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THE SILVER INSTITUTE

Market Trend Report

Price Sensitivity of Above-Ground Silver Stocks



February 2025

Conducted By: Precious Metals Insights

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1. Introduction and Summary

Silver is a rare, precious metal with a high intrinsic value. This explains its historical role as money and its continuing relevance as an investment asset. Scarcity, coupled with the metal's singular brightness has also given it a distinct place among materials used for jewelry and the decorative arts. And, since the industrial age, silver has become increasingly important as a commodity, its special characteristics making it essential for many industrial applications and, until relatively recently, indispensable for photography.

The scarcity and high value of silver means there has always been a powerful incentive to safekeep and hoard the metal in its purer and weightier forms, such as coins, bars, silverware and, to a lesser extent, jewelry. For other fabricated products, the silver contained may also mean that they have some inherent value related to the precious metal content. In other cases, the amount of silver in fabricated products may be economically of little or zero relevance. When it comes to these items the silver consumed can be considered "lost." The practical division between "lost" and potentially "available" silver in fabricated products will usually be determined by the prevailing silver price, although government legislation and recycling technology are also factors to consider in making such calculations. Of course, a large amount of the silver produced and consumed over the centuries truly has been "lost" due to abrasion, particularly for coins, or because it has been returned to the earth as silver-containing waste products and solutions, in the latter case particularly through spent photographic fixer solutions that in the past were often discarded rather than recycled. Thus, historical mine production of silver, which through to 2023 has totalled some 57 billion ounces (Boz), is a poor indicator of the size of the true Above-Ground silver stock. This is an interesting contrast with gold, where the vast majority of its 212,582 tons of historical mine production is technically available to the market, principally as bullion and jewelry.

Although a large part of the silver mined has been "lost" or is practically irrecoverable, this still leaves a substantial Above-Ground stock of silver, especially, when compared to nearly all other commodities. While it is beyond the scope of this Report to come up with definitive figures for the size of Above-Ground silver stocks, for the purpose of statistical analysis it is necessary to have some working estimates. These have been based upon estimated legacy stocks of bullion and fabricated products prior to 1960, *World Silver Survey* data from 1960-2023 and assumptions for the amount of both "lost" and practically irrecoverable silver (see next chapter).

While estimates for the size of bullion and fabricated product stocks are useful, they are arguably less important to the objectives of this Report than the much harder data on flows to and from Above-Ground stocks. Here the annual statistics from the *World Silver Survey* provide good summary data on the recycling of fabricated products and implied changes in stocks of the same (a function of fabrication *less* scrap). These implied stock figures then need to be adjusted for "lost" and practically irrecoverable silver. This can be done by applying a different discount to each category of demand.

World Silver Survey data on flows in and out of bullion stocks is available and can also be broken down into government and private sector bullion stocks. The Report makes no adjustment for "lost" bullion from 1960-2023 on the assumption that the percentage should be tiny. (It should be noted that the transformation of coin into bullion bar – substantial in the past – has no impact *per se* on the overall size of bullion stocks.)

The Report assesses the relationship between annual and multi-year changes in the level of Above-Ground stocks of bullion and fabricated products and silver prices. For longer run data sets real silver prices in 2023 dollars are used, with these real prices generated basis the US CPI index. For shorter run data sets, nominal silver prices have also been used.

The key conclusions from this study this Report are summarized below:

- There is no correlation between the overall level of Above-Ground stocks and the silver price.
- Annual changes in total Above-Ground stocks and the silver price are likewise uncorrelated.
- The vast majority of Above-Ground stocks are “immobile,” with only small net additions to or subtractions from stocks on an annual basis.
- Movements in bullion stocks have an important impact on the silver price and *vice versa*.
- Increases in bullion stocks are often positively correlated with the price, as investment demand grows when silver prices increase and this stimulates still higher prices.
- At times, increases in bullion stocks are negatively correlated with the price, as either bargain hunters purchase silver on dips or “stale longs” exit their positions on a declining price trend.
- Multi-year growth in bullion stocks have sometimes driven prices higher and at other times supported prices and prevented more substantial price corrections.
- Multi-year drawdowns in bullion stocks have tended to occur in bear markets for silver and have exacerbated these. However, these drawdowns have typically set silver up for stronger rallies as investors’ have subsequently rebuilt their bullion holdings.
- Government stock sales were a significant factor in suppressing prices in the 1960s and somewhat important in the 1993-2003 period in delaying a rebound in silver.
- Private sector bullion stocks increased very substantially over 2009-2021 and they may represent a threat to prices in future if sentiment were to change and silver prices were to weaken.
- Above-Ground stocks of fabricated products are less price sensitive than those of bullion. Only certain subsets of silver fabrication demand show a great deal of sensitivity to the price.
- The level of scrap recycling, likewise, is only in part related to the level or change in silver prices. Product life cycle considerations and environmental legislation are also important drivers.
- Typically, large changes in the price and very high or low price levels are required to bring about material increases or decreases in scrap recycling.
- Substantial changes in the level of scrap recycling can have important second order effects on the silver price, falls in supply typically price-supportive and rises price-limiting.
- Growth in the Above-Ground stock of fabricated products was low from 1974-1984 due to very high real prices dampening demand and stimulating recycling, which on average accounted for a third of supply during that period.
- The stock of fabricated products has grown more rapidly since the mid-1980s due an increased volume of silver demand, a change in its composition and much reduced scrap recycling, its share of total supply falling to a fifth on average from 1985-2023.
- Since the mid-1980s, the levels of and changes in scrap recycling have been impacted more by changes in the composition of fabrication demand than the overall level of Above-Ground fabricated stocks or the level of or change in silver prices.

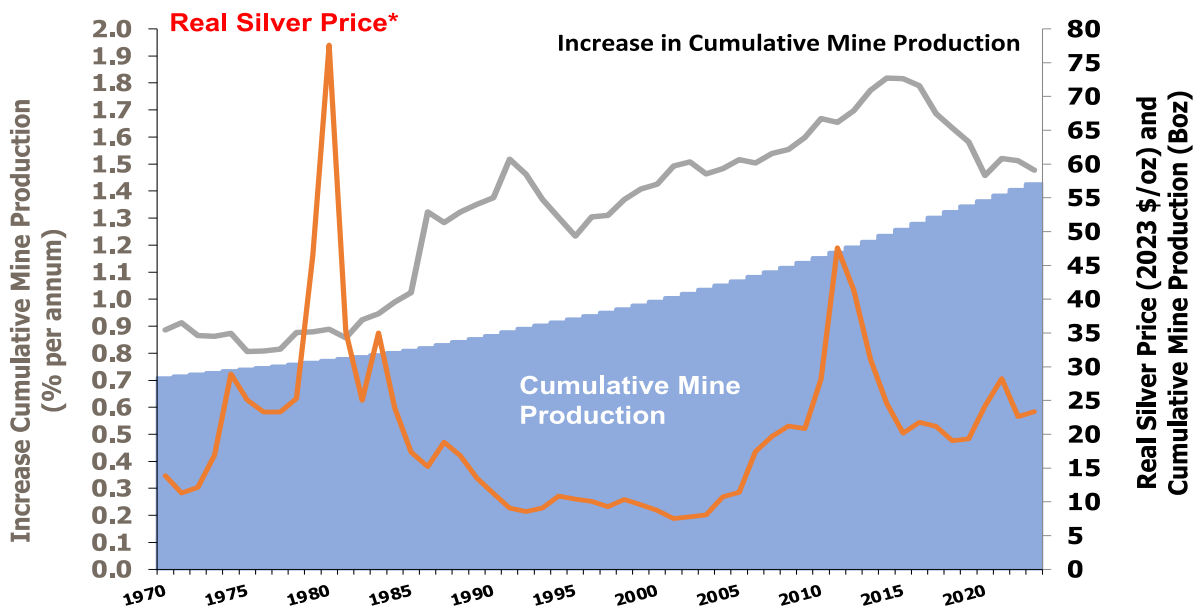
2. Above-Ground Silver Stocks

A logical starting point for an analysis of Above-Ground silver stocks is the amount of supply from the primary source of metal, namely global silver mine production. By 2023, cumulative historical production from mines had reached 57 Boz. However, as noted in Section 1 of this Report, this figure merely places a theoretical maximum on the size of the Above-Ground stock of silver. In reality, a substantial share is actually not available to the market even under the most generous of assumptions.

Firstly, a fair amount of this silver will have been lost to abrasion (i.e. coins and jewelry) or waste disposal (e.g. photographic fixer solutions, end-of-life consumer or industrial products) or because it has really been “consumed” (e.g. silver threads or edible silver in India). All this silver is truly “lost” and cannot be recovered no matter what the price incentives or legislative edicts.

Secondly, a still larger percentage of historical mine production, while theoretically recoverable is also in practice “unavailable.” This is silver that cannot be economically recovered due to price or other considerations. Recycling will be impractical because the silver is either too widely dispersed or the life-cycle of the product in which silver is incorporated is paramount. In either case the silver value is too low to warrant recycling. Most industrial products fall into this category, as does the majority of low-weight and high-markup silver jewelry. The silver contained is dispersed in very small quantities across millions of products whose ownership is also atomized.

Real Silver Price and Cumulative Mine Production

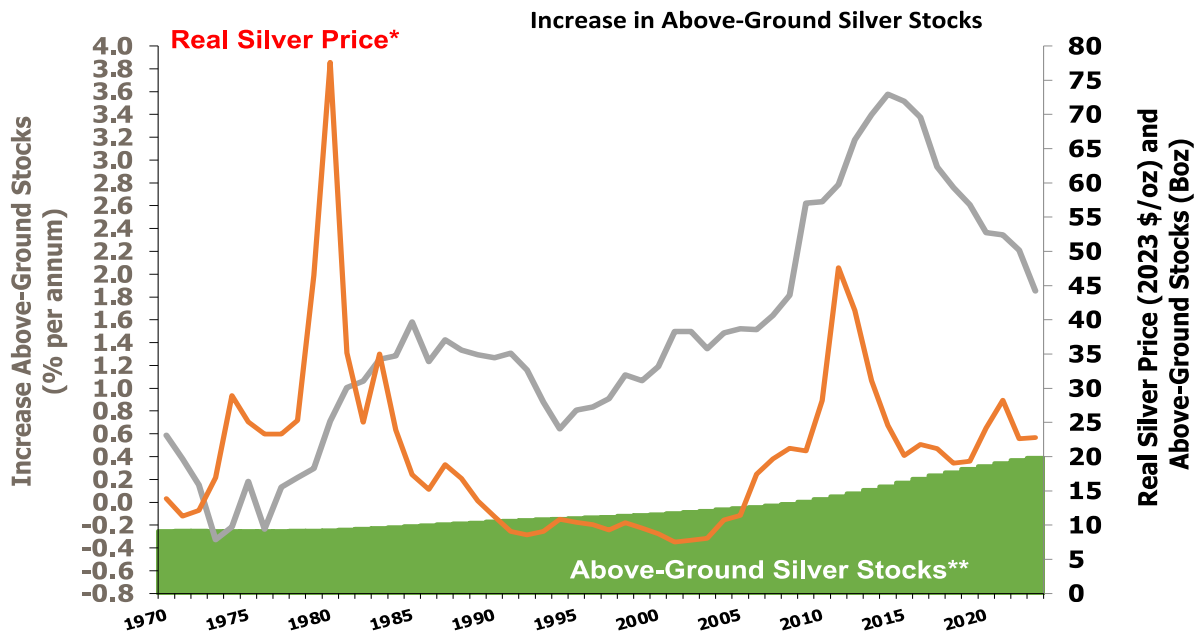


*Real price basis US CPI in 2023 US dollar terms
 Source: LBMA; US Bureau of Labor Statistics; The Silver Institute

Thirdly, the *World Silver Survey* data on supply/demand for the 1960-2023 period, and, specifically, that on supply from Above-Ground stocks supports the conclusion that the bulk of the 57 Boz of historical silver mine production through to 2023 has either been truly “lost” or is practically irrecoverable at almost any conceivable silver price. While the mobilization of Above-Ground stocks during periods of elevated real prices has been impressive at times, particularly in 1980, a much higher level of supply would have been expected had a high percentage of the to-date mine production been theoretically available to the market as either bullion or fabricated products.

The above considerations are critical when making assumptions as to how much of the silver mined over time could be considered “lost” or practically unavailable to the market, no matter what the price incentives. Of course, even a small shift in these assumptions will have a considerable impact on the size of Above-Ground stocks. Therefore, the estimates contained in this Report should be seen as points within a rather broad range of plausible figures.

Real Silver Price and Above-Ground Stocks



*Real price basis US CPI in 2023 US dollar terms; **Above-Ground Stocks of Bullion + Fabricated Products
 Source: LBMA; US Bureau of Labor Statistics; The Silver Institute; Precious Metals Insights

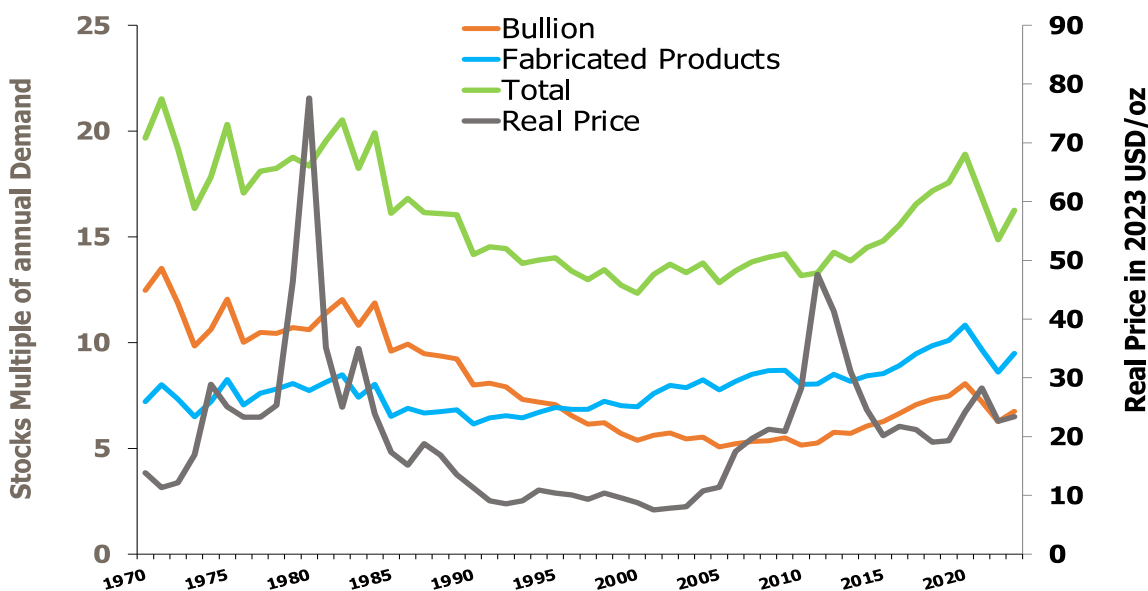
The starting point for the analysis has been to assume that as of 1959 Above-Ground silver stocks totalled 8.5 Boz, equivalent to a third of historical silver mine production at that date. This was composed of 6.0 Boz of bullion (much of it coins) and 2.5 Boz of fabricated products (the majority of which is silverware). The supply/demand data from 1960-2023 was used to construct a time series for bullion and fabricated product stocks based upon these starting points. No bullion stocks were assumed to have been “lost” over 1960-2023, as the percentage in reality lost through abrasion over this period is thought to have

been small. Much of the coin stock existing in 1959 and additions to the same in the 1960s would have subsequently been melted. The annual supply/demand data captures any of this silver that would have ended up as fabricated products. The balance would simply have been transformed into bar form, which has zero net impact on the overall level of bullion stocks.

For Above-Ground stocks of fabricated products, for the period 1960-89 the previous end-year level has been adjusted by the current year's net fabrication demand (i.e. fabrication *less* scrap), with the resulting figure lowered by a fixed percentage to account for "lost" or unavailable silver. From 1990-2023, more detailed data on global (not just Western World) fabrication demand has allowed for the "lost" or unavailable percentage to be derived from calculations for the individual components of fabrication demand.

Above-Ground stocks are a multiple of annual supply/demand for silver. According to the rough estimates produced for this Report, combined stocks of bullion and fabricated products totalled 19.3 Boz at end-2023. This compared to just under 1.2 Boz of silver demand that year, representing a multiple of over 16:1. This ratio has fluctuated over time, from a high of nearly 22:1 in 1970 to a low just over 12:1 in 2000. Curiously, real silver prices were low in both these years. It is easier to understand the high ratio-low price recorded in 1970, when high Above-Ground stocks, especially of bullion, weighed down on the price. In 2000, by contrast, silver had been in a multi-year bear market that had seen a substantial reduction in bullion holdings, good growth in fabrication demand and a noteworthy trend higher in scrap recycling. This resulted in the low ratio:low price recorded that year.

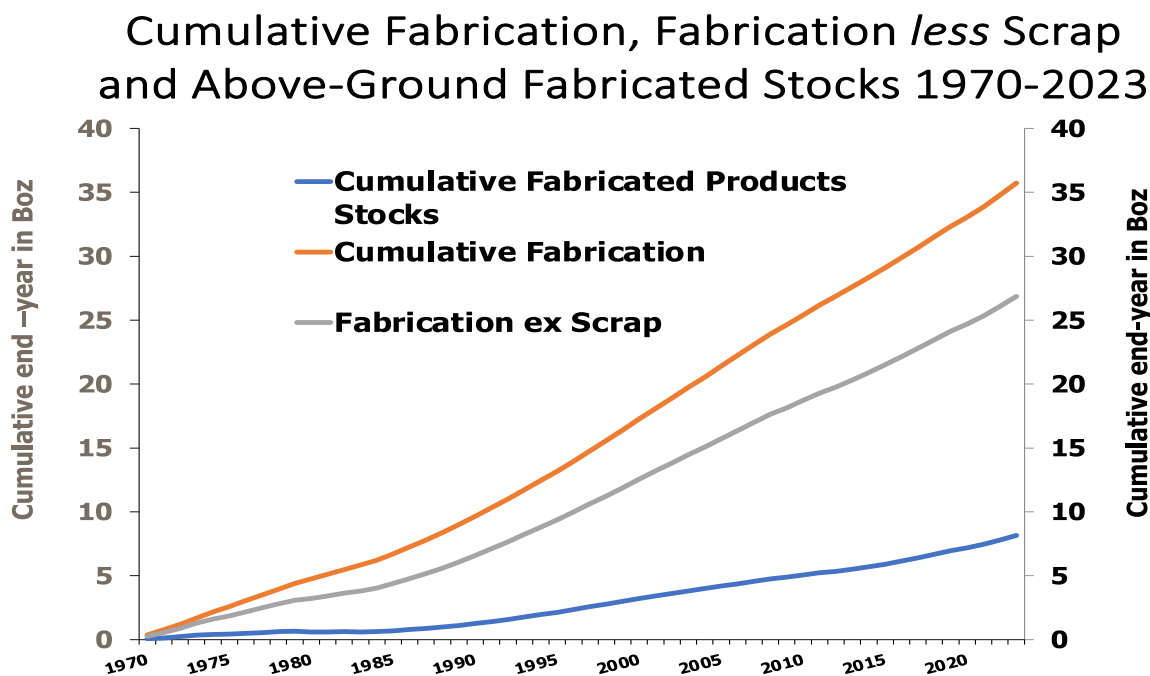
Above-Ground Stocks Multiple of Annual Demand and Real Price 1970-2023



Source: The Silver Institute; Precious Metals Insights

2.1 Fabricated Products

The Above-Ground stock of fabricated products is estimated to have reached 11.3 Boz at the end of 2023. This figure is equivalent to 12 times 2023 fabrication demand (excluding coins). While this may seem substantial, it is worth bearing in mind that from 1990-2023 alone, cumulative fabrication demand (excluding coins) amounted to 26.7 Boz. However, over the same period scrap recycling subtracted 6.0 Boz and a further 13.6 Boz was either in the form of products that are considered unavailable for recycling or “lost.” Therefore, the actual increase estimated for Above-Ground stocks of fabricated products over 1990-2023 is 7.1 Boz. Data for 1970-1989 is less precise and only covers the Western World. However, it is not thought that this changes very much the overall analysis for Above-Ground product stocks over that period. Combining the two data sets produces a similar set of results as those obtained for 1990-2023. From 1970-2023 cumulative gross fabrication totalled 35.7 Boz. Deducting around 8.9 Boz scrap results in cumulative fabrication net of scrap of 26.8 Boz. “Lost” silver in fabricated products over the period amounts to 18.6 Boz, leaving a net rise in fabricated product stocks of 8.2 Boz in 1970-2023.

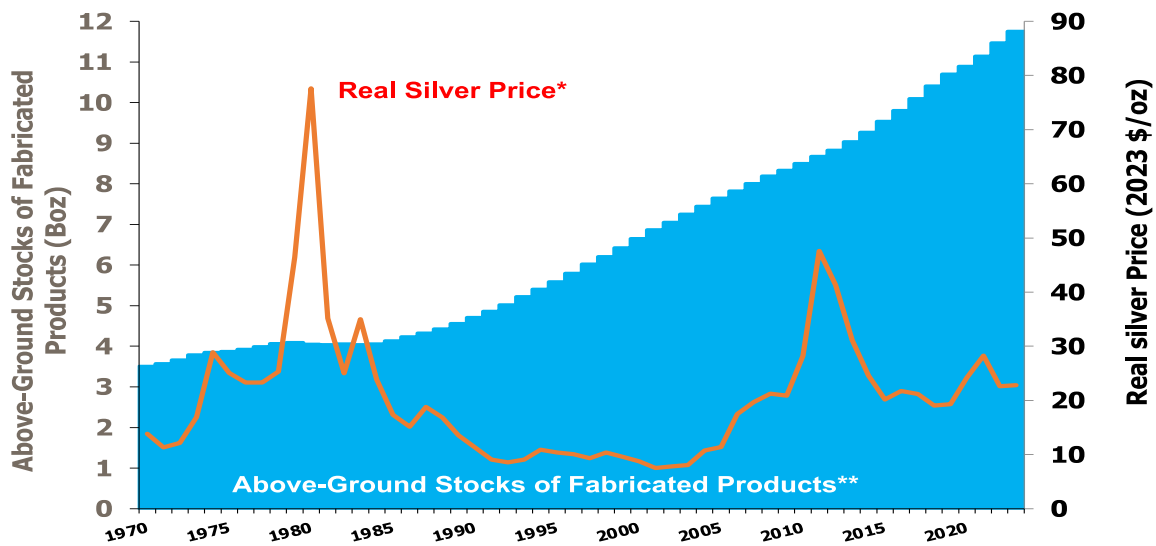


Source: The Silver Institute; Precious Metals Insights

For several reasons, the stock of fabricated products has increased rapidly since the mid-1980s. First, fabrication demand (excluding coins) has increased rapidly. From 1960-1985 this averaged 385 Moz per annum compared to 764 Moz per annum from 1986-2023. To only a limited extent this increase reflects the exclusion of the former Communist Bloc countries from the data prior to 1990. The vast majority of the increase between these two periods reflects a genuine, major rise in fabrication demand, especially

its industrial component. Second, scrap supply has fallen considerably in terms of its share of overall supply and as a percentage of fabrication demand in the last four decades. Scrap’s share of total supply averaged 24% from 1960-1985 (33% over 1974-1985) compared to 20% for 1986-2023 (and just 15% over the last decade). As a share of fabrication demand scrap accounted for an average of 31% from 1960-85 compared to 23% from 1986-2023. Third, the amount of “lost” or irrecoverable silver has fallen in recent years reflecting robust jewelry & silverware demand and the very strong rise in electronics demand, particularly the latter’s photovoltaic component.

Real Silver Price and Above-Ground Fabricated Stocks



*Real price basis US CPI in 2023 US dollar terms; **Above-Ground Stocks of Fabricated Products (excluding coins)
Source: LBMA; US Bureau of Labor Statistics; The Silver Institute; Precious Metals Insights

2.1.1 Industrial

It is particularly challenging to estimate the size of Above-Ground industrial product stocks. This is arguably the component of demand where the theoretical and the practical most obviously part company. Moreover, comprehensive data on the amount of silver recovered from industrial products is scarce, particularly prior to 1990. Indeed, annual *World Silver Survey* statistics on global industrial scrap supply are only available from 2010 onwards.

Nevertheless, past editions of the *World Silver Survey* do comment on trends in industrial scrap supply. These and other sources confirm that a very high proportion of historical industrial silver fabrication has either been “lost” to landfill or cannot practically be recovered or has already been scrapped. Another important observation is that, from a fairly low base, the stock of fabricated industrial products has recently been growing quickly. This is partly a function of much higher industrial fabrication: Over the

past twenty years it has risen from 368 Moz to 654 Moz. Most importantly, the industrial component showing fastest growth has been photovoltaic demand. This has soared from trivial levels in the early 2000s to 194 Moz in 2023. Cumulatively around 1.3 Boz has been used for photovoltaic applications. Moreover, photovoltaic installations are usually of a scale where the silver contained can be feasibly recycled. The assumption is, therefore, that most of this silver can one day be recovered, although this will depend on end-of-life considerations for solar arrays rather than the level of the silver price. Photovoltaic applications may now account for over half the Above-Ground stock of fabricated industrial products.

2.1.2 Photographic

Photographic use of silver used to be one of the three pillars of silver fabrication demand, the other two being industrial applications and jewelry & silverware. From 1990 to 2023 alone, photographic demand as measured by the *World Silver Survey* totalled 4.3 Boz, averaging 126 Moz per annum over this period. However, of considerable importance to this analysis of the price sensitivity of Above-Ground stocks is the trend in photographic demand around this impressive average. Photographic demand peaked in 1999 at 229 Moz; since then the switch to digital technology has resulted in a precipitous fall in offtake, it recording a mere 27.0 Moz in 2023.

The Above-Ground stocks of consumer and industrial silver-bearing photographic products were always much lower than the cumulative annual demand because, firstly, the life of most color film sold was short, with much of the silver recovered from fixer solutions when these were developed, and, secondly, the silver in photographic paper was generally not economical to recover. The silver used in x-ray film was an exception, with, in particular, a fairly large amount of legacy medical x-rays retained for long periods. However, much of that stock has since been depleted through the recycling of old x-rays exceeding falling new demand, as most medical and other users having long since switched to digital technologies. Data available on global photographic recycling show that between 2010 and 2023 recycled silver from photography dropped from 42 to 17 Moz. The Above-Ground stock of silver-containing photographic products will have been declining before 2010 and by now is of little overall importance to the market and the silver price.

2.1.3 Silverware & Jewelry

Prior to the industrial age, silverware was the second largest source of demand after coinage. Solid silverware was appreciated by the wealthy throughout most of the world where there was access to the precious metal. An even larger amount of silverware is thought to have been commissioned for religious ends. How much of this silverware fabricated prior to 1960 was still in existence at that date is impossible to measure. The high value of most silverware articles should mean only a small portion ought to have been truly “lost” over time. Yet, this high value and its ease of recycling also makes silverware more prone to being scrapped than any other fabricated product. The assumption made in this Report is that the bulk of the existing Above-Ground stock of fabricated products (excluding coins) in 1959 was in the form of silverware. Including the smaller weight back then of silver jewelry stocks, the combined

silverware & jewelry stock, at close to 2 Boz, is thought to have accounted for roughly four-fifths of all stocks of Above-Ground fabricated products at the end of the 1950s.

Since 1960, the stock of silverware and jewelry has grown substantially. From 1977-2023 alone, gross fabrication exceeded 9 Boz. Part of this would have been “lost,” principally lower value jewelry, and a fair amount will have been recycled. Anecdotal information is that a substantial amount of, particularly, silverware was melted during the price spike over 1979-1981. Data available on scrapped silverware and jewelry from 2010-2023 indicates an especially large ratio of old scrap to new fabrication for silverware, with 366 Moz versus 725 Moz. The comparable figures for jewelry are 440 Moz scrap versus 2,640 Moz fabrication. In part, this reflects the reduced demand for silverware since the 1990s. This results, for example, in legacy holdings that are inherited frequently being melted for cash by new owners. The scrap and fabrication data also show that silver jewelry has become a much larger category of demand than silverware. Over the last few decades, silver jewelry has become a far greater source of demand than silverware. Above-Ground stocks of silverware & jewelry, which are estimated at some 8.9 Boz at end-2023, are therefore increasingly skewed towards the latter. This change is important given jewelry’s far lower scrap ratio than silverware and is significant when addressing the topic of the price-sensitivity of Above-Ground silverware & jewelry stocks.

2.2 Bullion

Bullion was in the past the prevalent form of silver due to the metal's use over centuries in circulating coins. Huge amounts of silver were required for the production of, for example, Ocho Reales ("Pieces of Eight") and Maria Theresa Thaler coins. This changed with the de-monetization of silver in the 19th and first half of the 20th centuries. The initial phase of this de-monetization consisted of countries switching from a silver to a gold-based and, subsequently, fiat currency monetary system. A subsequent phase, most notably in the US but also in a number of other countries, saw the complete elimination of silver's monetary legacy, as governments stopped using any silver in circulating coins.

De-monetization did not lead to the immediate disappearance of many hundreds of millions of ounces of silver circulating coins. As a rule, these tended to be hoarded, used in private trade or gradually removed from circulation and melted into ingots. While some formerly circulating coins have truly been "lost" and many more have been worn down through abrasion, the silver contained in the bulk of the coins minted over time remains Above-Ground. This is not to say that it remains in the same form as coins. It is certain that a large share of the pre-1960 historical coin minting by now has been converted into bullion bars (where it remains) or after being converted into bar form has subsequently been used as raw material for fabrication. The transformation or not of this legacy silver into a fabricated product is the key question. The simple conversion of coin into bar does not change the totality of the bullion stock. Indeed, as a rule, it moves the corresponding silver bullion closer to the market.

Real Silver Price and Above-Ground Bullion Stocks



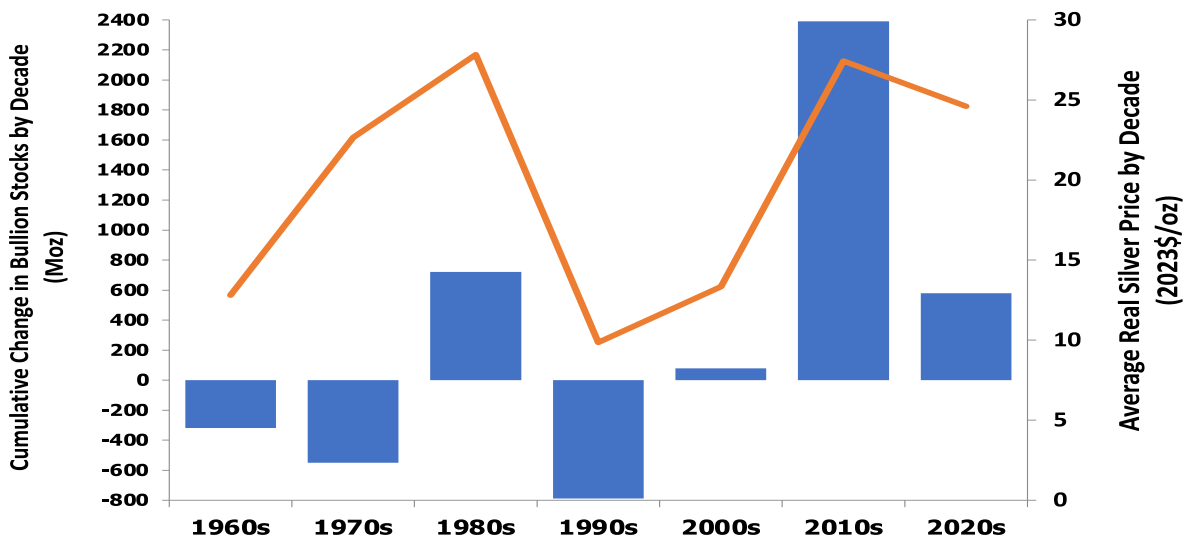
*Real price basis US CPI in 2023 US dollar terms; **Above-Ground Stock of Bullion (Coins & Bars)
Source: LBMA; US Bureau of Labor Statistics; The Silver Institute; Precious Metals Insights

A substantial amount of bullion existed prior to 1960 in both coin and bar form. How large this global bullion stock was at that time is impossible to determine with any certainty. However, at the end of the 1950s the US Treasury alone held 2.06 Boz of silver with another 1.33 Boz in US circulating coinage. This Report’s estimate of 6 Boz of global silver bullion stocks at end-1959 might, therefore, seem excessively conservative. Yet, taking into account the impact of the 1933 US Silver Purchase Act, America’s post-World War 2 economic dominance and its (ultimately failed) attempt to control silver prices while maintaining a large amount of circulating silver coins, this is perhaps a not an unrealistic assumption.

From 1960-2023 the *World Silver Survey* data provides greater clarity when it comes to the level of bullion stocks and the annual changes in these. It is also possible to construct a time series for government and private sector bullion stocks. More challenging is the division between coin and bar form of the Above-Ground bullion stock. While the coin & medals demand series in the *World Silver Survey* sheds light on the quantity of silver used over the 73-year period, nearly 6.2 Boz, it is not clear how much of this has subsequently been transformed into bullion bars.

From 1960-2023, the supply/demand data shows a cumulative bullion surplus of 2.1 Boz. Added to the 6.0 Boz estimated to have existed at end-1959, this gives the 8.1 Boz of silver bullion stocks referred to at the beginning of this Report. None of this calculated increment in the bullion stock is assumed to have been lost. In reality, part of the stock of coins will have been “lost” either to abrasion or for other reasons. (Not counting coins that have been transformed into bars.) However, given that this “lost” amount is a very small percentage it is neater to assume all the increment from the cumulative bullion surplus has been added to the Above-Ground bullion stock. In practice, this is largely irrelevant set against the difficulty in establishing how large were bullion stocks prior to 1960.

Cumulative Bullion Stock Change and Average Real Price by Decade



Source: Silver Institute; Precious Metals Insights

Using supply/demand data from the annual *World Silver Survey* it is possible to estimate the annual change in bullion stocks for the 1960-2023 period. Through to end-2023 these rose by 2.1 Boz. However, as the chart on page 13 shows, there have been three decades – the 1960s, 1970s and 1990s – when bullion stocks declined. These were periods during which supply from mine production and scrap recycling fell short of fabrication demand (excluding coins). The resulting deficit between supply and demand had to be filled by a liquidation of existing bullion stocks.

In the 1960s, the decline in bullion stocks was entirely due to massive government silver sales, especially by the United States. Private sector bullion inventories actually increased substantially over that decade. Government sales were largely related to the ending of silver circulating coinage and the associated abandonment of official silver price targets. This and the strong private sector bullion demand referred to above helps to explain why the drop in overall bullion stocks during the 1960s did not prevent a rise in real silver prices over much of that decade.

The 1970s saw a smaller fall in government bullion holdings and a swing to substantial net sales (in most years) out of private sector bullion holdings. The strong uptrend in real silver prices during the decade was the driver for the decline in private sector bullion stocks, as investors that had pre-1960 legacy stocks or had accumulated silver in the 1960s took profits in the 1970s. Only in 1979 did the spike higher in the silver price attract more buyers than sellers, with private sector bullion stocks rising as a result. This switch to a net increase in bullion stocks was of course itself a principal cause of the jump in the price in 1979.

The 1980s was a decade of substantial bullion investment driven initially by investors buying during the unprecedented bull market of 1980 (pushing up the price) and then, collectively, their acquiring still more silver as the silver price tended to fall over the remainder of the decade. Clearly in the absence of such supportive bullion purchases the silver price would have fallen faster and further than it actually did.

Bullion stocks dropped by nearly 800 Moz in the 1990s, the bulk of this coming from a fall in private sector inventories, although government stock sales also jumped to levels not seen since 1960-1970. It is undoubtable that price was an important factor driving the fall in bullion stocks in the 1990s. There was very little buy-side interest in silver at the time and price expectations dropped, such that “stale longs” sought to dispose of silver that had been accumulated in the 1980s and previous decades. The liquidation of these bullion inventories drove silver down further and for longer than would have been the case in their absence.

By 1999 a large amount of near-market private sector bullion stocks had been liquidated. In contrast, from 2001 onwards, the data show a steady rise in stocks held by the private sector. For example, the former *World Silver Survey* series for European Dealers’ Stocks indicates a rise of some 540 Moz from 2001-2010. (Against this, government sales during 1998-2003 rose to their highest level since 1960-1970.) Private sector holdings of silver had been historically “light” at the end of a prolonged bear market for the precious metal. The change in the price trend from the early 2000s onwards stimulated fresh investment demand that in turn helped to drive silver prices higher.

At the beginning of the 2010s silver prices rose to their peak, the annual average in 2011 hitting \$35.12/oz, equivalent to nearly \$48/oz in 2023-terms. Private sector bullion stocks increased strongly in 2010-2012, by over 240 Moz per annum, while government bullion sales were subdued, reflecting their

substantial depletion over 1998-2006. The increase in investors' bullion holdings was very clearly a principal factor behind the rise in the silver price. What is noteworthy is that buy-side interest was sustained over 2013-2015 as silver prices dropped back first to below \$20 and then further to the \$15 level. It would seem that liquidations by some investors were more than compensated by bargain hunters, at times especially in India, looking to purchase silver at much lower levels in expectation of future gains in the price. This was similar to what was seen in the first half of the 1980s but this time on a larger scale and for much longer. Indeed, it is only in 2022 and 2023 that for the first time since 2008 the annual rise in private sector bullion stocks has fallen below the 100 Moz mark. Undoubtedly, the persistent strength of investment demand behind these increases in stocks helped silver, first, to stabilize at a higher level than recorded prior to 2008 and, since 2020, push again above the \$20 mark.

The very substantial rise in bullion stocks, 3.2 Boz over the past 15 years, could at some point represent a threat to the price if silver were to enter a bear market and were investors' expectations to change. This "horror movie" has been seen before in the 1990s, when investors selling into falling prices exacerbated the bear market and drove silver below what would otherwise have been equilibrium levels. While the depletion in bullion stocks that resulted effectively helped to tee up the silver market for a stronger rebound in prices when circumstances changed, in the interim it was a very painful period for producers.

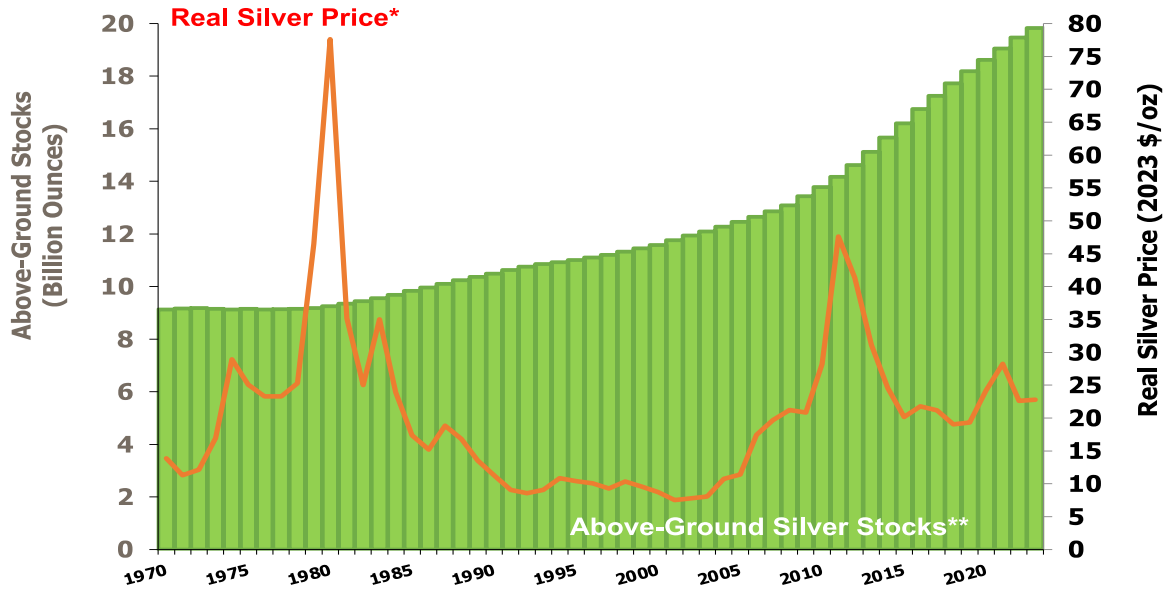
3. Analysis of Price Sensitivity of Above-Ground Stocks

This chapter analyses the price sensitivity of Above-Ground stocks in terms of both levels and changes in these inventories and in real silver prices. Total stocks, bullion stocks (government and private sector) and fabricated product stocks are all covered separately. Where data exists, the statistical analysis is extended to disaggregated data for bullion and fabricated product stocks. In general, annual data for the 1970-2023 period is analysed. Real prices in 2023 terms, obtained by means of the US CPI index, are used. In cases where only much shorter time series are available, these are measured against nominal silver prices.

3.1 Total Above-Ground Stocks

Total Above-Ground stocks rose from 8.5 to 19.4 Boz between 1960 and 2023, an increase of 10.9 Boz or 128%. The increase has not been uniform. During the 1970s total stocks rose by only 100 Moz due to the combination of a significant fall in bullion stocks and a higher amount of "lost" silver trimming fabricated stocks as the amount of silver going into industrial applications increased. The silver market was in "deficit" from 1971-1979, which required supply from existing bullion holdings to make up the difference between mine production and scrap recycling on the one hand and fabrication demand, on the other.

Real Silver Price and Level Above-Ground Stocks

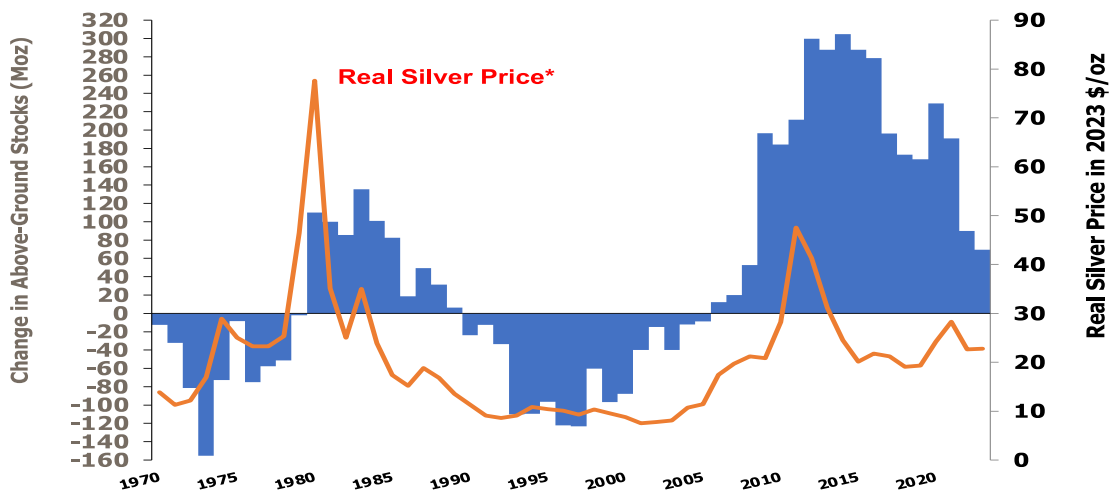


*Real price basis US CPI in 2023 US dollar terms; **Above-Ground Stocks of Bullion + Fabricated Products
 Source: LBMA; US Bureau of Labor Statistics; The Silver Institute; Precious Metals Insights

A largely flat level of stocks in the 1970s occurred at a time of (generally) rising silver prices. The clearest relationship between the two was of higher silver prices attracting outflows from existing bullion stocks that had been built up in the 1960s and earlier. These were not sufficient to prevent silver prices from climbing due to other countervailing factors.

Since 1980 Above-Ground stocks have increased substantially, particularly in the last 15 years. The more rapid increase in total stocks has only partly been price related. This part is related to the swing from disinvestment during 1990-2000 to investment from 2001 to 2023, especially the heavy additions to private sector bullion stocks from 2009-2021. The former period saw liquidations of stocks on declining prices, while the latter has seen bouts of investors chasing prices higher and also large purchases of bars and coins from retail investors on weaker prices. Overall, bullion stocks rose by 3.1 Moz from end-2000 to end-2023. Greater still, though, was the rise in fabricated product stocks that increased by 4.9 Moz. As a reflection of growing fabrication demand this increase in stocks in itself was supportive of the price.

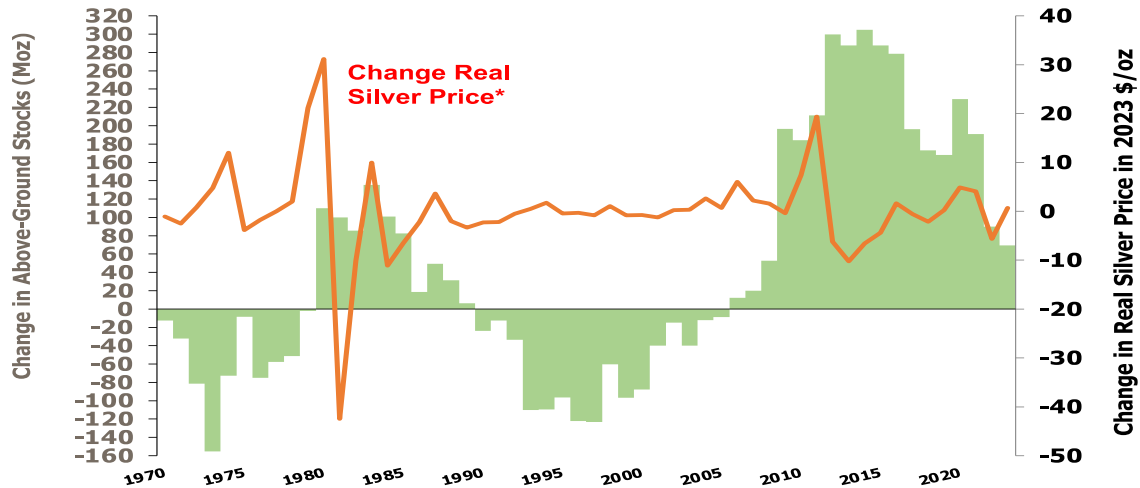
Real Silver Price and Change in Total Stocks



*Real price basis US CPI in 2023 US dollar terms; **Above-Ground Stock of Bullion (Coins & Bars)
 Source: LBMA; US Bureau of Labor Statistics; The Silver Institute; Precious Metals Insights

There is no statistical correlation between the level of total Above-Ground stocks and the level of the real price. Nevertheless, it can be observed, as described above, that during certain periods there appears to be a link between the two, most clearly in the 1990s when both the level of total stocks and real prices fell. This was related principally to changes in the bullion rather than the fabricated products component of total Above-Ground stocks, as will be elaborated on in the sections below.

Change Real Silver Price and Change in Total Stocks



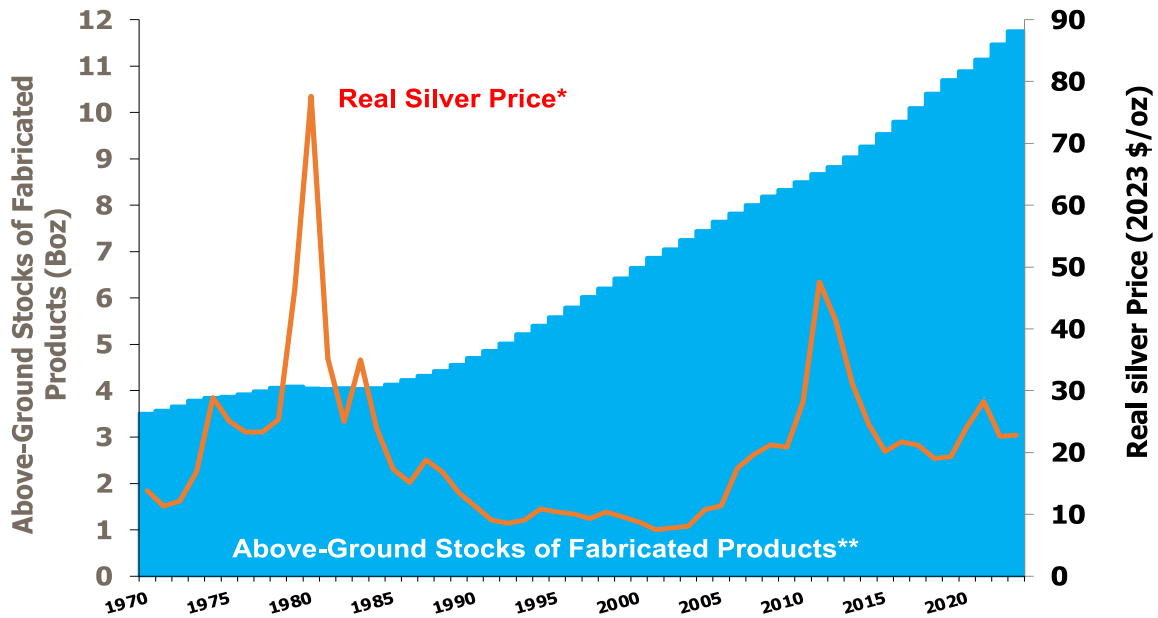
*Real price basis US CPI in 2023 US dollar terms; **Above-Ground Stock of Bullion (Coins & Bars)
Source: LBMA; US Bureau of Labor Statistics; The Silver Institute; Precious Metals Insights

Statistical analysis of changes in total Above-Ground stocks and the real silver price level show a very low correlation for the 1970-2023 period. The same exercise for changes in both total Above-Ground stocks and changes in the real price indicates a very low positive correlation. For shorter time periods the correlation is greater, with, for example, a value of -0.25 for 1990-2005 and -0.55 for 2010-2023.

3.2 Fabricated Products

The level of fabricated product stocks and the level of the real price show no statistical relationship for the 1970-2023 period. Shorter time periods within this range likewise showed close to zero correlation between the data sets. The only period where a fairly significant negative correlation of -0.55 appeared was for 2010-2023. The strong rise in fabricated product stocks over the last 13 years has occurred at a time of somewhat weaker real silver prices since the rally at the beginning of this period. However, it is difficult to see the causality at work and why a higher level of fabricated product stocks should *per se* depress the silver price. It is improbable, for example, that the market is discounting a much higher level of future scrap supply from this faster rising Above-Ground stock of fabricated products.

Real Silver Price and Above-Ground Fabricated Stocks



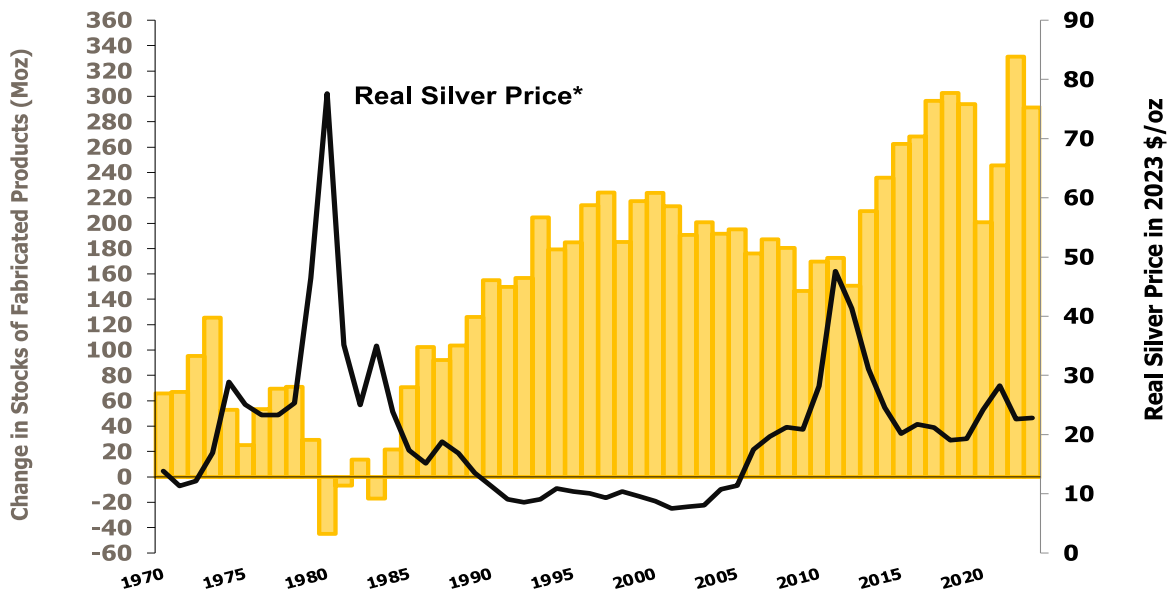
*Real price basis US CPI in 2023 US dollar terms; **Above-Ground Stocks of Fabricated Products (excluding coins)
Source: LBMA; US Bureau of Labor Statistics; The Silver Institute; Precious Metals Insights

There is a moderate statistical relationship between the change in Above-Ground stocks of fabricated products and the real silver price level, with a correlation coefficient of -0.40 for the 1970-2023 period. This is not surprising, given that parts of silver fabrication demand, especially jewelry and silverware, are price-sensitive. Moreover, such categories of demand generally see little “lost” silver and, as such, annual demand for these products is largely fully reflected in the Above-Ground fabricated stocks numbers.

Reviewing shorter time periods, the negative correlation between prices and stocks was much stronger from 1970-1990 and again from 2010-2023. The first of these periods saw initially a period of high prices limiting growth in Above-Ground fabricated stocks, with, exceptionally, outright falls in stocks on the 1980 and 1983 price spikes due to weak demand and a surge in recycling. Thereafter, a sharply falling real silver price stimulated fabrication demand, depressed scrap supply and resulted in a faster build in fabricated product stocks. From 2010-2023 the high negative correlation of -0.78 between the change in fabricated product stocks and the real price level was related to a period of weak prices coupled with a general rise in jewelry demand and very strong growth in electronics demand, a larger share of which is considered available (at some point) to the market due to the surge in the share of photovoltaic demand over the last decade. Yet, while the high correlation between the stock change and price level data sets can be explained, it would be misleading to imply that there was causality between the faster positive change in fabricated product stocks and the level of the silver price. A stable to lower silver price may have favored, at the margin, higher levels of photovoltaic silver demand. This would have helped to buoy

silver prices that might otherwise have fallen further. But it does not explain the somewhat lackluster trend in real silver prices since 2012.

Real Silver Price and Change in Fabricated Stocks



*Real price basis US CPI in 2023 US dollar terms; **Above-Ground Stocks of Fabricated Products (excluding coins)
Source: LBMA; US Bureau of Labor Statistics; The Silver Institute; Precious Metals Insights

Comparing changes in Above-Ground fabricated product stocks with changes in the real price, there is no statistical relationship between the two series over the 1970-2023 period. Only in more recent years, e.g. from 2010-2023, is there a moderate negative correlation to be observed. Again, this almost certainly reflects the combination of a more rapid build-up in fabricated products stocks and the softness of the real silver price. However, the latter cannot be ascribed to the former.

Disaggregating the Above-Ground fabricated products stocks and looking first at the relationship between jewelry and silverware stocks and nominal prices for 2010-2023, there is a moderate negative correlation of -0.32 between changes in Above-Ground jewelry and silverware stocks and the real price level for 1970-2023. This is hardly surprising given the price sensitivity of jewelry and silverware demand. The same exercise for the change in industrial stocks and nominal prices for 2010-2023 shows a much smaller negative correlation.

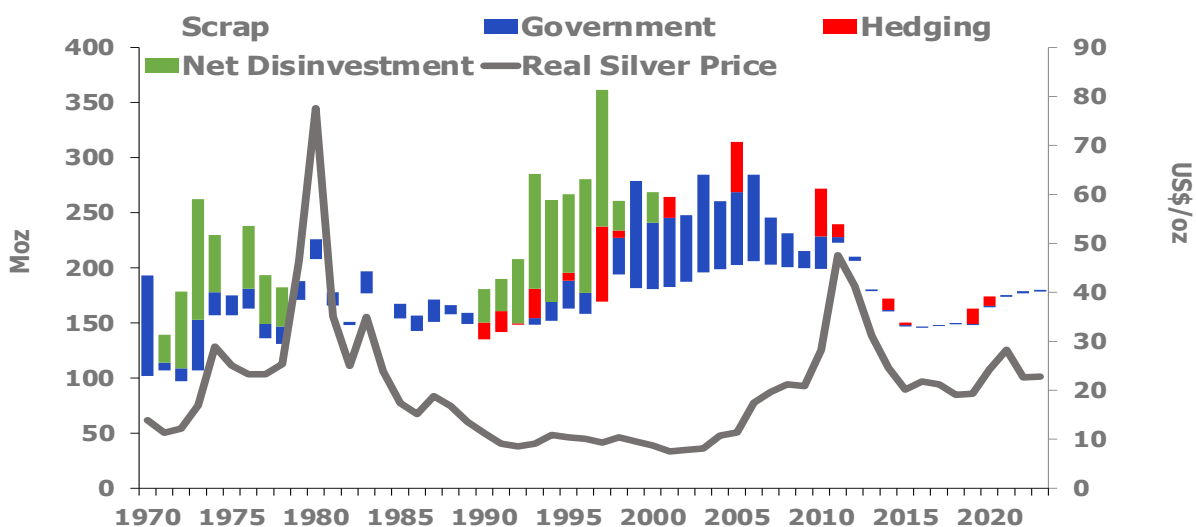
The above statistical analysis for Above-Ground fabricated product stocks for 1970-2023 against real prices and its jewelry and silverware components against nominal prices for 2010-2023 has the shortcoming that the fabricated stocks data is the product of three different variables each of which may impact prices (and *vice versa*), namely the level of fabrication demand in a given year, assumptions for the amount of “lost” silver in that fabrication demand and the quantity of scrap recycling netted off the

fabricated stock level. Clearly the level of and change in annual fabrication demand will in itself be of some importance for the silver price, although this is usually more of a supportive factor than a driving one. As described in the February 2024 *Market Trends Report* [Factors that Determine the Silver Price](#), overall fabrication demand has a relatively low historical correlation with the silver price.

As pointed out elsewhere in this Report, assumptions regarding the truly “lost” quantity of fabrication are a key factor in arriving at estimates of Above-Ground fabricated stock levels. Even a small change in such assumptions will produce a major impact over time on the stock level. The question is whether changing these assumptions and therefore the implied level of fabricated product stocks really matters for the analysis of price sensitivity? In order to test this, two alternative data sets for fabricated product stocks were created, basis a high and low scenario for stocks. The starting assumptions for stocks at end-1959 were respectively 1 billion ounces higher and lower, respectively than the base case of 2.5 Boz. Fabrication data net of scrap was then adjusted by a higher assumed “lost” percentage for the low stocks case and a lower one for the high stocks case. While the base case assumption is that fabricated product stocks totalled 11.3 Boz at end-2023, the High variant results in 17.6 and the Low 5.4 Boz, respectively.

Correlations against the real price for 1970-2023 were very similar for the High stocks scenario and the Base Case. The Low case scenario showed a somewhat stronger relationship, albeit with still weak absolute correlation coefficients, for the level of fabricated stocks and the real price level and annual changes in stocks and real prices. For all scenarios, only the negative correlation between changes in stocks and the price level was moderately strong, with similar results across all three. This would seem to confirm that, in itself, the absolute level of fabricated product stocks, and by extension assumptions regarding the “lost” quantity, is of relatively little importance to the real price and *vice versa*.

Supply from Above-Ground Stocks & Real Silver Price

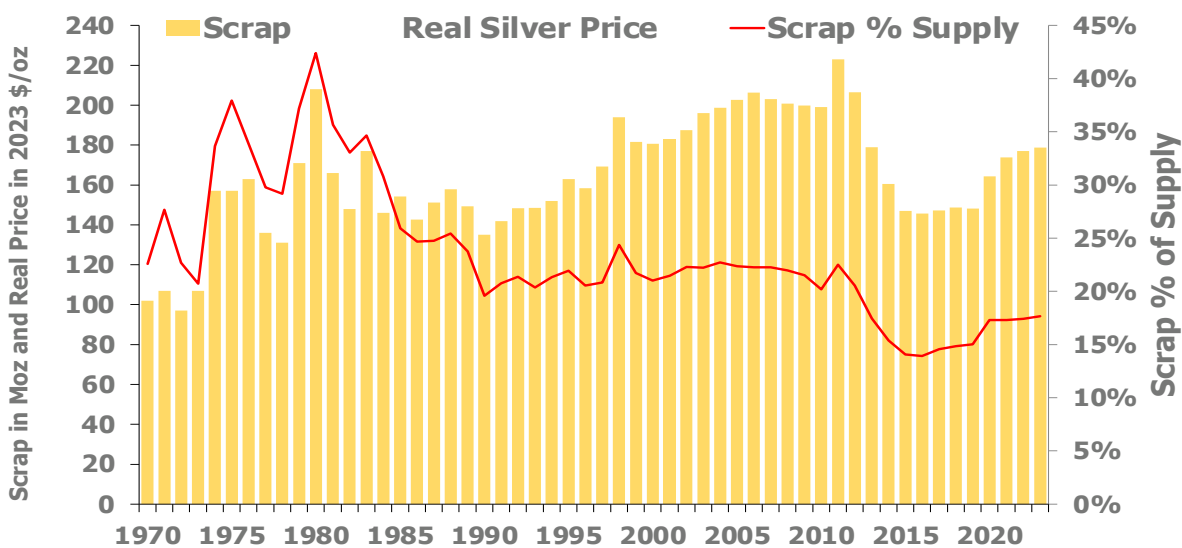


Source: The Silver Institute; LBMA

3.2.1. Scrap Recycling

The relationship between the quantity of fabricated products scrapped in a given year and the real price has also been analysed. This is the most important metric in terms of supply to the market from Above-Ground stocks. Summary silver scrap data is available from 1960 onwards. However, the data for the 1960s includes a very large proportion of demonetized and recycled coins, which are treated in this Report under the bullion category. A further limitation comes from the pre-1990 data only covering the Western World, although this is partly compensated by the volume of scrap pre-1990 being measured against Western World supply/demand. From 2010 onwards scrap data is broken down by source in the *World Silver Survey*. Price sensitivity for jewelry & silverware and industrial scrap can therefore be measured for the 2010-2023 period.

Supply from Scrap & Real Silver Price



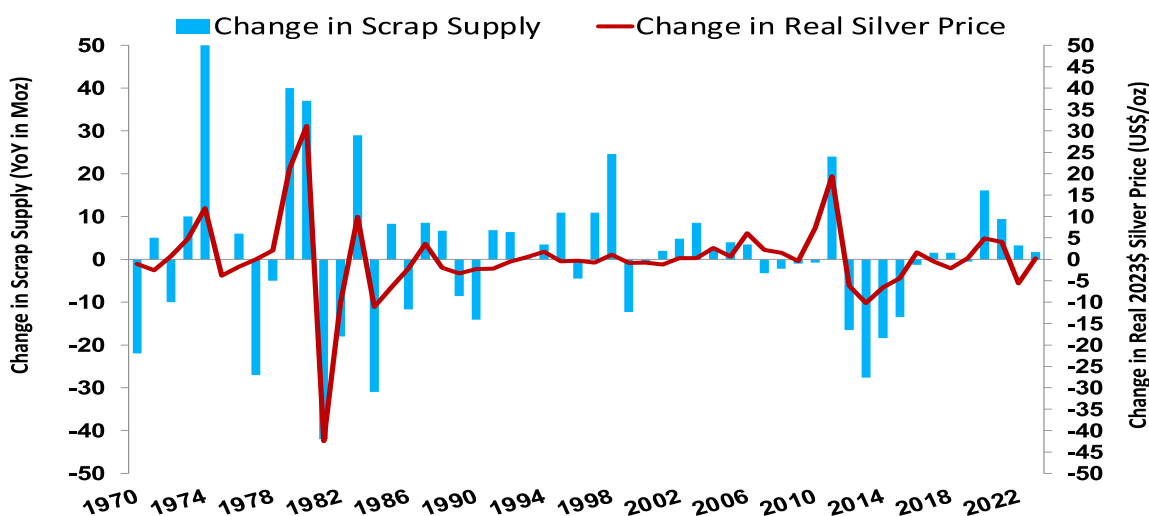
Source: The Silver Institute; LBMA; US Bureau of Labor; Precious Metals Insights

The summary scrap recycling data for 1970-2023 was analysed in terms of price sensitivity against real prices in 2023 terms for levels of and changes in the two data series. Scrap levels and price levels for 1970-2023 showed a correlation of 0.32, with the co-efficient rising to 0.77 for the 1970-1990 period. The correlation drops back to the long-term mean for 1990-2023. These results are not surprising given obvious incentive higher prices give for recycling, particularly for some kinds of fabricated products and the relative or close to zero price sensitivity of other kinds of fabricated products, where product life cycle or regulation is of far greater importance. The higher correlation for 1970-1990 is also

understandable given the massive run up and equally huge decline in the real price over those two decades.

The correlations for the level of scrap supply against the change in the real price for 1970-2023 are a fair bit lower at 0.23. The implication being that the price level rather than the change in the price in any given year may be of greater importance. Curiously the correlation was much the same for 1970-1990 but rises to 0.40 for 1990-2023. The suspicion is that something else may coincidentally be at work here such as the trend lower in photo scrap from the 2000s onwards and the eventual compensation for this from much higher levels of industrial scrap in the last ten years. Both of these trends being largely independent of the changes in the real price over the period.

Change in Scrap Supply & Real Silver Price



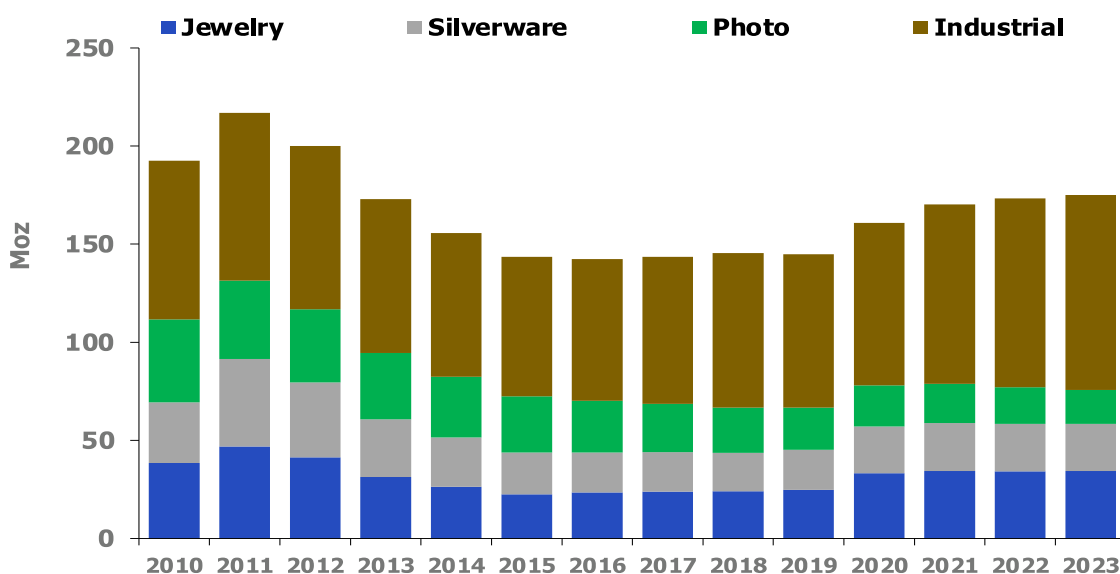
Source: The Silver Institute; LBMA; US Bureau of Labor Statistics, Precious Metals Insights

Finally, looking at the correlation between annual changes in scrap supply and changes in the real price, the analysis shows a high correlation of 0.76. Correlations were 0.79 for 1970-1990 and 0.67 for 1990-2023. Again, it would seem as if the particularly large annual changes in the price over 1970-1990 were responsible for larger rises or falls in annual scrap supply. The average year-on-year change in the annual average real price between 1970-1990 was an astounding 28% compared to 15% for 1990-2023. Average changes in scrap supply year-on-year for these two periods were 13% and 4%, respectively. This supports the arguments, first, that large changes in the price are required to bring about substantial changes in scrap supply and, second, that there are typically smaller changes in scrap in response to changes in the price, especially when price changes are relatively small. In other words, scrap supply does not respond in a linear fashion to increases or decreases in real prices. Price sensitivity of scrap supply is much greater on major moves in silver prices. Nevertheless, the historical record shows that when it comes to the volume of recycling an exclusive focus on the price is mistaken. Other factors discussed in this Report, such as the changing mix of fabrication demand, have been of greater importance. Indeed, the absolute amount of silver scrap recycling actually fell between 2004 (199 Moz) and 2023 (177 Moz) in spite of a

doubling in the real silver price over the 20-year period. The positive impact of price was overwhelmed by the collapse of photographic scrap supply.

Disaggregated data on scrap supply for 2010-23 provides a further insight into the dynamics of scrap supply in response to levels of and changes in the silver price. As the period under review is only 13 years it is better in this case to measure correlations against nominal silver prices.

Recycling by Sector

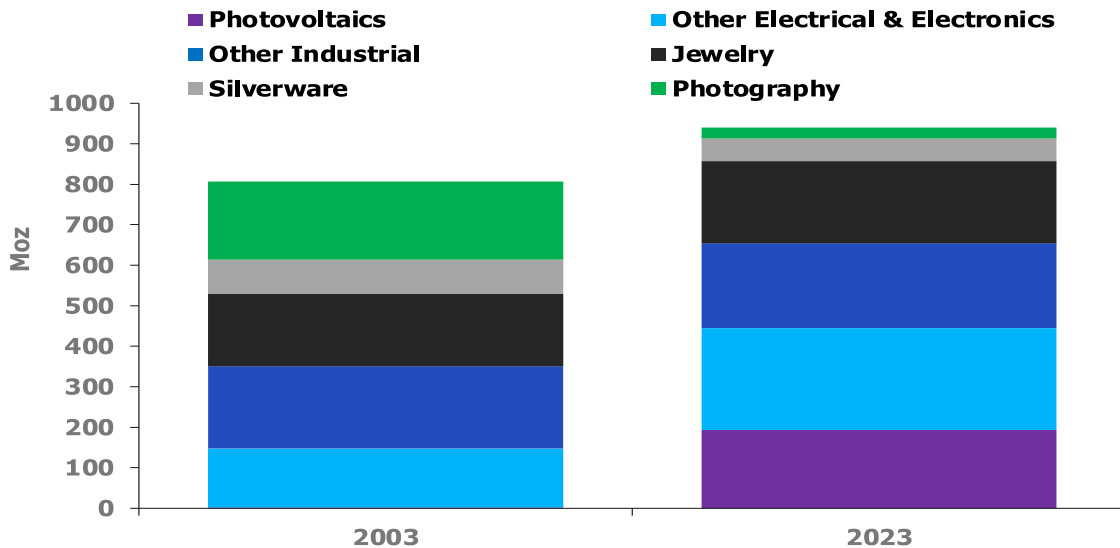


Source: The Silver Institute

The data on recycling by sector show two major trends in the composition of scrap supply (excluding coins) between 2010 and 2023. Industrial products' share has risen from 42% to 59%, whereas Photography's has dropped from 22% to 8%. (Note that by 2010 photographic scrap's share had already fallen by close to a half from its level a decade earlier.) Meanwhile Jewelry and Silverware scrap levels have been up and down over the same thirteen-year period. None of these results is surprising given, first, the changing composition of silver fabrication demand in the past two decades and, second, changes in the price over 2010-2023.

World Silver Survey data show how silver fabrication demand has changed between 2003 and 2023. Photographic demand has collapsed; overall Jewelry & Silverware demand is little changed but has shifted even more towards the former; Industrial demand has soared, particularly the Electrical & Electronics category and, above all Photovoltaics use of silver, which barely existed in 2003. These changes have been reflected in the composition of old scrap supply, although to-date recycling from photovoltaic is limited given the relatively short life of the majority of current installations.

Fabrication Demand (excluding coins)



Source: Silver Institute

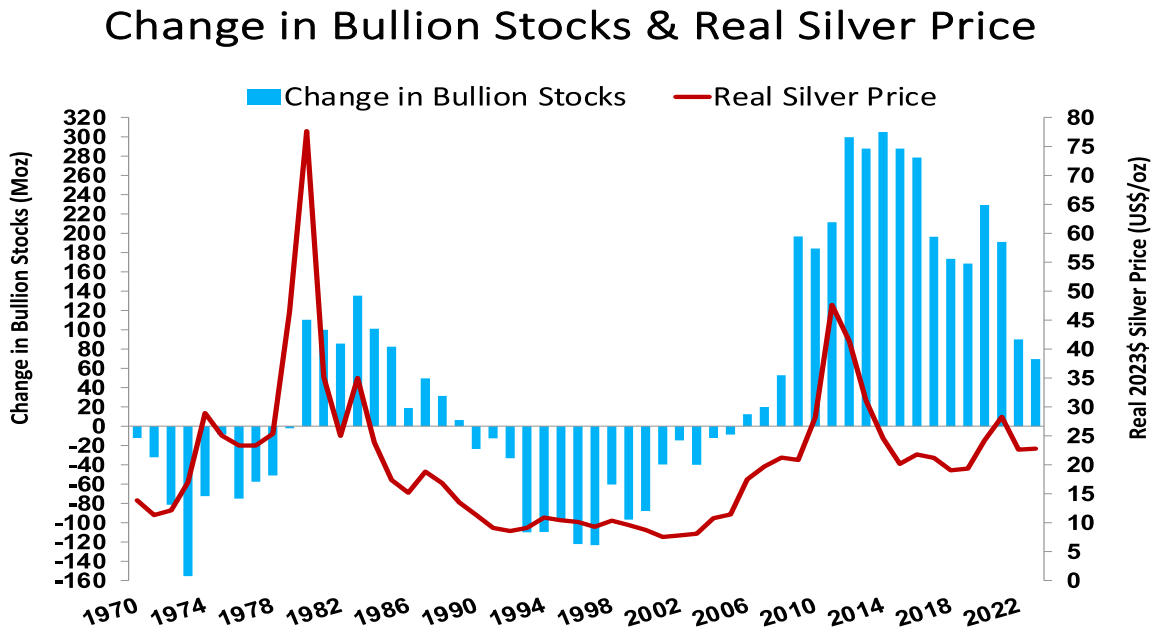
Analysis of the relationship between industrial scrap and nominal silver prices shows a fairly strong correlation of 0.48 between scrap and price levels for 2010-2023 and a yet stronger 0.65 when looking at annual changes in scrap and the price for 2011-2023. These are somewhat higher figures than might be expected given the general tendency for product life cycle to be of greater importance than the silver price for the recycling of most finished industrial products containing the precious metal. It may be that the growth in global Ethylene Oxide (EO) catalyst capacity (a rise of over 80% from 2010-2022) has impacted these results. In 2021 and 2022 there was a particularly high level of EO plant change-outs, which only coincidentally occurred during a period of high silver prices.

The correlation between Jewelry & Silverware scrap recycling levels and price levels for 2010-2023 is a very high 0.93. The same co-efficient was obtained when analysing changes in jewelry & silverware scrap and changes in the nominal silver price for 2011-2023. The unsurprising conclusion is that jewelry & silverware scrap is very price elastic. That said, for the period under review, the average annual change in jewelry & silverware scrap at 12% of the 2011-2023 average (6.6 Moz/56.6 Moz) is a fair bit lower than the equivalent figure for the silver price of 18% (\$3.98/\$21.67). The implication is that on average over 2011-2023 for every percentage change in the price a 0.666% change was produced in the supply of jewelry & silverware scrap. Individual correlations for jewelry and silverware levels against price levels and changes in the data sets over the period were similar, although somewhat stronger for silverware, especially for annual changes in the price and changes in scrap supply.

3.3 Bullion

Changes in bullion stocks on an annual basis can be calculated from the annual supply/demand data in the *World Silver Survey*. They are essentially the net product of three items: net government purchases or sales, net investment or disinvestment and net de-hedging or hedging. (The understanding is that all silver de-hedging or hedging impacts only the level of bullion stocks in the private sector.)

The historical data from 1970-2023 show that there have been several multi-year waves of net declines and net increases in bullion stocks, with a particularly strong rise in stocks over the past 16 years. The correlation between the changes in bullion stocks and the real price in 2023 terms has been analyzed for the 1970-2023 period.

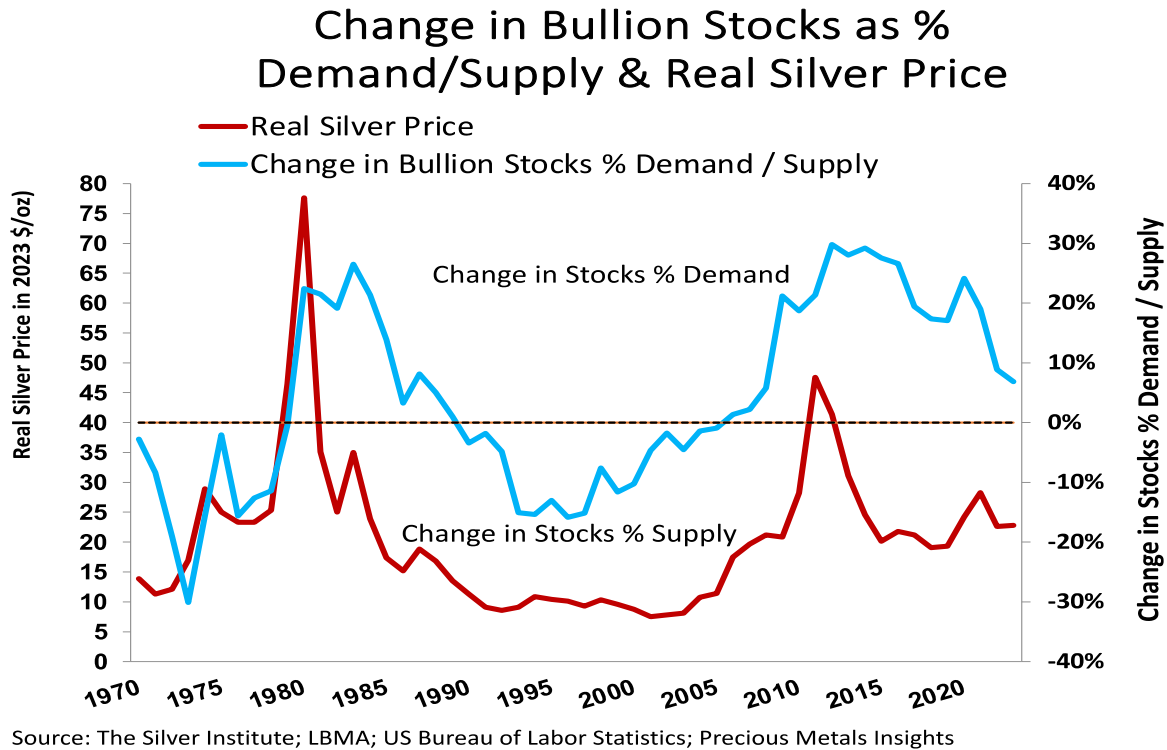


Source: The Silver Institute; LBMA; US Bureau of Labor Statistics

The results of this analysis show only a tiny negative correlation between the annual change in bullion stocks and the annual change in price for the 1970-2023 period. There is a slightly stronger correlation for the 1970-1990 period but it is of no statistical significance. This is not surprising if one takes into account rises and falls in bullion stocks over the 53-year period that occurred during periods of both rising and falling prices. For instance, periods of rising prices have seen both increases and decreases in aggregate bullion stocks and *vice versa*.

In contrast with the above, the correlation between annual changes in bullion stocks and the silver price level is significant, with a figure of 0.49 for 1970-2023. A similar result was obtained for 1970-90 but for 1990-2023 the co-efficient jumps to 0.80. This is probably because the latter period captures two strong trends. The first, a period of falling bullion stocks and a weak real silver price from 1990-2003 and,

second, a period from 2008-2023 of strongly rising bullion stocks and much higher real price levels, certainly when compared to the 1990s and early 2000s.

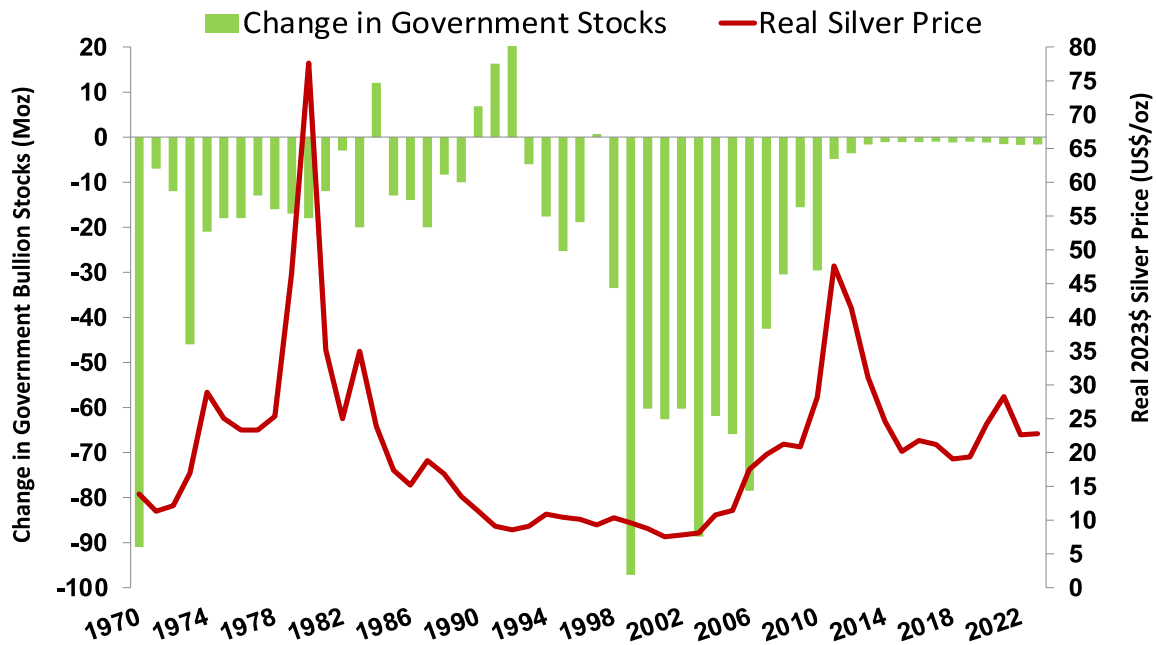


Annual changes in bullion stocks have often constituted a high share of overall annual silver supply or demand. From the early to mid 1970s substantial declines in bullion stocks added to supply and arguably prevented a still stronger increase in prices at the time. The rapid swing to net additions to bullion stocks at the end of the 1970s helped to push up real prices dramatically and the resulting fabrication demand destruction resulted in one-third of total demand at that time coming from additions to bullion stocks. In contrast, the change to net disharding in the 1990s helped to drive prices down to a much lower level than would otherwise have been the case. Nevertheless, the depletion of a good part of the near-market bullion stock in that decade and the early 2000s prepared the ground for higher real prices, especially once bullion stocks started to be rebuilt. At its peak, this phenomenon once again saw net additions to bullion stocks account for close to one-third of total silver demand. The subsequent drop back in the percentage share of demand from the late 2010s was largely down to the surge in fabrication demand rather than a fall in the amount of silver going into Above-Ground stocks of bullion, at least that is until 2022-2023 when net investment eased.

3.3.1. Government

Government stocks of silver were once substantial, largely due to silver’s monetary legacy, important producer and consumer interests and associated attempts by especially the US government to control silver prices. When silver was removed from circulating coinage and prices were liberalized, this created something of a “supply shock,” with very heavy government sales during the 1960s through to 1970. These averaged over 200 Moz per annum from 1960-1970, although over the period 85% of this silver was effectively transferred to private bullion stocks, the balance ending up in fabricated products. Since then, changes in government stocks have only occasionally been of importance to the market. Specifically, from 1998-2008 sales averaged 62 Moz per annum, ranging from a high of 97 Moz in 1999 to a low of 31 Moz in 2008. These sales were mainly from Chinese government stocks, with much smaller quantities offloaded by Russia and the US. Chinese sales were related to the liberalization of the Chinese silver market and a change in policy regarding the optimum size of strategic stockpiles of the precious metal. US sales were from the country’s Defense National Stockpile to provide silver for the US Mint’s American Silver Eagle bullion coin program.

Change in Government Stocks & Real Silver Price

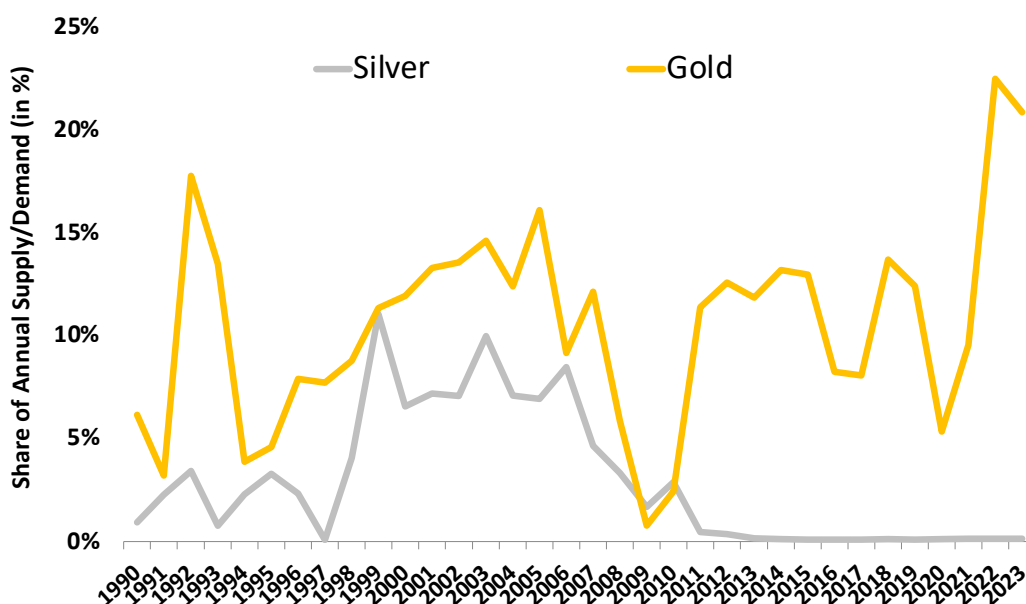


Source: The Silver Institute; LBMA; US Bureau of Labor Statistics

The quantity of metal sold by the official sector from 1998-2008 accounted for 7% of total supply over these 11 years. This was enough to create some headwinds to the price, especially over 1998-2001, but not sufficient to prevent silver’s advance over the period: annual average nominal prices rose by 2.7 times between 1998 and 2008. Nevertheless, over 1998-2001, anecdotal evidence at the time pointed to

government sales and, especially, the fear of further official selling as negatively impacting the price. This was partly related to developments in the gold market, where an exceptionally high level of official sector sales and lending to fund a wave of producer hedging was pushing down gold prices at the time. The fear, in retrospect quite unfounded, was of something similar taking place in silver. It is probable that this was the final episode of government sales pressure on the market because global official stocks of silver bullion are now thought to be less than 100 Moz. These are nowadays not sufficient to impact the annual silver supply/demand balance in a meaningful way for more than a couple of years at most.

Government Sales or Purchases % Share of Annual Silver & Gold Supply/ Demand



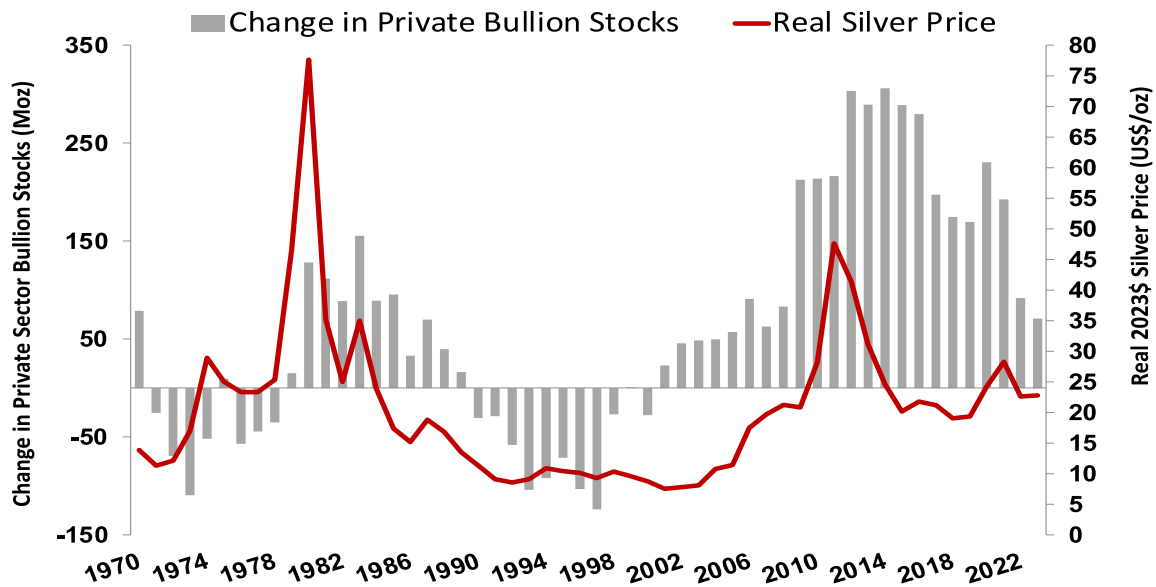
Source: Silver Institute, GFMS, Metals Focus

3.3.2. Private Sector

In contrast, stocks of bullion held by the private sector now constitute a large multiple of annual silver supply/demand. This Report estimates that these private sector global inventories totalled 8 Boz at end-2023, equivalent to 6.7 years total silver supply that year. As discussed elsewhere in this Report, these private sector bullion stocks cover a wide range of bar and coin inventories, from retail investor holdings through to institutional investor positions in physical metals and silver in Exchange Traded Products. Most of this metal is immobile most of the time. The average annual change (increase or decrease) in private sector bullion stocks between 1970-2023 was just 1.9% compared to 19.8% for the average year-on-year

change (rise or fall) in the real silver price. The implication is that a very large change in prices is required to bring about higher-than-average changes in private sector bullion stocks.

Change in Private Bullion Stocks & Real Silver Price



Source: The Silver Institute; LBMA; US Bureau of Labor Statistics

There is no meaningful correlation between the annual change over 1970-2023 in private bullion stocks and the annual change in the real silver price. The same analysis for the change in private bullion stocks and the level of the real silver price generates a reasonably significant positive correlation of 0.46.

The *World Silver Survey* data has been used to calculate annual changes in private sector bullion stocks. These are the product of aggregate net investment or net disinvestment plus net producer hedging or net producer de-hedging in a given year. As indicated elsewhere in this Report, the assumption is that, in contrast to the gold market, all producer hedging of silver is related to private sector bullion holdings. It is also assumed that there has been no “lost” bullion over the 1960-2023 period.

Data on producer hedging is available from 1990 and these show that its average share of supply or demand from 1990-2023 was 1.9%. Intuitively, this does not seem to be sufficient to have had much effect on the annual average silver price, even if transactions undertaken over a shorter-time frame intra-year probably did have some temporary price impact. However, in a few of the years under review more substantial amounts of hedging and, less frequently de-hedging, probably were significant. On three occasions over 1990-2023 hedging and on one occasion de-hedging more than doubled the 1.9% figure quoted above. In 1997, for example, hedging accounted for a record 8% or 68 Moz of supply. It is reasonable to presume that this helped to keep the average nominal silver price that year below \$5/oz. Similarly, the 40 Moz of de-hedging recorded in 2012 surely helped to limit silver’s decline that year. It

would be misleading though to assume that (de)hedging reacts in a predictable fashion to the price. Much depends upon the objectives of the corporate hedging strategy and the instruments used. For example, depending on the options products used, delta-hedging in response to changes in the price can vary enormously. Finally, in terms of assessing the relationship between hedging and the price it is worth noting that the cumulative change in the producer hedgebook between 1990-2023 was close to zero and that the outstanding delta-adjusted book was a mere 8.0 Moz at the end of 2023. Producer hedging and de-hedging's impact on private Above-Ground bullion stocks and the price is therefore limited.

In contrast to hedging, annual changes in private sector bullion stocks driven by investment or disinvestment are frequently of importance for the direction and level of the silver price. Although, as discussed elsewhere in this Report, the relationship between aggregate net investment or net disinvestment and the price is not consistent. Thus, during the 1970s a generally rising silver price resulted in a depletion of bullion inventories that had been accumulated at much lower prices in the 1960s. In 1979, the surge in the price prompted both profit-taking from existing holders and fresh buying from new investors but with a net increase in bullion stocks. 1980 and the rest of that decade was characterized by a sizeable increase in investor-held inventories, notwithstanding the trend down in the silver price. The 1990s, in contrast, saw a depletion of these bullion stocks as investors finally gave up hope of a return to a silver bull market or those inheriting these positions liquidated them to invest in other assets or to finance consumption. It is surely the case that the increase in bullion stocks cushioned silver's fall during the 1980s and their running down exacerbated its bear market in the 1990s.

Since 2008, private sector bullion stocks have increased substantially as investors have year-after-year been net buyers of silver. The steady build-up in inventories has occurred during a period when silver prices have, much of the time, been highly volatile. Investment demand has, in the aggregate, mopped up all the available surplus silver in the market. Occasionally, such as in 2015, bargain hunting, notably in India, has dominated investment and the related increase in implied bullion stocks. This phenomenon helped establish a floor for the price when silver was under pressure. At other times, stock-building has been related more to investment driven by rising silver prices, most notably in 2020.

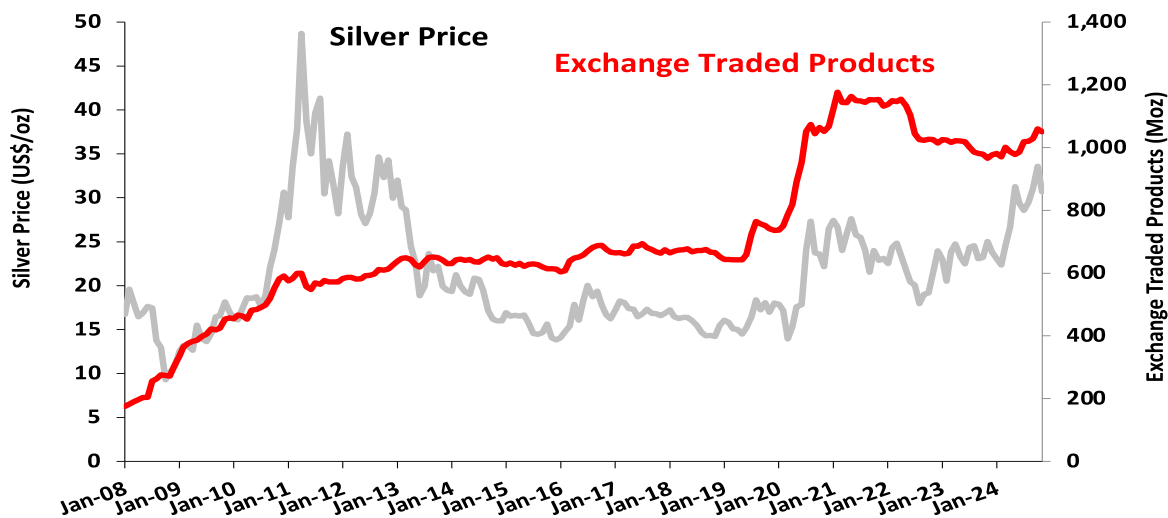
Investment/disinvestment is reasonably well correlated to the real price level, with for 1970-2023 a coefficient of 0.46 (the same as changes in private bullion stocks against the price level). For changes in the real price, there is no long-term observable relationship with investment/disinvestment. This supports the above observations on the variability of investor behavior, which largely depends upon what is motivating the investor buying/selling at a given time.

3.3.3. Exchange Traded Products

Exchange Traded Products (ETPs) collectively held 964 Moz of silver in bullion form at the end of 2023. While this represents only about 12% of estimated private sector bullion stocks, it is one of the most concentrated and liquid parts of the Above-Ground bullion stock. Moreover, data on ETP holdings is transparent, comprehensive and regularly available. As such, it provides an important indicator of the price sensitivity of a large subset of global silver bullion stocks. The correlation between levels and changes in ETPs and the nominal silver price since the products were launched in 2008 have been calculated for both daily and monthly data. The results show positive correlations between the two series

that vary between 0.30 and 0.40, indicating a fairly close relationship but by no means a very tight one. Moreover, the average change in ETPs is typically much smaller than the average change in silver prices. The monthly data from February 2008 to November 2024 show that the average change in ETPs was 1.9% compared to 7.1% for the silver price. Logic suggests that when there is a relationship operating between ETPs and the silver price, causality should operate in both directions: Investors both drive prices and their behavior is to a large extent price-driven. However, as discussed elsewhere in this Report, investors' behaviour is not necessarily consistent. This is clear from episodes when ETP holdings rose in spite of declining silver prices, e.g. the 12 months from end-September 2012 when 40 Moz was added to holdings in spite of the price falling by \$13 over the period or more recently April-May 2024 when there was a 23 Moz drop in holdings over these two months while silver rose by nearly \$7/oz.

Exchange Traded Products and Silver Price



Source: Bloomberg

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