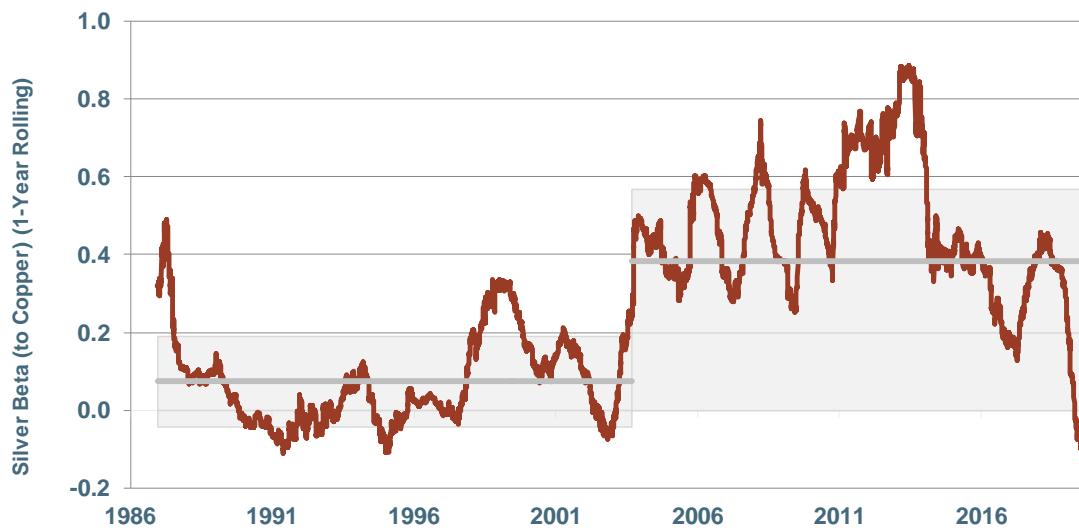
Figure 3 displays the silver to gold price beta (or how sensitive the silver price is to changes in gold prices¹). Under this calculation, the silver (gold) beta measures the volatility of silver prices relative to gold. A beta equal to 1.0 indicates silver prices are strongly correlated with gold and have similar volatility. When this beta is greater than 1.0, the volatility of silver is higher than gold and less than that of gold when the beta is less than 1.0. As shown on Figure 3, the silver (gold) beta appears to have migrated through three regimes: from 1972 until 1995 where the beta averaged slightly under 1.0. From the mid-1990s through the early 2000s, silver's sensitivity to changes in gold price was significantly lower, with the beta averaging ~0.35. Since the early 2000s, this beta has increased to average 0.8. To summarize, more recent silver prices appear to be less sensitive to moves in gold prices than during the 1970s through mid-1990s, but more sensitive than during the late 1990s.

¹ Specifically, the silver gold beta is calculated as the covariance between gold and silver prices divided by the variance of gold prices

Figure 3: Silver (to Gold Price) Beta


Source: Tom Brady and Murenbeeld (1 year trailing beta (based on daily price changes)). Shaded areas are 95% confidence intervals.

As discussed in the next section, industrial uses for silver are significantly higher than for gold and thus more aligned with overall economic cycles. To measure silver's sensitivity to economic activity, a silver (copper) beta is calculated (using copper prices as a proxy for the economy) and shown in Figure 4. From the mid-1980s through the 1990s, silver's sensitivity to moves in copper prices is low, with this beta averaging below 0.10 (where 0.0 implies zero correlation). Since the turn of the millennia, the silver (copper) beta is higher, averaging closer to 0.40. Note, however, with overlapping confidence intervals between the two displayed regimes, we cannot conclude these findings are statistically significant, however it is an interesting trend with silver price moves more related to those with copper price changes (as opposed to apparent lower price relations with gold shown in the previous figure).

Figure 4 – Silver (to Copper Price) Beta


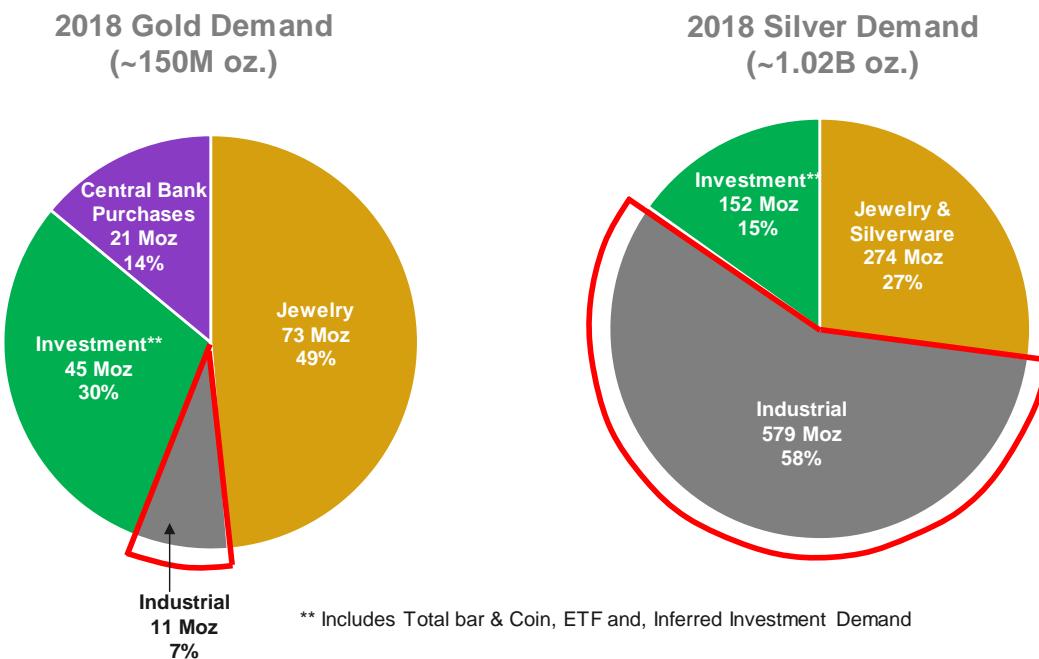
Source: Tom Brady and Murenbeeld (1 year trailing beta (based on daily price changes)). Shaded areas are 95% confidence intervals.

Demand breakdown

Figure 5 provides a demand breakdown from 2018 for both gold and silver. Silver has many industrial applications including electrical, photovoltaic and others, which collectively accounted for nearly 60% of total demand (Figure 5). By comparison, industrial demand only accounted for 7% of total demand for gold in 2018. As such, U.S. and global economic growth trends have a much larger impact on silver than gold. Investment demand for silver represented 15% of demand, whereas for gold 30% of total demand is for investment, not including demand from central banks (another nearly 15%).

This relationship between industrial and investment demand and gold and silver can be viewed under the recent pandemic. Since late February, when the virus began to significantly impact global financial markets, silver prices have declined by over 20%, with gold only declining ~1% (thus driving the gold to silver ratio to record territory).

Figure 5 – 2018 Gold and Silver Demand Breakdown



Source: Tom Brady and Murenbeeld, World Gold Council and Silver Institute

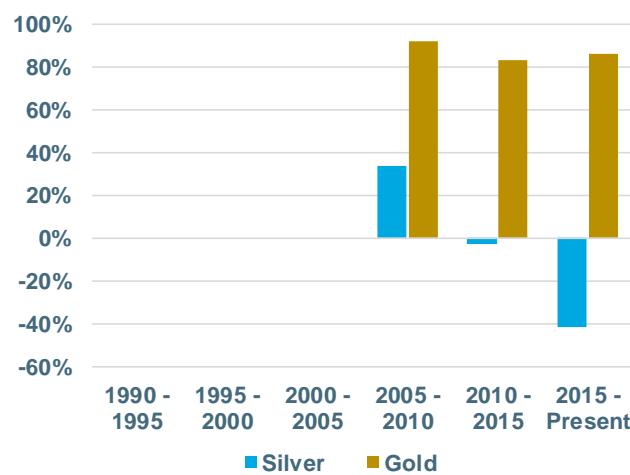
Market Investment Demand

To further understand the relationship gold and silver and the financial investment markets, correlations between prices and respective ETF holdings and speculative positions have been calculated. Figure 6 summarizes correlations with respective global ETF holdings. As shown, since the inception of these funds (in 2004 for gold and 2006 for silver), daily gold price moves are very highly correlated with changes in gold ETF holdings. By comparison, silver prices are much less correlated with holding changes in silver ETFs (and have been negatively correlated over the last 5 years).

Similarly, Figure 7 displays correlations between gold and silver prices with respective speculative net-long futures positions on the Comex. As shown, in 1990s silver prices appear to be more sensitive to weekly changes in speculative positions. This has reversed since 2000 with both metals experiencing periods of high and lower correlations with respective speculative interests.

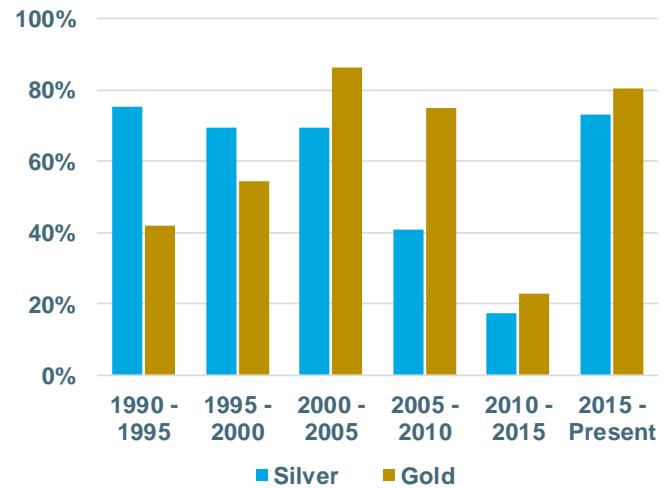
To summarize, compared with silver, gold prices are significantly more correlated with investor preferences toward respective ETFs and slightly more sensitive to speculative interest.

Figure 6 – Correlation with ETF Holdings



Source: Tom Brady and Murenbeeld

Figure 7 – Correlation with Spec Positions²



Since the onset of Covid-19, gold ETF holdings have increased by over 3M ounces (or by 4%) while silver ETF holdings have liquidated 4M ounces (or ~22%). On the Comex, net-long speculative futures positions have declined for both metals: 6.4M ounces for gold (or down 17%) and 5.5M ounces (down 55%) for silver.

Overall, silver with its strong tie with overall global economic activity and gold's sensitivity to investor preference for safe-havens have driven the gold to silver ratio to record levels. At this point, I am expecting the current global recession to persist well into the third quarter of this year, followed by a slow recovery. As such, I am anticipating the ratio to persist (in the 100 range) over the coming weeks.

Tom Brady, Ph.D.

Tom is a mineral and commodity sector economist and is currently the Executive Director of the J.P. Morgan Center for Commodities at the University of Colorado Denver Business School and founder of Brady Commodity Advisors, LLC. Most recently Tom was the Chief Economist at Newmont Mining Corporation responsible for generating key commodity price, foreign exchange and other financial assumptions used throughout the company. Previously at Newmont, Tom led the Strategic Planning function that developed and implemented portfolio modeling analytics

² These positions are net-speculative long positions (long – short) futures contracts on the Comex and include positions from both commercial and non-reportable (using weekly data).



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and also held positions in Investor Relations, Treasury and Corporate Development. Prior to rejoining Newmont. Tom was a Senior Manager at Risk Capital Management, a consultancy that advised energy and natural resource companies on financial risk, valuation and commodity hedging.

Tom holds a Ph.D. in Mineral Economics with research emphases in commodity markets from the Colorado School of Mines. In addition, Tom holds a Master's degree in Mathematics, also from the Colorado School of Mines.

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