

Investment Update: Gold, an efficient hedge

April 2020

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The benefits of certain portfolio hedges came into clear focus during the 2008-2009 financial crisis and did so again during the subsequent European sovereign debt crisis, the 2018 December stock market pullback and the most recent COVID-19 pandemic.

Many tail hedges work well during crises if timed appropriately, but are technically complex investments, and can be expensive to hold systematically.

Historically, gold prices have not increased as rapidly in tail events¹ as in hedges that track market volatility indices.² But, importantly, gold has served as a safe haven, improving risk-adjusted returns and adding welcome liquidity during times of crisis, without the costly effects of systematic implementation or the difficulties of market timing.³

Comparing hedges across metrics

We have established the **Relevance of gold as a strategic asset** and the importance of portfolio diversification, but in this analysis we look specifically at gold's role as a hedge compared to other well-established hedges.⁴

We focus on volatility and credit hedges as well as real assets, particularly precious metals, and adjust the amount of a given hedge in a portfolio depending on the risk exposure of that portfolio.⁵ Finally, we ranked the effectiveness of each hedging strategy based on attributes

including returns, portfolio volatility, risk-adjusted returns and portfolio drawdown.

Our analysis shows that, historically, any of the hedging choices are better than a diversified hypothetical portfolio without hedging (Table 1). And while each of the choices have merit in various market conditions, our analysis shows that historically, **gold is generally the overall optimal hedge over the long run when considering these attributes.**

Table 1: Performance of hedging strategies in an average pension fund portfolio over the past 20 years*

Ranked (1= most optimal to 9 = least optimal) for each category and overall.

| | Returns | Volatility | Risk-adjusted returns | Max Drawdown | Overall Average |
|------------------------|---------|------------|-----------------------|--------------|-----------------|
| Gold | 1 | 7 | 1 | 3 | 3.0 |
| CDS HY | 4 | 5 | 3 | 4 | 4.0 |
| VIX mid-term futures | 8 | 2 | 5 | 2 | 4.3 |
| TIPS | 3 | 6 | 2 | 7 | 4.5 |
| VIX short-term futures | 9 | 1 | 9 | 1 | 5.0 |
| CDS IG | 6 | 4 | 6 | 5 | 5.3 |
| Cash | 7 | 3 | 7 | 6 | 5.8 |
| Silver | 2 | 9 | 4 | 8 | 5.8 |
| No hedge | 5 | 8 | 8 | 9 | 7.5 |

*Performance between March 2000 and March 2020. The

hypothetical portfolio is based on Willis Towers Watson Global Pension Assets Study 2019 and Global Alternatives Survey 2017 as described in the Appendix footnote 5. Performance is based on blended weights of the hedges ranging from 2.5% to 10% of the portfolio, proportionately reducing the rest of the portfolio by the initial weights. 'Returns': average of cumulative and average returns; 'Volatility': overall portfolio volatility; 'Risk-adjusted returns': average of the return on risk, Sharpe ratio and information ratio; 'Max drawdown': the most the portfolio lost during any trough. See the Appendix and footnote 4 for definitions of 'VIX short-term futures', 'CDS IG', 'CDS HY'; and 'TIPS'.

Source: Bloomberg, World Gold Council

1 See Appendix for tail-event time horizons.

2 An example of this is the CBOE Volatility Index or VIX, which we discuss in more detail in the Appendix footnote 4

3 See Appendix for an explanation of time series usage.

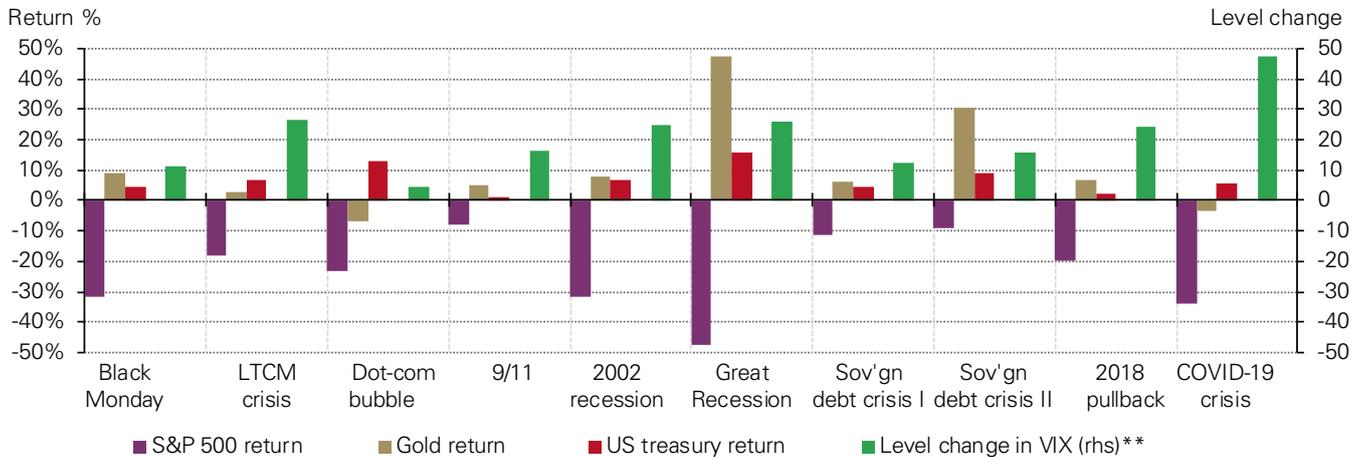
4 The selection of hedges is by no means exhaustive, and omits more complex structures. It is illustrative of various thematic approaches. See

Appendix for an explanation of the hedging strategies. While there may be other more complex structured products, often called exotic structures, they are highly individualised and not available to most investors.

5 Based on our historical analysis, we have found that an allocation of 2.5% to 10% of gold to a typical pension fund is optimal and have used this amount for other hedging strategies. See Appendix for portfolio composition.

Chart 1: Gold tends to outperform in left-tail events¹

Performance of gold, US Treasuries and S&P 500 during VIX spikes



*See the Appendix and footnote 1 for the tail-event dates. 'rhs' stands for right-hand-side.

Source: Bloomberg, ICE benchmark Administration, World Gold Council

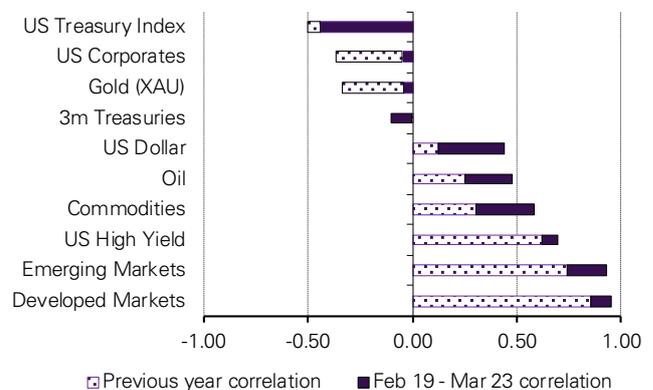
Hedging tail events is often a compromise between the greatest protection and cost

We often highlight gold's role as a safe haven, most recently in our [Investment Update: Gold prices swing as markets sell off](#), which shows that gold can provide liquidity and protection in risk-off scenarios, especially during so-called systemic events that affect multiple regions and industries (**Chart 1**). When stock markets sell off quickly, correlation across risk-assets can increase and portfolios that were thought to be diversified could experience unexpected drawdowns, forcing margin calls and low funding ratios.

Investors often rely on selling highly liquid assets like gold in these events, which can sometimes lead to temporary liquidations, as seen in the recent COVID-19 selloff. While correlation for most major asset classes, including gold, increased meaningfully during the most recent stock market selloff, gold's correlation to the stock market remained flat to slightly negative (**Chart 2**).

Chart 2: Correlation increased across all major asset classes except three-month Treasuries during the COVID-19 selloff

One-year daily correlation of some widely followed major assets and the S&P 500 versus the daily correlation during the selloff.



The dotted bar represents the daily correlation from 23 March 2019 to 23 March 2020, while the solid bar represents the daily correlation from 19 February 2020 through 23 March 2020, the peak to trough dates of the S&P 500 prices. The bars represent the actual levels; so for example, the one-year correlation in gold was -0.34, while the most recent correlation was -0.04⁶. 3m Treasuries exhibited minimal correlation during the past year, which is why the dotted box appears non-existent.

Source: Bloomberg, World Gold Council

⁶ See Appendix for the representative indices used in the correlation calculations.

But, as systemic events unfold, gold tends to outperform. In general, the stronger the pullback in the stock market, the more negatively correlated gold becomes with the market highlighting its effectiveness in a sustained pullback (**Chart 3**).

Chart 3: Gold and stock market correlation becomes more negative with more pronounced market moves

S&P 500 and gold weekly correlation in tail events*



Weekly returns January 1971 - March 2020⁷

*Correlations computed using weekly returns based on the Bloomberg Barclays US Treasury Index and the LBMA Gold Price PM since January 1971.

Source: Bloomberg, World Gold Council

Analysing tail events is important, but the events are not always contained within a neat periodic window. They can occur at much shorter intervals and barely register in weekly returns, as we saw during the infamous ‘flash crash’ of 2010 when markets fell precipitously, only to recover quickly. They could drag out like 2008 and span several months with non-contiguous but frequent selloffs. In fact, an effective tail-risk hedge may need to extend its performance beyond the window that defined the event.

Volatility-related hedges like VIX futures and other index put option strategies have been shown to mean revert. In other words, if the selloff is an isolated event, then the value of the hedge is likely to come tumbling back towards the average quickly afterwards. Owning put options, in particular, is a form of insurance that requires ‘buying’ protection. Because there are various forms of listed option structures outside of VIX futures, we focus on the VIX as a barometer for option performance. Much like the VIX, option insurance can erode overall portfolio performance meaningfully if implemented systematically.

This is why we consider overall portfolio performance, risk-adjusted returns and the portfolio drawdowns to assess the best overall hedges (**Table 1** and **Table 3**). Each metric highlights different qualities of a hedge; namely overall portfolio performance, portfolio volatility, how that volatility

impacts performance, and how well the hedge helps with pullbacks or tail-events. We now address the behaviours of some of the various hedges in each category.

Volatility hedges are costly, but historically have provided protection if timed right

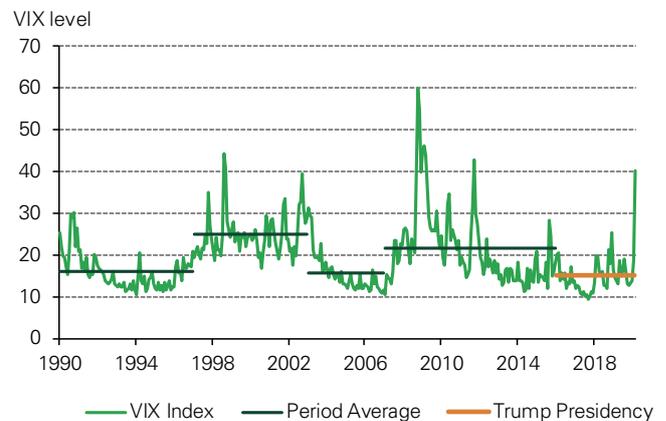
VIX can work well - if you time it!

While the VIX itself is not investible, owning VIX futures across most tenors, along with portfolio insurance via option strategies like put options has historically provided the clearest levered or explosive protection during a tail event. This was evidenced most recently in the COVID-19 pullback, as the VIX traded at or near record highs. Timing the event with VIX futures or options purchased would have paid out handsomely.

The problem with owning VIX futures specifically is that, when implemented systematically, they provide a negative expected value, seriously eroding portfolio performance over time and requiring resources that require position monitoring not present in passive hedging strategies. Owning VIX short-term futures, for instance, can erode performance by nearly 2% a year (**Table 3**). This portfolio attrition has been more significant during the past four years, linked to what is known as the “Trump bump”, with quantitative easing measures as well as low rates propelling stocks to their longest bull market in history (**Chart 4**). It is worth noting that all of the hedges in our analysis, except the short-term VIX futures, have historically improved risk-adjusted returns, when compared to a portfolio with no hedges over the past 20 years.

Interestingly though, while VIX futures risk-adjusted returns performed poorly, they significantly reduce portfolio volatility. VIX futures greatly reduce portfolio drawdown, but at a considerable cost.

Chart 4: Market volatility has been much lower since the financial crisis and Trump presidency*



*Based on month-end prices from March 1990 to March 2020

Source: Bloomberg, World Gold Council

7 For information on ‘sigma events’ and calculations see Appendix.

Credit hedges have had the best tail-event performance since the financial crisis

Credit hedges

Liquid indices on credit default swaps (CDS), a type of insurance on credit events on corporate bonds, such as a stress or default, are popular with investors. They represent an easier way to express a bearish view on corporate bonds than actually shorting the bonds - though access for ordinary investors is limited, as they generally trade over-the-counter (OTC). While holdings of these structures over the long term can hurt cumulative returns because of the premium paid, many of the most recent tail-events were credit related. As such, these positions have positively contributed to portfolio performance since the financial crisis, performing better than any other hedge during these events (**Table 2**).

Table 2: Short credit trades via CDS have done particularly well since the financial crisis

Investment grade and high yield CDS have led performance in the past five tail-events including and following the financial crisis*

| Hedge | Average | Max | Min |
|------------------------|---------------|---------------|--------------|
| CDS IG | 205.2% | 375.7% | 58.4% |
| CDS HY | 130.0% | 313.8% | 9.0% |
| VIX short-term futures | 111.6% | 253.4% | 11.8% |
| VIX mid-term futures | 62.6% | 120.2% | 29.0% |
| Gold (US\$/oz) | 17.5% | 47.5% | -3.2% |
| Cash | 7.5% | 15.9% | 2.4% |
| Silver | 5.4% | 36.7% | -30.1% |
| TIPS | 4.2% | 13.1% | -0.5% |

*Financial crises since 2008 as highlighted in Chart 1. Index explanations can be found in the Appendix footnote 4.

Source: Bloomberg, World Gold Council

Fixed income hedges can act like risk assets

Treasuries provide limited diversification

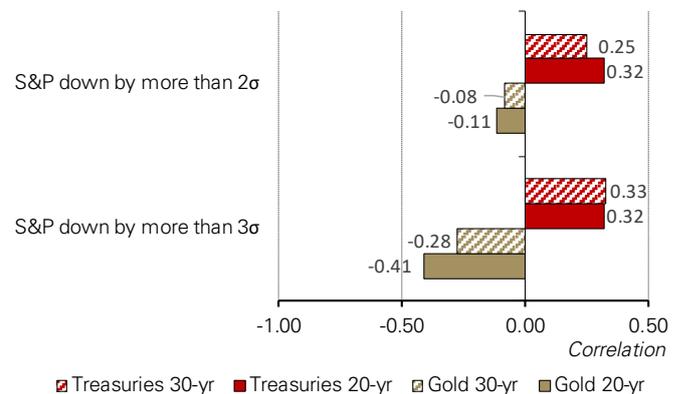
Investors often include US Treasuries as hedges to their stock allocation. But while there is generally an initial positive move in Treasuries as crises begin, contrary to popular belief, when looking at the last 20 and 30 years, the correlation of US Treasuries to the S&P 500 is generally somewhat positive in tail events; it is during the non-tail events that Treasuries provide diversification. (**Chart 5** and **Chart 6**). During the COVID-19 drawdown in stocks, for example, longer-dated bonds had a daily correlation of 0.60 with the S&P 500.

Treasury Inflation-Protected Securities (TIPS) have done meaningfully well as a portfolio hedge, particularly as it relates to overall portfolio performance. Part of this is likely

a diversification factor and the fact that bonds have enjoyed a multi-decade bull market. TIPS, however, are the poorest performers when it comes to tail events and rank near the bottom in portfolio drawdowns (**Table 1**). While they would likely help in an inflationary event, they have not been shown to effectively hedge systemic events.

Chart 5: In tail-risk events, Treasuries have not behaved according to conventional wisdom....

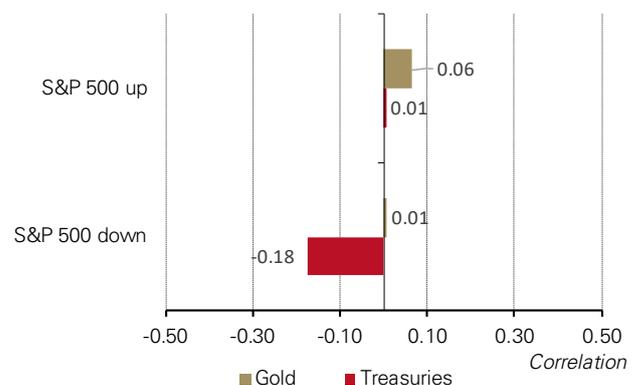
Gold has acted much better as a tail hedge over the past 20 and 30 years*



*As of March 2020. See footnote 3 in Appendix for times series explanations.

Source: Bloomberg, World Gold Council

Chart 6: ...despite good diversification when considering all periods*



Weekly returns for the period March 1990 - March 2020, based on available data.⁸

Source: Bloomberg, World Gold Council

Precious metals, like gold, provide a balanced effective hedge

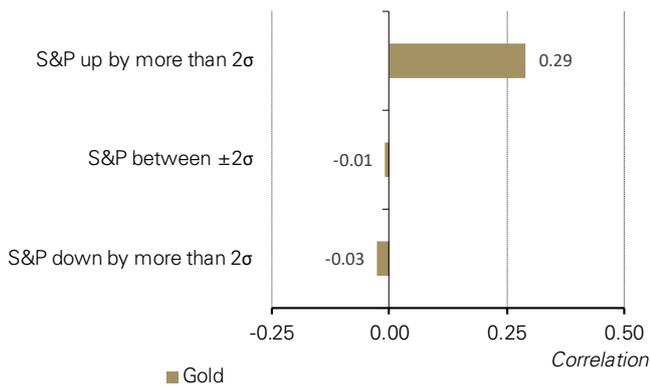
The irony behind diversification is that many investors want it when markets go awry but prefer high correlation when markets do well. Most risk assets have provided diversification on the way up but become highly correlated on the way down. Furthermore, hedges that provide

8 See Appendix for Chart 5 and Chart 6 details

diversification on the way down can erode performance on the way up.

Gold is one of the few hedges that is positively correlated in risk-on environments, yet becomes increasingly negatively correlated in risk-off environments - and has been for nearly 50 years (**Chart 7**).

Chart 7: Gold works well in varying market conditions



January 1971 - March 2020. See footnote 3 in Appendix for times series explanations⁹

Source: Bloomberg, World Gold Council

And unlike financial assets, gold is a real asset: it has no credit or counterparty risk and is supported by high inflation. This is why, in terms of cumulative and annual returns, real assets like gold and silver have performed best over the past 20 years.

Silver is often lumped into the gold investment story; its higher volatility than gold makes it compelling to some investors when precious metals, in general, are moving higher. As we discussed in **Gold: the most effective**

commodity investment, silver tends to be much more correlated with the performance of the economy than gold, particularly to the downside. And while it boosts overall returns when used as a hedge, it also increases portfolio volatility to levels above that of an unhedged portfolio, significantly reducing risk-adjusted returns and thus eliminating some of the rationale for a hedge in the first place.

Gold ranks near the bottom in terms of reducing portfolio volatility, the only metric for which it does not land near the top. But, when factoring in its returns, it takes the top spot across various risk-adjusted metrics.

Summary

Gold stands out as a key portfolio component when identifying a long-term portfolio diversifier. Historically, gold has shown that it acts as an effective hedge and a useful part of the larger tail-risk picture.

Volatility-linked hedges like VIX futures and index options, are more effective than gold at reducing both portfolio drawdown and volatility, but the long-term returns of a portfolio that includes VIX futures have been almost halved.

While gold is not necessarily the best 'volatility hedge', an allocation to gold can not only improve both absolute and risk-adjusted returns when compared to an unhedged portfolio but can also provide the protection needed in times of market stress. And when one factors in the low cost of ownership, the protection afforded, the low level of active management required and the breadth of application, gold can clearly serve as a valuable alternative.

Table 3: Strategy performance

Blended performance of various hedges over the past 20 years*

| | Cumulative return | Annualised return | Volatility | Return on risk | Sharpe ratio | Information ratio | Max drawdown |
|------------------------|-------------------|-------------------|------------|----------------|--------------|-------------------|--------------|
| Gold | 200% | 5.6% | 9.9% | 0.57 | 0.38 | 0.09 | -39.0% |
| Silver | 191% | 5.5% | 10.7% | 0.51 | 0.33 | 0.08 | -40.3% |
| TIPS | 176% | 5.2% | 9.7% | 0.54 | 0.34 | 0.07 | -40.2% |
| CDS HY | 174% | 5.2% | 9.6% | 0.54 | 0.34 | 0.07 | -39.6% |
| No hedge | 173% | 5.1% | 10.5% | 0.49 | 0.31 | 0.06 | -43.2% |
| CDS IG | 161% | 4.9% | 9.6% | 0.51 | 0.32 | 0.05 | -39.9% |
| Cash | 161% | 4.9% | 9.6% | 0.51 | 0.31 | 0.05 | -40.0% |
| VIX mid-term futures | 144% | 4.6% | 8.0% | 0.57 | 0.33 | 0.04 | -34.3% |
| VIX short-term futures | 95% | 3.3% | 7.3% | 0.45 | 0.19 | -0.04 | -30.5% |

*Based on performance between March 2000 and March 2020. Performance is based on blended weights of the hedges ranging from 2.5% to 10% of the portfolio, proportionately reducing the rest of the portfolio by the initial weights. See footnote 5 for portfolio weights. Sorted by overall cumulative portfolio performance

Source: Bloomberg, World Gold Council

⁹ See Appendix for additional information.

Appendix

1. The VIX is available only after January 1990. For events occurring prior to that date, annualised 30-day S&P 500 volatility is used as a proxy. Dates used: Black Monday: 9/1987-11/1987; LTCM: 8/1998; Dot-com: 3/2000-3/2001; September 11: 9/2001; 2002 recession: 3/2002-7/2002; Great recession: 10/2007-2/2009; Sovereign debt crisis I: 1/2010-6/2010; Sovereign debt crisis II: 2/2011-10/2011; 2018 Pullback: 10/2018-12/2018; COVID-19 Pandemic: 2/2020 – 3/2020.

2. See footnote 4.

3. When possible, we analyse long-term performance of gold from 1971, since the gold standard collapsed. During the gold standard, the US dollar was backed by gold and the foreign currency exchange rates were dictated by the Bretton Woods System: <https://www.imf.org/external/about/histend.htm>. However, in some instances, the data of other asset classes and indices are not available to us for that time horizon, as is the case with US Treasuries in this analysis. In those cases, we analyse various time periods such as 10-, 20- and 30-yr time horizons with as much consistency as possible across analysis.

4. Explanation of hedges:

Volatility-based:

VIX short-term future: The S&P 500 VIX short-term futures index is, an index of rolled front month VIX futures (rolls between first and second future). The shorter maturity future has a greater response to volatility but is more mean reverting and has a higher roll cost than longer dated futures.

VIX mid-term future: The S&P 500 VIX mid-term futures index, which rolls between the fourth to seventh VIX futures contracts. With a slightly more moderate response than the VIX short-term future, the VIX mid-term futures strategy is less of a performance drag. We also tested the VIX index itself as an illustrative benchmark of how different the tradable derivatives perform relative to the non-tradable VIX Index, and highlight some of these in the text.

Credit /rate-based:

CDS HY: A liquid investment-grade credit default swap (CDS) on the bonds of a North American high-yield index. An instrument seeking investment results that are the inverse of a liquid high-yield corporate bond index, but require an insurance premium to purchase. High yield bonds, those with low-to-junk level credit ratings are particularly sensitive to volatility and risk aversion.

CDS IG: A liquid investment-grade credit default swap (CDS) on the bonds of 125 of the most liquid North American investment-grade entities. A systemic event is likely to instantly affect the market's perception of credit ratings and default probability. CDS indices have become popular hedge instruments following the 2008-2009 financial crisis. CDS IG 'on-the-run' series is available through Markit; however, a listed vehicle available that incorporates the costs of rolling an 'off-the-run' into a new 'on-the-run' series is not currently available. Investors need to actively manage the timing of the roll when a new 'on-the-run' series when it becomes available. For this analysis, we constructed a rolling 'on-the-run' index that rolls at expiry.

TIPS: A Treasury Inflation-Protected Security (TIPS) index, which aims to add to the existing treasury position with the additional support of being indexed to inflation.

Cash/Treasury: We use the short-term Treasury Index

Real-assets:

Gold. We use physical gold priced in US dollars.

Silver: Along with gold we introduce physical silver to the analysis priced in US dollars, to determine to what extent, if any the two might be interchangeable as tail-risk hedges.

5. See *Relevance of gold as a strategic asset*, 2020 edition for more information on gold portfolio analysis. The hypothetical average US pension fund portfolio is based on Willis Tower Watson Global Pension Assets Study 2019 and Global Alternatives Survey 2017. It includes annually-rebalanced total returns of a 42% allocation to stocks (27% MSCI USA Net Total Return, 15% MSCI ACWI ex US), 27% allocation to fixed income (21% Barclays US Aggregate, 3% Barclays Global Aggregate ex US, 1% JPMorgan EM Global Bond Index and 3% short-term Treasuries), and 30% alternative assets (13% FTSE REITs Index, 8% HFRI Hedge Fund Index, 8% S&P Private Equity Index and 1% Bloomberg Commodity Index). The allocation to gold comes from proportionally reducing all assets. Risk-adjusted returns are calculated as the annualised return/annualised volatility. See important disclaimers and disclosures at the end of this report.

6. Indices used: S&P 500 INDEX, Bloomberg Barclays US Treasury, Bloomberg Barclays US Corporates, Gold Spot \$/oz, ICE BofA US 3-Month Treasury Bills, Dollar Index Spot, Bloomberg WTI Crude Oil Subindex, Bloomberg Commodity Index Total Return, Bloomberg Barclays US Corporate High Yield, MSCI Emerging Markets Index, MSCI EAFE Index

7. Correlations computed using weekly returns based on the Bloomberg Barclays US Treasury Index and the LBMA Gold Price PM since January 1971. The investment industry generally quantifies tail risk events as those two or more standard deviations from the mean. Although there are now enough 'events' to include three- or four-sigma events. The chart includes the numbers of weeks/observations of each multi-sigma event since 1971. While eight observations of four standard deviations or more is a limited number, the overall direction in those events tends to be negatively correlated. Each bar corresponds to the correlation conditional on S&P 500 weekly return falling by more than respective standard deviations (or ""). The standard deviation is based on the same weekly returns over the full period.

8. As of 31 March 2020. Correlations computed using weekly returns based on the Bloomberg Barclays US Treasury Index and the LBMA Gold Price PM since January 1990. Chart 6 corresponds to the unconditional correlation over the full period. Each bar in Chart 5 corresponds to the correlation conditional on S&P 500 weekly return falling by more than respective standard deviations (or ""). The standard deviation is based on the same weekly returns over the full period.

9. As of 31 March 2020. Correlations computed using weekly returns based on the LBMA Gold Price PM since January 1971. The middle bar corresponds to the unconditional correlation over the full period. The bottom bar corresponds to the correlation conditional on S&P 500 weekly return falling by more than two standard deviations (or "") respectively, while the top bar corresponds to the S&P 500 weekly return increasing by more than two standard deviations. The standard deviation is based on the same weekly returns over the full period.

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We develop gold-backed solutions, services and products, based on authoritative market insight and we work with a range of partners to put our ideas into action. As a result, we create structural shifts in demand for gold across key market sectors. We provide insights into the international gold markets, helping people to understand the wealth preservation qualities of gold and its role in meeting the social and environmental needs of society.

Based in the UK, with operations in India, the Far East and the US, the World Gold Council is an association whose members comprise the world's leading gold mining companies.

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