

# Portfolio Diversification Matters: Investing in Commodities

By Matthew Schwab, Head of Investor Solutions at Quantix Commodities

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Diversification is the foundation of modern portfolio theory. The standard "60/40" approach is based on the expectation that equities and bonds will have little to no correlation over time. The potential benefits of diversification are clear: higher returns and/or lower risk, with shallower drawdowns.

Since 2000, equities and bonds have been *negatively* correlated, further enhancing the benefits of diversification<sup>1</sup>. However, this is historically unusual: over the long term<sup>1</sup>, equities and bonds have been *positively* correlated most of the time.

If equity and bond correlations revert towards their historical norm, we believe that investors will need to look beyond the "60/40" for those diversification benefits, with a commodity investment a potential natural place to start.

To those who are concerned about recent disappointing investor experience with commodities, we argue that this is due to using the wrong tools rather than the wrong asset class.

Traditionally investors have been attracted to commodities for three core reasons:

**Returns**, the expectation of earning a risk premium over time as well as a view on commodity prices;

**Inflation**, the demonstrated ability of commodities to be an effective source of inflation protection; and

**Diversification**, differentiated return drivers historically generating the lack of correlation between returns of commodities and those of financial assets.

Quantix has previously written about the return potential going forward and commodities' better inflation hedging characteristics relative to other real assets. This paper focuses on the third reason: **Diversification**.

This is timely in the current environment as if ex-post correlations of equities and bonds are higher than ex-ante assumptions, combining the two assets can potentially result in *higher* risk and/or *lower* returns.

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<sup>1</sup>Source Quantix Commodities, please see Figure 2 for further details. Any asset allocation(s) mentioned or referenced herein are subject to change and do not guarantee a profit or protection from losses in a declining market. Investments, when sold, may be worth more or less than the original purchase price.

Investment in a private fund and related investment vehicles is speculative and involves risk, including the risk that the entire amount invested may be lost. Past performance is not necessarily indicative of future results.

The outline of this note is as follows:

- First we review the **historic diversification characteristics** of a traditional commodity index
- Then we examine **practical portfolio construction conclusions**, both ex-ante and ex-post
- Finally we look at **alternative tools** that investors can use to gain exposure to the diversification benefits without the (disappointing) performance of traditional commodity indices

Broadly speaking there are two main indices<sup>2</sup> used by institutional and retail investors to invest in commodities: the S&P Goldman Sachs Commodity Index (“S&P GSCI”) and the Bloomberg Commodity Index (“BCOM”), originally the Dow Jones-AIG Commodity Index. The former was launched in 1991 and the latter in 1998 and, while there are older indices dating to the late 1970s (such as the Bob Greer Commodity Index launched in 1978) and more recent custom indices, the S&P GSCI and BCOM are now, and have been, the main indices that investors use.

We discuss the index construction and history for both indices below but, for the purposes of the analysis in this note, we use BCOM due to its wider use (in our experience).

## Commodities as a portfolio diversifier

As noted above, one of the main reasons that institutional and retail investors alike have invested in commodities is because of their diversification characteristics relative to equities and bonds. Since the drivers of commodity returns, such as weather, generally differ from those financial assets, an investor would reasonably expect ex-ante returns to be uncorrelated, or at least to exhibit relatively low correlation.

Indeed that is what you have found over the period since 1960 (the start of the BCOM backtest):

*Figure 1: Historical Correlation of Commodities, Equities and Bonds*

<i>Correlation</i>	<i>BCOM TR</i>	<i>S&amp;P 500 TR</i>	<i>US 10Y TR</i>
<b>BCOM Total Return</b>	1.00	0.13	-0.16
<b>S&amp;P 500 Total Return</b>		1.00	0.07
<b>US 10Y Total Return</b>			1.00

*Source: Data from Bloomberg and Goldman Sachs, Calculations by Quantix Commodities. Average of the 36 month rolling correlations from February 1963 to November 2023. Please see page 13 for index definitions.*

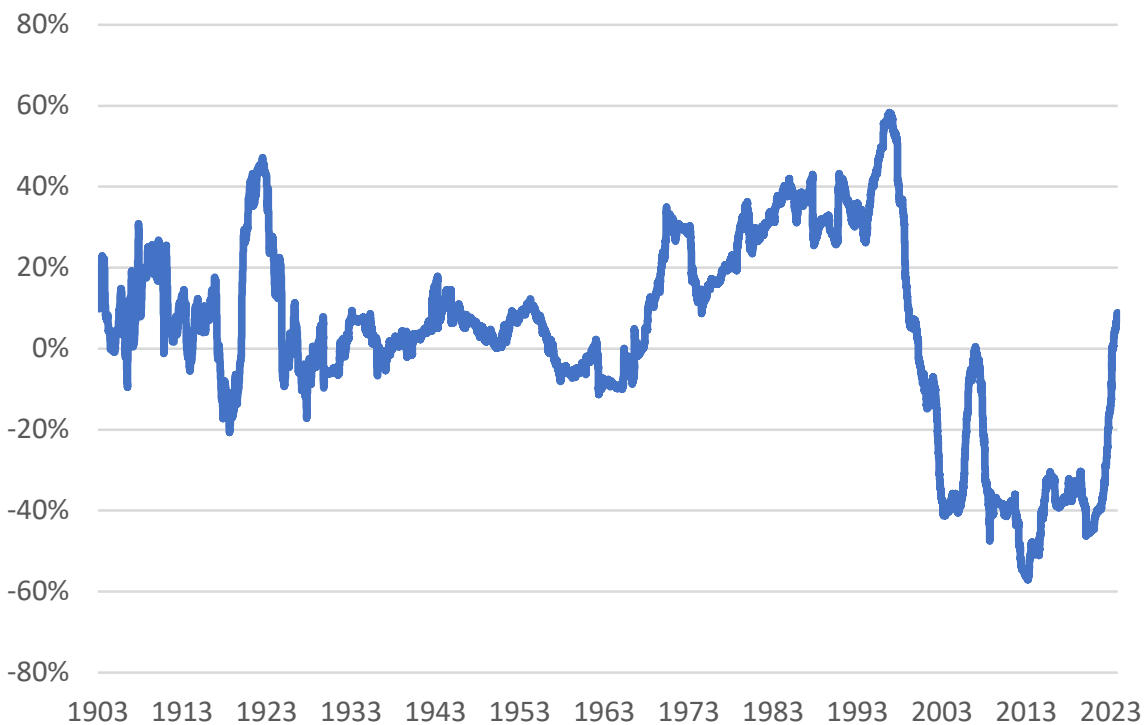
Two observations are evident from this table:

- **Commodities have exhibited low correlation to equities** (represented here and going forward by the S&P 500 Index Total Return) and negative correlation to bonds (represented here and going forward by the Total Return on the US 10 year bond)
- **Equities and bonds exhibited slightly positive correlation on average**, in contrast to the period since 2000

Taking the latter point first, we extend the analysis of rolling 3 year correlations between equities and bonds back to 1900, which yields results which may surprise some investors.

<sup>2</sup> Please see page 13 for index definitions.

Figure 2: Rolling 3 Year Daily Correlation of Equities and Bonds



Source: Data from Goldman Sachs Investment Research, Calculations by Quantix Commodities. Rolling 3 year daily correlation between US 10 year Treasury and the S&P500 from February 1903 to November 2023.

As can be seen from the above, the negative correlation between equities and bonds from 2000 to 2022 is a relatively recent phenomenon. For the majority of the time, equities and bonds have been *positively* correlated. This will become relevant when we look at the performance of commodities during different correlation regimes.

Specifically, looking at the period since 1960:

Figure 3: Historical Correlation of Equities / Bonds and Equities / Commodities

Correlation	Equities / Bonds	Equities / Commodity
Average	+7%	+13%
Average when Equity/Bond correlations are >7%	+30%	-1%
Average when Equity/Bond correlations are <7%	-30%	35%

Source: Data from Bloomberg, Calculations by Quantix. Average of 36 month rolling correlations February 1965 to November 2023.

**What is the initial takeaway from this? Commodities are a better portfolio diversifier when equity/bond correlations are above average.** What type of environment result in above average correlations?

Looking at data since 1923 (10 years after the inception of the CPI), we find that the correlation between equities and bonds is higher in environments of higher CPI.

Figure 3: Historical Correlation of Equities / Bonds in different CPI environments

Correlation	Equity/Fixed Income
Average	+7%
Average when YOY CPI > 3% (full period average)	+22%
Average when YOY CPI < 3% (full period average)	-2%

Source: Data from Bloomberg, Goldman Sachs, Calculations by Quantix. Average of 36 month rolling correlations December 1918 to November 2023.

This makes economic sense – when inflation rises, the Fed will generally raise the discount rate (and sell securities as necessary to affect that change) and use other tools to reduce the money supply and increase market interest rates, as it has done for more than a hundred years.

In this scenario, bond prices should fall and, as the “fair value” of equities is theoretically their discounted cash flows, so should those of equities.

The correlation between commodities and equities should fall in such a scenario because commodity prices are a key driver of inflation (hence their usefulness as a source of inflation protection).

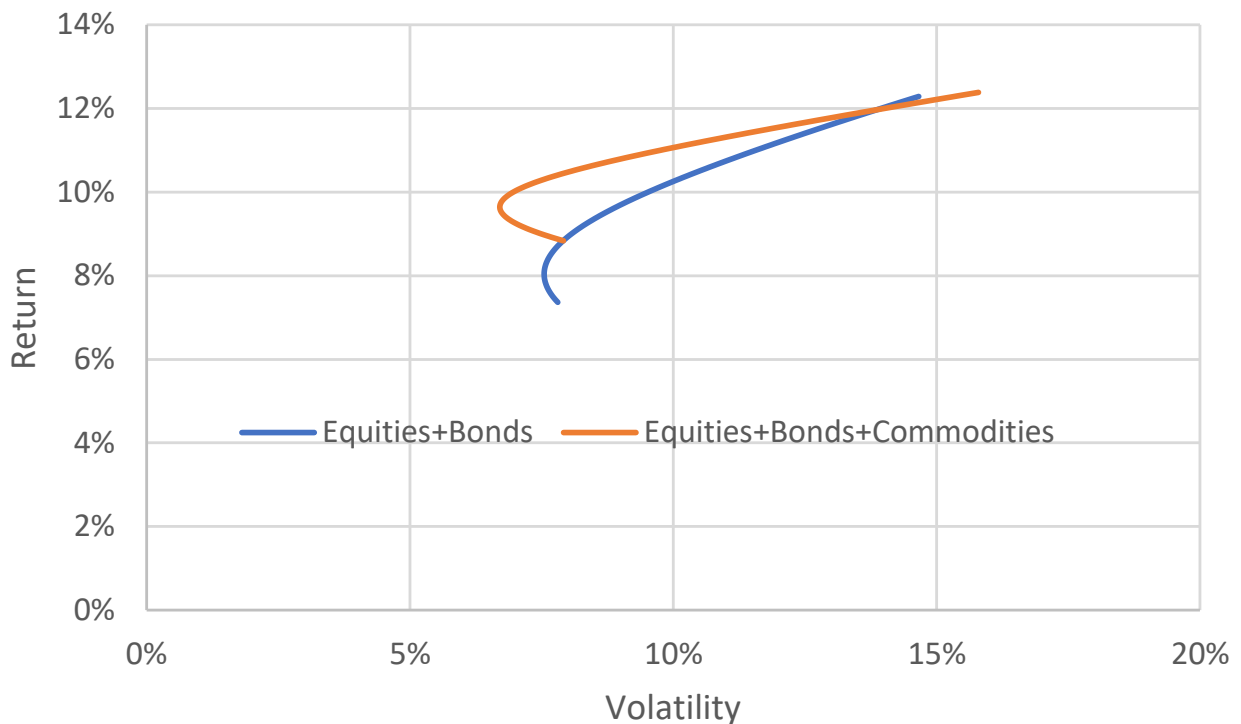
**In sum, history would potentially suggest that commodities provide the best portfolio diversification when equities and fixed income are non- or positively correlated (which is usually the case) and when inflation is above average.**

## Portfolio construction

Let us assume that an allocator reviewed this history in 2000 and decided to include commodities in their portfolio, they would have to decide what percentage to allocate to the asset class and where to take it from (assuming they were fully funding it). What would be the right amount to allocate to this asset class?

The standard way to answer this question would be to construct an efficient frontier. Using data from 1960 to 2000, we have constructed two sets of portfolios: one starting with 100% fixed income and incrementally adding equities to construct an optimal portfolio and one that adds commodities incrementally to that optimal portfolio.

Figure 4: Efficient Frontiers for Equities+Bonds and Equities+Bonds+Commodities



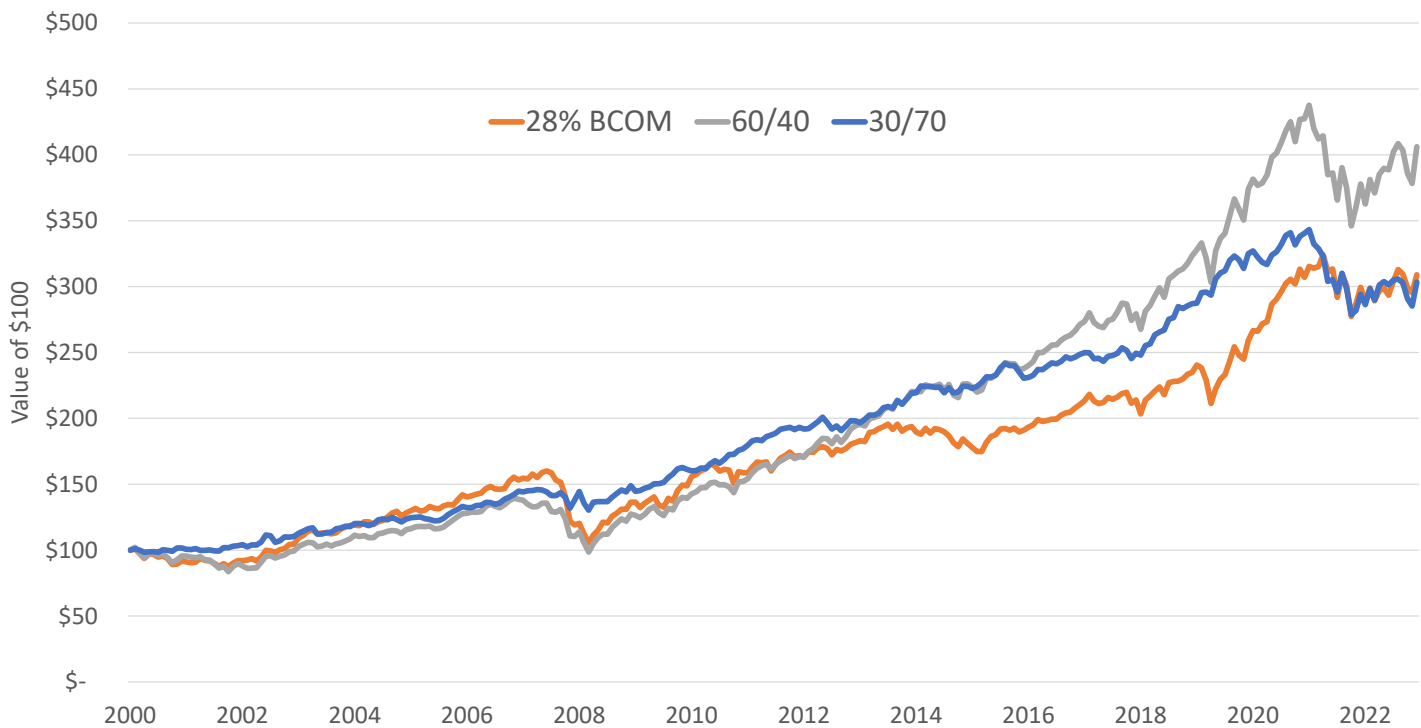
Source: Data from Bloomberg, Calculations by Quantix. Uses monthly returns from 1960 to 2000.

- The **Equities+Bonds portfolio** starts at 100% bonds with an annualized volatility of 7.8% and adds equities in 1% increments until the portfolio is 100% equities with an annualized volatility of 14.7%. The optimal return/volatility is 1.12 which would be the portfolio **which has 70% fixed income and 30% equities**.
- The **Equities+Bonds+Commodities portfolio** starts at the optimal portfolio (70/30) and gradually adds commodities (BCOMTR). The **optimal commodities allocation would have been 28%** with a historic return/volatility of 1.45
- Expected returns including commodities would have been 9.8% compared to 8.8% excluding commodities with an expected volatility of 6.8% compared to 7.9% respectively

Historically the portfolio which includes commodities would have had a *higher return with lower volatility* over the time period from 1960 to 2000.

Assuming one decided to invest in the **Equities+Bonds+Commodities** portfolio in 2000, and held it until today, returns would have been in line with the **Equities+Bonds** portfolio and lagged a “60/40” portfolio.

Figure 5: Relative performance of portfolios with and without commodities using BCOM



Source: Data from Bloomberg, Calculations by Quantix.

- The optimal **Equities+Bonds** portfolio, with 30% equities / 70% bonds, produced an annualized return of 5.1% with an annualized volatility of 6.3%, for a return/volatility ratio of 0.8, since 2000
- The “**traditional**” asset allocation portfolio with 60% equities and 40% bonds produced an annualized return of 6.5% with a annualized volatility of 9.1%, for a lower ratio of 0.7
- However, the **Equities+Bonds+Commodities** portfolio since 2000 has produced a lower annualized return of 5.4% with a higher annualized volatility of 9.2%, for a lower ratio of 0.6

So, notwithstanding the fact that including commodities in a portfolio would have been beneficial from 1960 to 2000, from 2000 to 2023 it would have been disappointing whether you consider it in absolute or risk adjusted terms. This is why many investors chose to reduce their commodities allocations in recent years.

But that is the past – what will the future look like? Will including commodities in a portfolio be good or bad for returns?

We believe there are a few reasons why the environment going forward may be different to the 2000 – 2023 period and that investors should consider including commodities in their portfolio:

1. The **negative correlation between equities and bonds since 2000 is historically unusual**
  - a. The largest (absolute value) rolling 3 year correlation between equities and bonds since 1903 was -57% in March of 2010
  - b. The average since 1903 is +4%
2. **The world may have already entered a period of sustainably higher inflation** for four reasons:
  - a. *The Energy Transition* – the world’s determination to shift to a lower carbon intensive economy will require massive investment. As this unprecedented transition is government driven, there are few examples to draw upon. That said, the American economy electrified once before – largely between 1880 and 1925 (by 1925 half of American homes had electric power). According to the Minneapolis Fed, between 1801 and 1880 the annual rate of inflation was -0.6% while between 1880 and 1925 it was 1.5%<sup>3</sup>, a difference of over 2% per year.
  - b. *De-globalization* – As the world shifts from “just in time” supplies to “just in case” and adopts new ideas such as “friendshoring”, global trade will most likely decline. Again, comparisons are imperfect, but according to the St. Louis Fed, inflation in the UK during the period of globalization - from the end of the Napoleonic Wars in 1816 until the beginning of World War I in 1914 - was -0.3%. From then until the beginning of the next era of globalization in 1989, it was 5.3%<sup>4</sup>
    - i. Closer to home, inflation in the US was -0.5% and 3.5% in respectively, according to the Minneapolis Fed<sup>5</sup>
  - c. *Cold War II* – Although the United States and China are far more intertwined than the US and USSR ever were, they have clearly shifted into a more adversarial posture with defense spending to follow. Similar commitments to increased defense spending can also be seen in Europe and Asia.
    - i. The increased demand for resources (both human and materiel) has historically led to higher levels of inflation. During the Cold War between 1945 and 1989, US inflation averaged 4.5% compared to 2.7% thereafter (again, according to the Minneapolis Fed<sup>6</sup>)
  - d. *Debt* – Although the circumstances are different from those in 1945, current US debt<sup>7</sup> to GDP exceeds the highs reached after World War II of 106%. Between that historic high and the Fed-Treasury Accord in March of 1953, the US inflation rate averaged 6.3% vs 3.6% thereafter<sup>5</sup> as the US grew the economy in nominal terms to drive down the Debt/GDP ratio
3. **Investors simply may not have had the proper tools to access the potentially beneficial characteristics of a commodity allocation** which we examine in more detail below.

<sup>3</sup> Source: Federal Reserve Bank of Minneapolis: <https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1800->

<sup>4</sup> Source: Federal Reserve Bank of St. Louis: <https://fred.stlouisfed.org>

<sup>5</sup> Source: Federal Reserve Bank of Minneapolis: <https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1800->

<sup>6</sup> Source: Federal Reserve Bank of Minneapolis: <https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1800->

<sup>7</sup> Source: Federal Reserve Bank of St. Louis: <https://fred.stlouisfed.org/series/FYPUGDA188S>

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## Practical considerations when investing in commodities

As we discussed above, the S&P GSCI and the BCOM are the two main commodity benchmarks, with the S&P GSCI being constructed first. At inception it was designed to connect producers (who were selling to Goldman Sachs to hedge production) with investors (who, according to the Keynesian theory of Normal Backwardation, should expect a return for providing a hedge, or price insurance, to producers).

Logically, it was weighted by global production of the relevant assets to reflect producer hedging requirements which resulted in an index that, much like the equity indices in Canada or Finland during the “dot-com boom”, was seriously skewed to one sector (in this case, Petroleum).

The BCOM was designed later to provide a more balanced exposure to commodities and did so with the same starting methodology but implementing various caps and floors on individual commodities and sectors.

Beyond that history, these indices share certain characteristics in common:

- Weights are based on liquidity and/or production
- They hold contracts at the front of the curve (generally the first or second nearby future)

**Both indices weight commodities based solely on liquidity and/or production and not on their return potential, inflation sensitivity or diversification value.**

- There is a significant impact on returns from a less-well understood feature of commodity markets; these indices generally represent positions in futures contracts close to the front of the curve which need to be “rolled” (selling the nearby contract and buying one incrementally further out) to avoid taking delivery.
  - o in a “contango” market, where the contract being rolled into is more expensive than the contract being rolled out of, if spot prices remain unchanged futures prices will gradually fall and converge to spot – this is called a negative “roll yield.”
  - o In contrast in a “backwardated” market, where the contract being rolled into is less expensive than the contract being rolled out of, if spot prices remain unchanged, futures prices will gradually rise and converge to spot – this is called a positive “roll yield.”
- Due to different storage costs and other market dynamics, different commodities will exhibit a greater or lesser tendency to contango or backwardation
  - o The best example is US (NYMEX Henry Hub futures) Natural Gas where the seasonal pattern of supply and demand (supply exceeds demand in the summer while demand exceeds supply in the winter) requires an incentive to store during the summer as without storage there would be insufficient gas in the winter. As storage is expensive, producers need to be compensated in the form of a *positive* roll yield on the short positions they hold against gas in storage. Unfortunately this results in a *negative* roll yield for (long) investors. Specifically, this has resulted in a negative roll yield of approximately 25%, on average, since the year 2000. In other words, if US Natural Gas starts the year at \$4, and if spot prices remain unchanged, investors have historically lost \$1 just from holding and rolling the exposure.

Beyond returns, it is also important to note that, much like the S&P 500 or the Bloomberg Aggregate<sup>8</sup>, commodity indices have historically not had an “investment thesis” but rather simply weight commodities using production and/or liquidity as a proxy for “market capitalization.”

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<sup>8</sup> Please see page 13 for index definitions.



In equities and bonds, even with the well documented fund flows from actively managed funds to passive alternatives, the majority of AUM still invests with an active manager who seeks to outperform a benchmark. Usually investors give managers a tracking error budget around a recognized benchmark. Can these markets provide a framework with which to look at active management around a benchmark in commodities beta?

Readers familiar with the invaluable SPIVA (“S&P Indices Vs. Active” Scorecard) produced by S&P Dow Jones Indices since 2002 will be aware that this is difficult to achieve in equities – 92% of Large-Cap funds underperformed the S&P 500 over the past 15 years<sup>9</sup>!

Let’s take one of the categories where active management performs best (according to the SPIVA scorecard) – Global Income Funds. These funds (according to the most recent scorecard) outperformed the Bloomberg Aggregate by 74bps per annum over the past 15 years<sup>10</sup>. For the purposes of our analysis, let’s round that to 100bps. If we assume that investors expect an IR of 0.5, this could allow for a tracking error budget of 200bps.

How would an active manager in commodities “spend” that tracking error budget?

- One common approach is to invest in deferred contracts instead of the front month contracts that the benchmark uses.
  - o The 3 month deferred index would have had an annualized tracking error to BCOM of 2.8% since 2000
  - o A manager could have “spent” their 200bps tracking error budget by investing ~70% in this index with ~30% in BCOM
- Another approach is to “spend” the tracking error budget by excluding a portion of the Natural Gas weight given the significant negative “roll yield” of that commodity.
  - o Such a portfolio would have had an annualized tracking error of 5.8% since 2000
  - o A manager could have “spent” their 200bps tracking error budget by investing ~30% in this modified BCOM portfolio and kept ~70% in the benchmark

These portfolios would have returned as follows:

Figure 6: Performance of “active” BCOM tracking portfolios

	BCOM	BCOM 3 Month Deferred Portfolio	BCOM excluding Natural Gas Portfolio
Annualized Return	0.6%	3.7%	1.6%
Annualized Volatility	15.9%	15.3%	15.5%
Sharpe Ratio	0.0	0.2	0.1

Source: Data from Bloomberg, Calculations by Quantix. Please see Index Definitions on page 13.

While the performance of these portfolios are better relative to BCOM, they are still poor relative to the history of BCOM prior to 2000 and that of other asset classes.

So is the problem the asset class? **No – the problem is the benchmark.**

<sup>9</sup> <https://www.spglobal.com/spdji/en/research-insights/spiva/>

<sup>10</sup> [https://www.spglobal.com/spdji/en/documents/spiva/spiva-us-mid-year-2023.pdf?force\\_download=true](https://www.spglobal.com/spdji/en/documents/spiva/spiva-us-mid-year-2023.pdf?force_download=true)

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## A Commodities Benchmark Built with Investors in Mind

As noted above the two main commodity indices both weight contracts based on production and liquidity and don't have an explicit "investment thesis." The Quantix Commodity Index (QCI)<sup>11</sup> is designed around an explicit "investment thesis"; if investors generally invest in commodities as a source of inflation protection *then the index weights should reflect the different inflation characteristics of the underlying commodities.*

In addition, commodities have different roll yields, which impact investor returns. Although Natural Gas, as noted above, is the most glaring example many other commodities exhibit persistent negative roll yields such as CBOT Soft Red Winter Wheat which has had a roll yield of -11% per annum over the past 10 years. Since investors will be buying and rolling commodity contracts, *the index weights should reflect this additional, significant source of return.*

However, *this philosophy is impossible to implement while keeping the concept of a tracking error to the BCOM.* As noted above, excluding just US Natural Gas can result in close to 6% annualized tracking error, beyond most investors' tracking error tolerance. So the final decision Quantix made was to throw out the concept of tracking error to possibly flawed benchmarks.

The QCI therefore has no concept of tracking error relative to BCOM. It starts with liquidity but aims to hold higher weights in commodities with a greater inflation sensitivity and a lower (higher) cost of negative (positive) roll yield. In doing so, we believe this should help investors get the diversification benefits of commodities without the potential performance issues associated with the traditional benchmarks.

In addition, reflecting the index experience of the Quantix team, QCI does not aim to minimize negative roll yield by investing in deferred contracts as outlined in the tracking error options above. Instead, if a commodity has significant negative roll yield, the QCI will reduce the weight (or not hold it) rather than invest at the same weight but in a more deferred contract. From our perspective, reducing that Natural Gas negative roll yield from 25% (in the front month) to 10% (in the six month deferred contract) just means that investor should expect to lose less money.

- At this point it is worth noting that as the traditional indices do not take roll yield into account they effectively reset their weights back to their starting point every year. So if the index starts with a weight of 10% in US Natural Gas and loses 25% because of a negative roll yield, it would generally increase the weight back up to 10%

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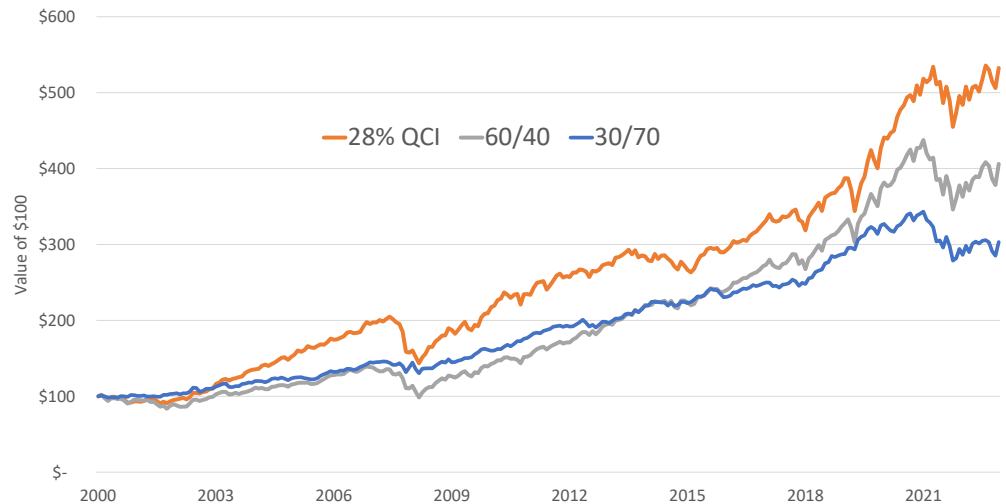
<sup>11</sup> Please see page 13 for Index Definitions.

Returning to the asset allocation examples above, and using a hypothetical backtest of the QCI, if one had invested the 28% commodities allocation in the QCI instead of BCOM, returns would have been higher than either the Equities+Bonds portfolio or a traditional 60/40 portfolio. These higher returns would have come with similar volatility to the BCOM portfolio.

Specifically, this portfolio would have returned 121bps per annum *above* the 60/40 portfolio compared to 119bps per annum *below* for the portfolio with 28% invested in BCOM.

Although our ratio of return to risk would have been 0.3 lower than the pre-2000 period, the 60/40 portfolio (excluding commodities) would *also* have had an 0.3 lower ratio suggesting that commodities – represented by the QCI – would have “done what it said on the tin” and produced *higher* returns with *lower* volatility.

Figure 7: Portfolios with and without commodities using the Quantix Commodity Index



Source: Data from Bloomberg and calculations by Quantix.

Moreover, for reasons noted above, we would expect (but obviously cannot guarantee) the inclusion of QCI to provide even greater benefits to a equity/fixed income portfolio going forward.

## Conclusion

Investors invest in commodities for a number of reasons, a crucial one of which is their beneficial portfolio effects due to the lack of correlation with traditional financial assets, as well as their inflation hedging characteristics. Commodities have historically been *most diversifying* when investors *need it the most* – when inflation drives equity and bond correlations higher.

Zero or positive correlation between equities and bonds has been the normal state for most of financial market history. The post-2000 low to negative correlation between them is historically an aberration and one should expect correlations to revert to their historical norm.

The disappointing performance of commodities both in absolute terms and as a diversifier since 2000 is, we believe, partly due to a combination of this lower correlation between equity and bonds but primarily that traditional benchmarks are potentially flawed and that those flaws filter through into active management.

If investors are attracted to the diversification characteristics of commodities (and their performance in different inflationary environments), we would argue that one needs to throw out the traditional benchmarks and start anew, with an index specifically designed to achieve their objectives such as QCI.

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## Contact Information

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**Quantix Commodities LP**

16 Old Track Road  
Greenwich, CT, 06830

t: +1.203.864.3388

[info@quantixcommodities.com](mailto:info@quantixcommodities.com)

[QUANTIXCOMMODITIES.COM](http://QUANTIXCOMMODITIES.COM)

**Don Casturo**

Founding Partner, Chief Investment Officer

**Tom Glanfield**

Founding Partner, Portfolio Manager

**Daniel Cepeda**

Founding Partner, Portfolio Manager

**Matthew Schwab**

Head of Investor Solutions

**Daniel Cole**

Global Head of Business Development

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## Index Definitions

“BCOM”: The Bloomberg Commodity Index, formerly known as the Dow Jones-AIG Commodity Index. The Bloomberg Commodity Total Return index is composed of futures contracts and reflects the returns on a fully collateralized investment in the BCOM. This combines the returns of the BCOM with the returns on cash collateral invested in 13 week (3 Month) U.S. Treasury Bills.

“S&P GSCI” or “SPGSCI”: The Standard & Poors Goldman Sachs Commodity Index. The S&P GSCI Total Return Index in USD is widely recognized as the leading measure of general commodity price movements and inflation in the world economy. Index is calculated primarily on a world production weighted basis, comprised of the principal physical commodities futures contracts.

“Bob Greer Commodity Index”: the BGCI index, created by commodity expert Bob Greer and published in 1978.

“S&P 500”: The Standard and Poor’s 500 (S&P 500) is a stock market index tracking the stock performance of 500 large companies listed on stock exchanges in the United States.

“US 10Yr Treasury”: The 10-year Treasury note is a debt obligation issued by the U.S. government with a maturity of 10 years upon initial issuance.

“Bloomberg Aggregate”: The Bloomberg U.S. Aggregate Fixed Income Index, “the Agg” is a broad-based flagship benchmark that measures the investment grade, US dollar-denominated, fixed-rate taxable bond market. The index includes Treasuries, government-related and corporate securities, MBS (agency fixed-rate pass-throughs), ABS and CMBS (agency and non-agency). The BCOM 3 Month Deferred Portfolio: three-month forward version of BCOM calculated as described in Appendix J of the Bloomberg Methodology ([https://data.bloomberglp.com/indices/sites/2/2015/12/BCOM-Methodology-January-2016\\_FINAL.Updated.pdf](https://data.bloomberglp.com/indices/sites/2/2015/12/BCOM-Methodology-January-2016_FINAL.Updated.pdf)).

“QCI”: The Quantix Commodity Index. is a dynamic commodity index with the objective of being a broadly diversified commodity exposure and inflation hedge for investors. Unlike traditional commodity indices, which use volume or production data to determine weights, the QCI has been designed with the goal of increasing the correlation to inflation and reducing the cost of carry over time.

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