Worth Its Weight?

Assessing Gold's Portfolio Utility

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Investors have paid increased attention to non-productive stores of value (NPSOVs), especially gold, in an environment characterized by inflation uncertainty, changing monetary and regulatory policy, questions about the U.S. dollar's primary reserve status, and the prospect of the globalized economy splitting into competing trade blocs.

As an NPSOV, gold presents unique modeling challenges. It doesn't generate income or have widespread industrial uses, its return drivers are variable, and its long-term upside potential is unclear. What's more, like all NPSOVs, gold faces the ever-present possibility of becoming worthless should society collectively decide to stop ascribing it value.

In much of our work, we find that optimizers help us better understand the portfolio implications of such variables. As we've explored previously, an optimization framework challenges us to supply and interrogate inputs, identify inconsistencies in our thinking, and better understand how correlation and tail risk affect portfolio outcomes.

In this piece, we use that framework to assess the portfolio utility of gold. We find that gold's long-term relationship with global growth, coupled with its lack of correlation to the shorter-term business cycle, makes it appealing to an optimizer. This is especially true during periods of inflationary shocks, geopolitical uncertainty, and positive stock-bond correlation.

Establishing a Forecast for Gold

Gold's lack of cashflows might suggest an expected long-term real return of zero, or even less after accounting for storage costs. Put another way, gold should be able to preserve, but not increase, its value after accounting for inflation.

We start from a different premise: The growth rate of gold's aggregate value should, over ultra-long horizons, equal the rate of global wealth growth. Why? A meaningfully lower or higher rate would imply that, over a sufficiently long period of time, gold's aggregate value will approach 0% or 100% of global wealth. Neither has happened over millennia.

We constructed periodic estimates from a variety of sources[1] going back roughly 200 years, a time period over which gold has generally accounted for a low but meaningful (single-digit) percentage of global wealth. Additionally, starting in 1975 when data become more reliably available, we estimate that gold has in aggregate generally represented between 1.8% and 7.3% of total developed market liquid wealth, although it's broken out of that range several times, including recently. While the precision of our observations decreases the further we look back in time, our longer-term estimates and this 50-year time series provide empirical support for our overarching premise.

What is an NPSOV?

As the name suggests, non-productive stores of value do not generate cashflow and are sought by investors primarily for their ability to retain, well, value. An NPSOV is typically a scarce asset that society has deemed valuable and reasonably secure over time. While an NPSOV's value can fluctuate year-by-year, its probability of drastically and permanently losing value is assumed to be low. Examples include diamonds, precious metals, fine wines, art, and other luxury items. In this paper, we use gold—for centuries, the prototypical NPSOV—as a proxy for NPSOVs generally. As we'll explore, gold's lack of productive capacity can be seen as a feature, not a drawback, since it leads to lower correlation with growth-oriented, pro-cyclical assets.

Proponents of bitcoin—a non-productive asset whose value is similarly rooted in social consensus, albeit with a short history—have suggested it could become a complement or substitute for gold as an NPSOV. Certainly, bitcoin's adoption in under two decades has been rapid: By some estimates, its aggregate market value was, as of June 2025, close to 10% of gold's. At the same time, it has yet to establish some of the other characteristics of NPSOVs, such as being a reliable safe haven during risk-off periods.

We don't take a position on bitcoin's long-term potential as a store of value. However, we'd note that any long-term shifts in the relative share of gold and any alternative NPSOV could substantially affect each asset's performance until a new equilibrium has been established. Such shifts must by definition be rare—otherwise NPSOVs would fail as stores of value—but should one eventually take place, much of our analysis would apply to any replacement for gold, digital or otherwise.

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[1] The sources we consulted to construct our estimates include the World Gold Council, MeasuringWorth, Eurostat, the Organisation for Economic Co-operation and Development (OECD), World Bank Group, the Maddison Database, the Maddison Project Database, the U.S. Bureau of Labor Statistics, Oregon State University, and American Antiquarian Society.

Turning this into a price forecast requires additional assumptions, and multiple approaches are possible.

Most importantly, we'd need an estimate of the long-term growth rate of wealth, which isn't easily observable. Based on a similar argument to the one above, we might assume that, at ultra-long horizons, wealth grows at the same rate as GDP (so, roughly 3% in real terms). However, it's also possible that wealth growth could diverge from GDP growth for years or decades at a time. Case in point, over the past 50 years, our measure of liquid wealth has grown 2.4 percentage points faster than GDP. If that were to continue, it would imply a medium-term real return above 5%—although the next 50 years could look different from the last 50, in either direction.

Additionally, the amount of mined gold isn't fixed, so gold's price return may be lower than its growth in aggregate value. Over our period, gold's supply has grown by approximately 1.6% per year, although some of this might already be incorporated into its price. On the other hand, some of this increase in supply would be counteracted if central banks were to continue to build their stockpiles during periods of geopolitical tension.

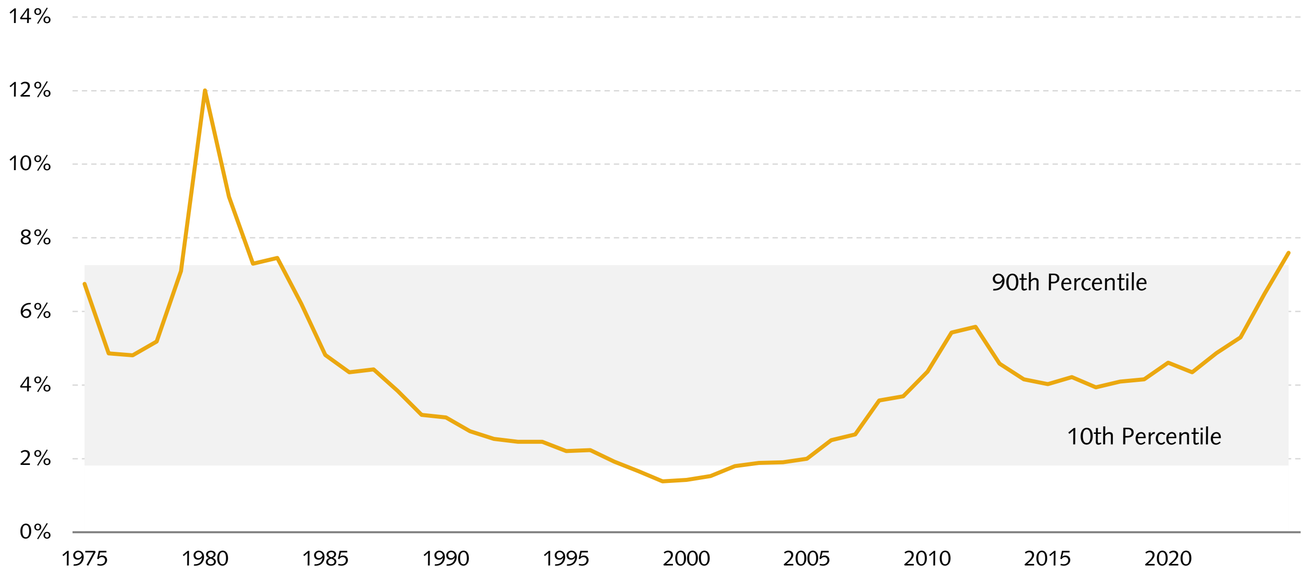
Depending on how we account for these variables, there's a range of plausible forecasts. For instance, we could assume real wealth grows by 3% annually, and that growth in gold supply subtracts 1.5% each year. This would result in an expected real return for gold of 1.5%, or 0% in excess of a real risk-free rate of 1.5%.

Alternatively, we could estimate that, for the foreseeable future, global wealth will continue to grow at an annualized rate of more than 5%, which after accounting for supply growth and the risk-free rate would lead to a forecast of 2%.

For our illustrative purposes, we'll use an excess return assumption of 0.5%, while acknowledging wide error bars around that estimate. For an estimate of gold's volatility, we'll use 15%, in line with empirical results.

With this risk-return profile, we might expect to find only modest utility in holding gold. However, optimizers often remind us that there's more to an asset than expected risk and return.

Figure 1: Gold as a Percentage of Developed Market Liquid Wealth (1975 – 2025)



Note: The shaded area represents values between the 10th and 90th percentiles of the historical distribution. Date range is selected due to data availability.

Sources: Bank for International Settlements; Coin Metrics; International Monetary Fund, Global Debt Database; U.S. Department of the Interior, Minerals Yearbook 1934; World Bank: World Development Indicators; World Gold Council; the D. E. Shaw group; applicable data used with permission of Bloomberg.

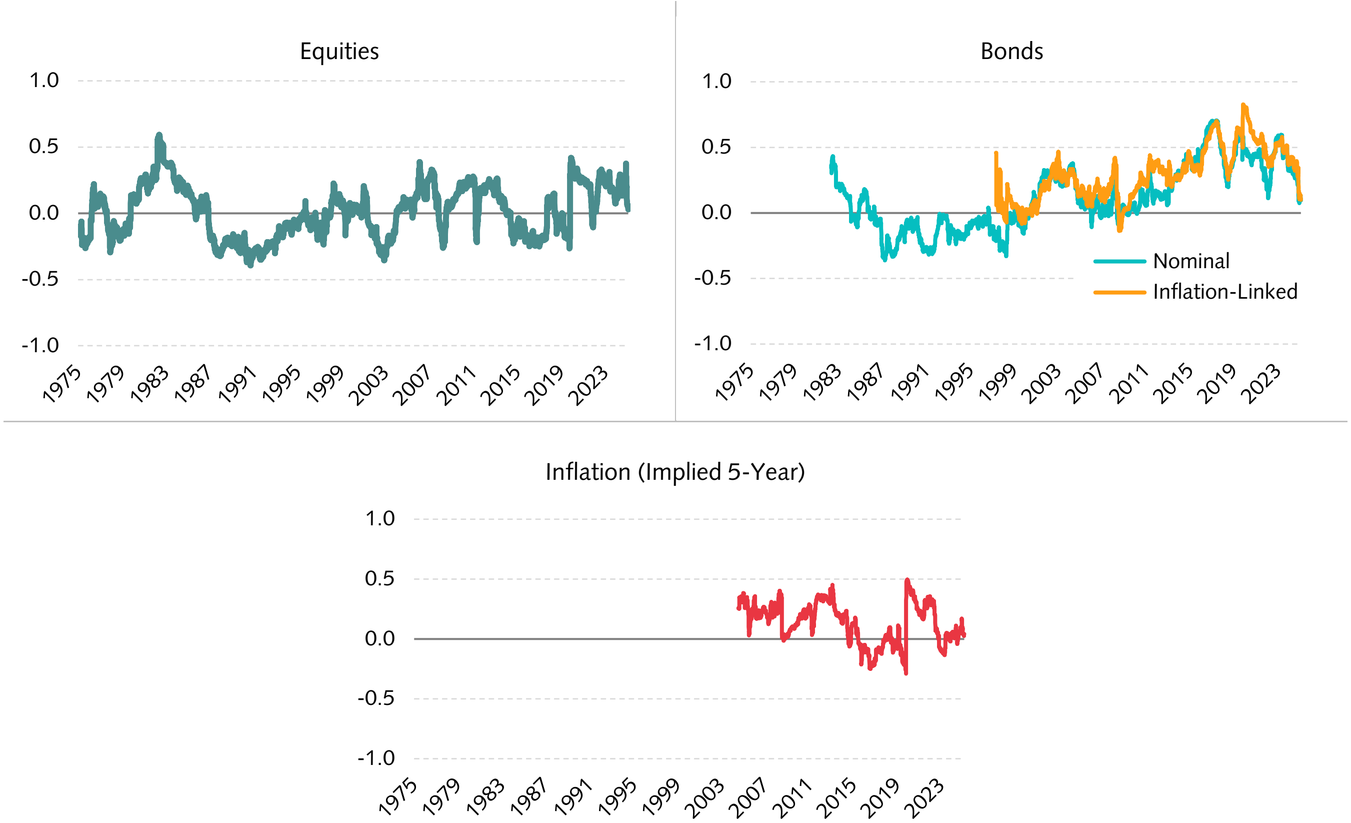
Correlations Matter

In theory, gold's returns should be correlated with certain key drivers, although those theoretical drivers often offset one another, and empirical evidence is mixed:

- *Real interest rates:* Opportunity cost is a key factor in determining gold's value, as every dollar allocated to gold is one that isn't earning (at least) the risk-free interest rate, or the additional spread earned by other risky assets. As a result, we'd expect gold's price to move inversely to real rates (implying a positive correlation with U.S. TIPS and likely to nominal bonds as well).
- *Economic growth:* The relationship between gold and growth is more complex. On one hand, we believe gold's value correlates with global wealth, implying a positive correlation to growth assets like equities. On the other, gold is often considered a safe haven, implying a negative correlation during elevated market volatility. Moreover, as a non-productive asset, gold should be less exposed to the traditional business cycle, including equity drawdowns. Given these offsetting forces, it's reasonable to assume there is a netting effect that dampens gold's correlation to stocks over time.
- *Inflation:* As a store of value, gold is generally expected to react to inflationary developments. However, this relationship may be confounded, or even canceled, by gold's negative correlation to real rates, which are themselves positively correlated to inflation. Gold's correlation to inflation often has been much closer to zero than is commonly supposed.

How well do these theoretical relationships map to reality? *Figure 2* plots the rolling correlations of gold to U.S. equities, nominal and inflation-linked Treasuries, and implied inflation.

Figure 2: Gold Correlations to Major Assets (1975 – 2025)



Note: Correlations are calculated using 5-day rolling returns and a 120-day half-life. Start dates of individual series are selected based on data availability.

Sources: the D. E. Shaw group; applicable data used with permission of Bloomberg.

Gold's relationship to stocks has been quite volatile, especially in recent years. Over the past five decades, the correlation has averaged 0.01 and changed sign numerous times, punctuated by periods of suddenly negative correlation during market crises (*e.g.*, the fall of 2008, August 2011, February 2020, and the spring of 2022). This supports our intuition that individual drivers of the relationship may dominate at different times, but generally net out over extended horizons. We will assume no correlation between gold and stocks.

Gold and inflation-linked bonds have shown a generally positive relationship over time, at least since the recovery from the Global Financial Crisis (GFC), also supporting our intuition. Gold's relationship to nominal bonds has broadly mirrored its relationship to TIPS, and the two have had an average correlation of 0.12 since 1982, when our data start. We will assume a 0.10 correlation between gold and bonds.

While we only have data going back to 2004, gold's relationship with inflation has generally been moderately positive, averaging 0.13 over this period. Notably, while the correlation increased somewhat between late-2021 and mid-2022, and again in April 2025, it remained well within its normal range during both periods. This supports our hypothesis above that gold's negative relationship to real rates may offset its positive expected relationship to inflation, at least to a point.

These (low) correlations matter. Gold's lack of significant exposure to equity risk offers potential utility to a portfolio otherwise dominated by stocks and bonds. This may be true even though, as suggested earlier, gold's expected risk-adjusted return does not compare favorably with those traditional assets. An optimizer finds notable value in a lowly-correlated asset like gold.

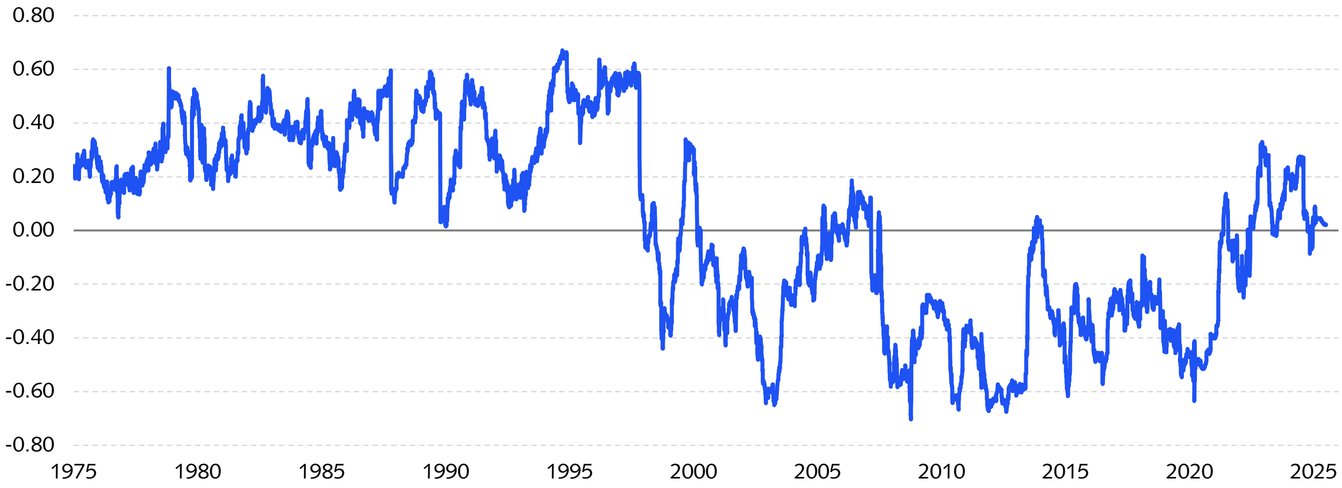
At the same time, it's not just gold's correlation to stocks and bonds that matters: We still need to account for their relationship with each other, one of the most important relationships for investors.

After being positive for much of the period from the 1970s through the 1990s, the stock-bond correlation became negative around the turn of the century and remained so for over two decades. In 2021, however, the stock-bond correlation began increasing, and even became positive for a time.

Given the ubiquity of these two assets across portfolios, we believe it's difficult to overstate the effects this change of sign can have, something we've discussed at length in previous pieces. In an environment where bonds are more highly correlated to stocks, the marginal portfolio utility of any asset that is uncorrelated to stocks goes up.

Thus, other things being equal, in a positive stock-bond correlation environment, the potential portfolio utility of gold increases, even if our forecast for gold remains unchanged.

Figure 3: Stock-Bond Correlation (1975 – 2025)



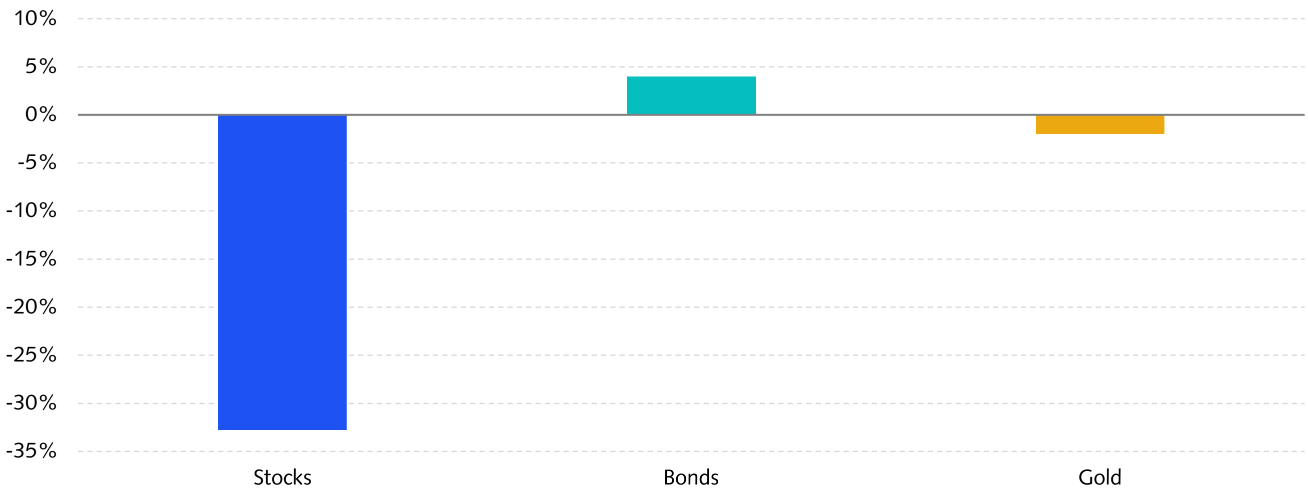
Note: Correlation is calculated using daily returns, a 6-month half-life, and a rolling 12-month window.

Sources: Haver Analytics; the D. E. Shaw group.

A Head for Tail Risk

Gold is widely considered a safe haven during periods of instability, as we've been vividly reminded in recent months. As can be seen in *Figure 4*, when equities have dropped 25% or more in less than three months, gold's average return has been -2%, notably better than that of equities (-33%) but worse than that of bonds (4%).

Figure 4: Average Returns During Equity Drawdowns (1990 – 2025)



Sources: the D. E. Shaw group; applicable data used with permission of Bloomberg.

Equity drawdowns aren't the only tail risk to which a multi-asset portfolio is exposed. Inflationary shocks, whether due to excess demand, supply chain issues, or tariffs, can be expected to be particularly painful for both stocks and bonds, and to provide a tailwind for real assets including gold. This means gold may be relatively more attractive to an optimizer during inflation events, although as noted above, gold's relationship to real rates may partially offset its utility as an inflation hedge.

Of course, gold can have its own tail events. As hypothesized earlier, if bitcoin (or any other asset) were to replace gold as the canonical NPSOV, gold could lose a substantial majority of its value, although it's unlikely to do so overnight. Alternatively, a material increase in supply growth could cause a severe drop in gold's price—to take just one example, an energy startup recently claimed that gold could be created as a byproduct of fusion reactions, although the results have yet to be verified. Were either event to occur, it's unlikely it would coincide with a crash in a portfolio's other assets. Gold's tendency to "crash differently" makes it more attractive.

Putting It All Together

We can use an optimizer to illustrate the impact of gold's return, correlation, and crash properties on its utility to a three-asset portfolio. We consider four scenarios: negative and positive stock-bond correlation environments, without and with crash considerations. The optimizer aims to maximize portfolio utility by accounting for expected returns, variance, and aversion to crash risk.[2]

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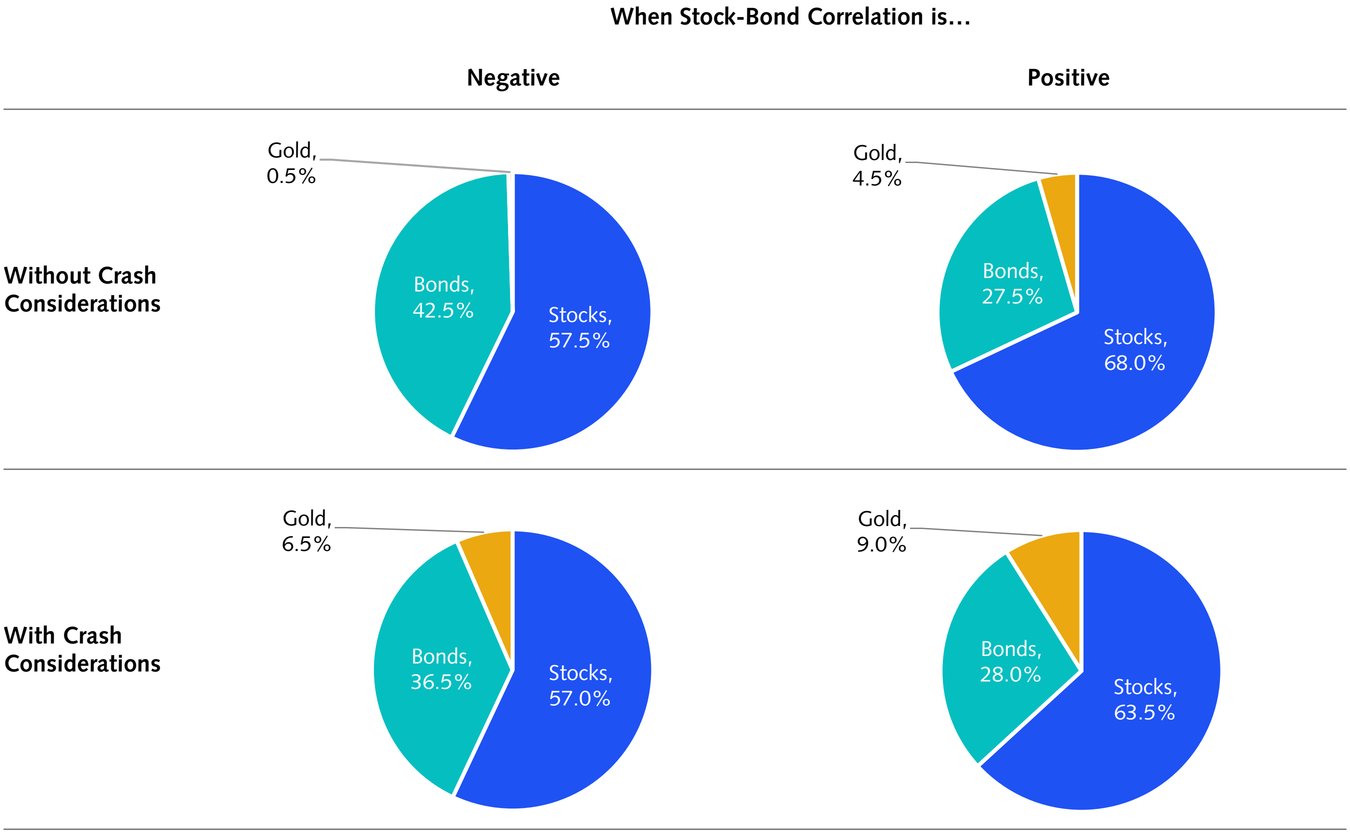
[2] The first two terms are standard in a mean-variance optimization framework. The third considers two scenarios: an equity market crash and an inflation spike.

For simplicity, we assume a long-only portfolio with fixed volatility, but similar intuition would apply without these constraints. As noted above, we present expected returns in excess of an assumed real risk-free rate of 1.5%.

Table 1: Stylized Optimization Inputs

	Equities	Bonds	Gold
E[R]	5.0%	1.0%	0.5%
E[σ]	15%	5%	15%
E[SR]	0.33	0.20	0.03
Correlation to Equities	1.00	-0.25/0.25	0.00
Correlation to Bonds	-0.25/0.25	1.00	0.10
Expected Performance in Equity Crash	-25%	5%	0%
Expected Performance in Inflation Shock	-10%	-10%	5%

Figure 5: Stylized Portfolio Risk Allocation



Note: Allocation amounts are rounded to the nearest 0.5%. As a result, the totals presented might not sum to 100%.

Source: the D. E. Shaw group.

In each of these four illustrative states, the optimizer allocates at least a modest amount of portfolio risk to gold, which may be surprising for a non-productive asset. Additionally, the optimizer shows clear sensitivity to assumptions of stock-bond correlation, as well as to consideration of potential crash scenarios. Specifically, the more exposed the portfolio is to risks like a positive stock-bond correlation, equity crashes, or inflation shocks, the more value the optimizer assigns to gold's diversification benefits. In fact, the optimizer allocates many times as much portfolio risk to gold when these considerations are incorporated, underscoring their importance.

This stylized illustration isn't meant to suggest that any of the above allocations is the "right" one. A more realistic example might include a range of additional considerations, including return objectives, risk aversion, liquidity, possible use of leverage, and other portfolio constraints, to say nothing of a broader range of assets. Additionally, as noted above, we've used an expected return estimate for gold based on an extremely long-run forecast with fairly wide error bars.

Conclusion

In the abstract, one might struggle to imagine a compelling pitch for an asset that never generates cashflows, has near-zero expected risk-adjusted real returns, and could theoretically lose all its value overnight.

Working with an optimizer reminds us that this intuition might miss the mark. It helps us see that gold's relative lack of productive applications is in fact a primary benefit, making gold broadly uncorrelated to pro-cyclical assets even as it grows along with global wealth. That diversifying property offers potential portfolio utility in a steady state.

Outside of the steady state, the optimizer also helps sensitize us to gold's additional utility when accounting for crash events, and perhaps especially in an environment in which both stocks and bonds are positively correlated, as was recently the case. What's more, the haven properties of gold could become increasingly important if the world becomes more geo-strategically fragmented and other reserve assets are perceived as less dependable or desirable. In any event, we believe quantifying any such assumptions—especially for an asset like gold—is key to determining its role in a portfolio.

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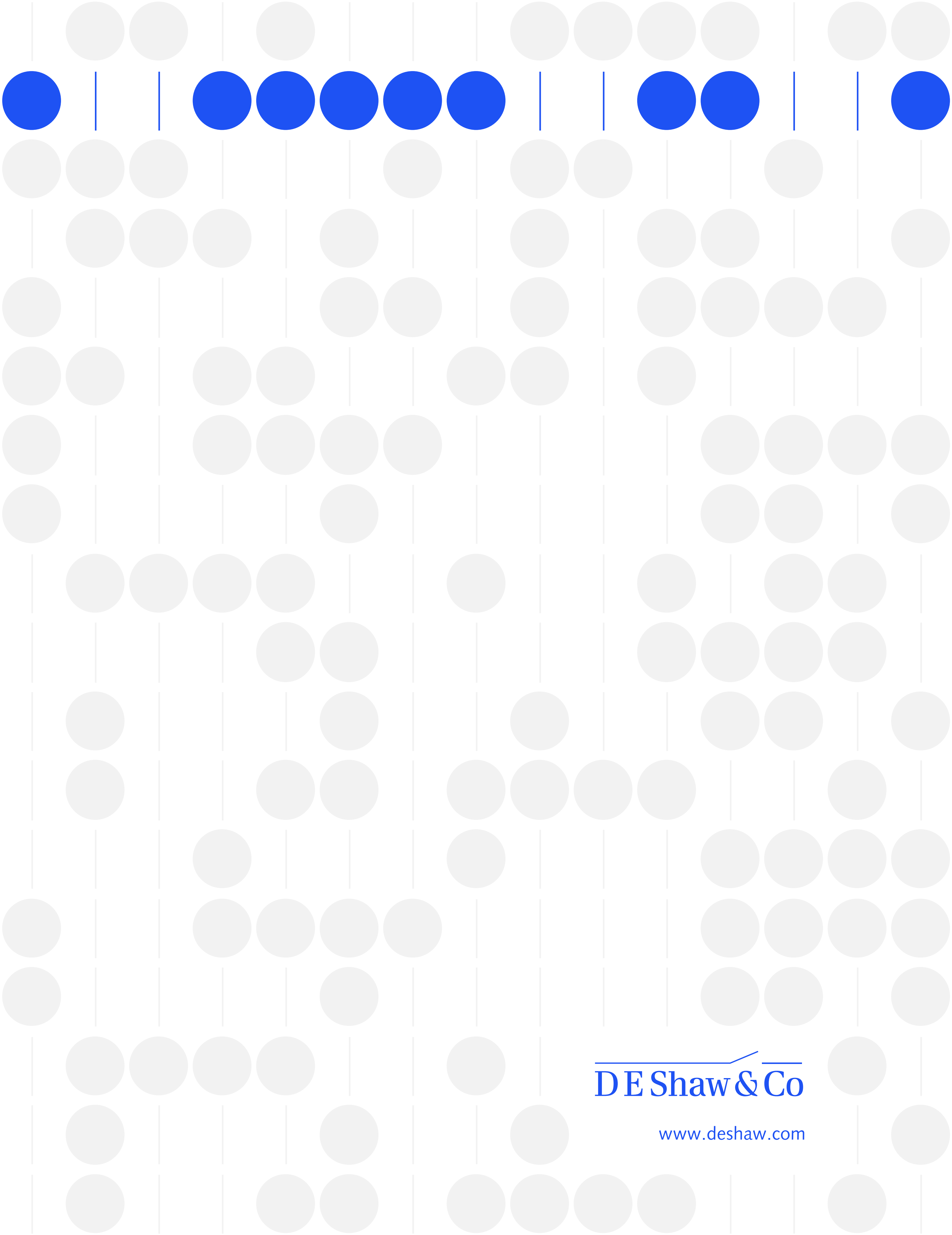

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