

# Street View

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BY GERARDO MANZO & JEFFREY N. SARET

## EXECUTIVE SUMMARY

The cost of rolling futures contracts, rather than the decline in commodity prices, has been the largest drag on commodity index performance over the past 10 years. Although difficult to implement, asset allocators' best response may be to develop dynamic execution strategies to mitigate the roll return "tax."

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**Inside:**  
**The Commodity Futures Roll Return 'Tax':  
Addressing a Recent Headwind**

**That commodity index returns have suffered both during 2017 and the past decade likely comes as no surprise to asset allocators.** What may surprise some is *how* commodity indices have suffered.

Take the S&P GSCI Total Return Index as an example. The index has declined 2.38 percent year-to-date and 57.7 percent since 2007, but the spot prices of the underlying commodities have increased by 0.88 percent year-to-date and only fallen by 6.53 percent since 2007.<sup>1</sup> In other words, the largest drag on commodity index performance has not been the decline in commodity prices but rather the cost of rolling futures contracts in order to hold those positions.

This negative drag exists at both the aggregate level (e.g., S&P GSCI Index) and for most individual commodity indices (e.g., agriculture and energy indices). Asset allocators trying to maintain a persistent exposure to commodities might want to bear in mind the magnitude of the headwinds of rolling futures contracts that has in the past persistently affected portfolio returns.

## DECOMPOSITION OF TOTAL INDEX RETURNS

Academic research like Erb and Harvey (2006) highlights the problem. The total return to a commodity index decomposes into three parts:<sup>2</sup>

$$\text{Total Return} \approx \text{Spot Price Return} + \text{Futures Roll Yield} + \text{Collateral Return}$$

or

$$\text{Excess Return} \approx \text{Spot Price Return} + \text{Futures Roll Yield}$$

where the collateral return equals the return to investing in US Treasury bills. Figure 1 plots each of these terms since 1970 for the monthly S&P GSCI Index.

FIGURE 1 - S&P GSCI EXCESS RETURN, SPOT RETURN, COLLATERAL RETURN, AND ROLL YIELD

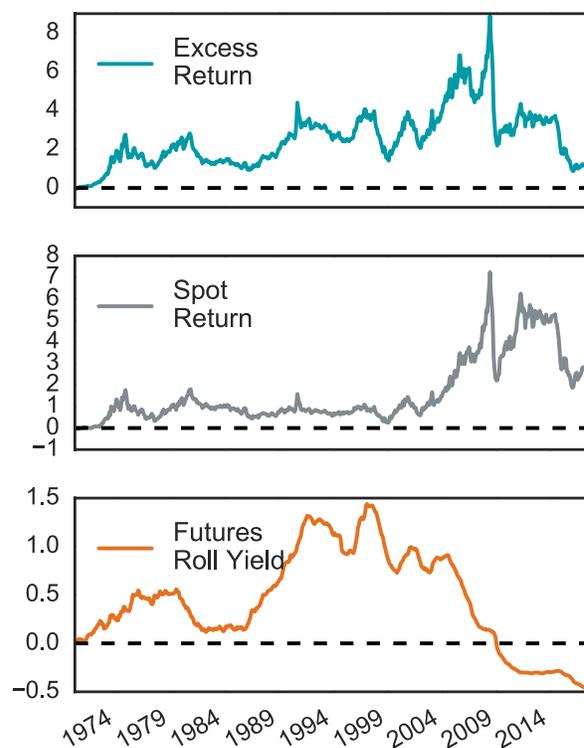


Figure 1 – S&P GSCI Excess Return, Spot Return, Collateral Return, and Roll Yield. Cumulative values. Source: Bloomberg and authors' computation.

The figure highlights two important facts. First, spot returns fluctuated in a relatively tight band between 1970 and 2004, during which time the roll returns were positive. As a result, an allocator with a persistent exposure to commodities via the S&P GSCI Index during those three-plus decades would have benefitted from price increases in both the underlying commodities and from rolling futures contracts in backwardation. Second, the period since 2004 has been characterized by higher spot return volatility and negative average roll return (about -10 percent from 2004 to 2017).

1 The indices are sampled monthly, using the end-of-month most available observation.

2 In general, this total return decomposition is true for any investment in futures, such as equity and bond futures. Moreover, the relation does not hold with equality because the S&P GSCI spot index is not tradable and the collateral return is implicit in the clearing mechanism.

## HOW CAN AN ALLOCATOR RESPOND TO NEGATIVE ROLL RETURNS?

An obvious question is why roll returns remain persistently negative. Unfortunately, some of the obvious answers seem incomplete. For example, Mou (2011) posits that GSCI's published roll-rules allows arbitragers to front-run the index. That argument may be true at some level—publicly declaring when and how much to trade seems like a suboptimal approach—but a simple arbitrage strategy that persists for more than a decade strains even weak formulations of the efficient market hypothesis.

Perhaps a more important question than why roll returns have been so negative for the past decade is what an asset allocator who wants persistent exposure to commodities can do about it. One option is to pay the roll return “tax” and accept that as the cost of holding commodity exposure. Another option is to buy and store physical commodities. A third option is to develop execution strategies that look like a dynamic game—i.e., optimize a function that outputs a roll date and volume for each commodity, based on expected transaction costs. Transaction costs usually vary as a function of future spreads, volume, volatility, and other variables, making this dynamic game an uncertain one. This last option is not easy to implement, but it could lend itself to data analysis and systematic strategies.

## GLOSSARY<sup>3</sup>

S&P GSCI **Total Return** Index: measures the returns accrued from investing in fully-collateralized nearby commodity futures.

S&P GSCI **Excess Return** Index: measures the returns accrued from investing in uncollateralized nearby commodity futures.

S&P GSCI **Spot Return** Index: measures the level of nearby commodity prices.

**Backwardation:** the condition in futures markets wherein the price of a commodities' futures contract is trading below the expected spot price at contract maturity. This also refers to a downward-sloping term structure of futures contracts.

**Contango:** the condition in futures markets wherein the price of a commodities' futures contract is trading above the expected spot price at contract maturity. This also refers to an upward-sloping term structure of futures contracts.

**Roll return:** represents the net benefit or cost of owning the underlying asset beyond moves in the spot price itself (CME Group, 2014).

## REFERENCES

Erb, Claude B., and Campbell R. Harvey. "The strategic and tactical value of commodity futures." *Financial Analysts Journal* 62.2 (2006): 69-97.

Mou, Yiqun. "Limits to arbitrage and commodity index investment: front-running the Goldman roll." (2011).

CME Group. "Deconstructing Futures Returns: The Role of Roll Yield." *Campbell White Paper Series*. (2014)

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<sup>3</sup> The definitions of the S&P GSCI Indices can be found here: <http://www.goldmansachs.com/what-we-do/securities/products-and-business-groups/products/gsci/components-weights-index-levels.html>

## INTERESTING TECHNOLOGY-RELATED ARTICLES

Two Sigma views itself as a technology company that applies a rigorous, scientific method-based approach to investment management. Our technology is inspired by a diverse set of fields including artificial intelligence and distributed computing. Occasionally, we read articles in the popular press that describe applications of technology that we find interesting, thought-provoking, and relevant for people thinking about improving the investment management process. Below is a subset of the articles we read this month. Please do not view the inclusion of these articles as an endorsement by Two Sigma of their viewpoints or the companies discussed therein. Two Sigma welcomes discussions (and contributions) about these and other such technology-related articles.

**“How Blockchain Could Give Us a Smarter Energy Grid”** by Mike Orcutt

<https://www.technologyreview.com/s/609077/how-blockchain-could-give-us-a-smarter-energy-grid/>

Blockchain, the distributed, encrypted ledger system underpinning cryptocurrencies like Bitcoin, has potential applications in almost any endeavor involving contracts and counterparties, since it can increase efficiency by eliminating intermediaries. Among its potential uses is to mitigate red tape and data-management problems plaguing the renewable energy sector. Currently, trading in clean energy depends on a byzantine system of certificates involving numerous different registries, brokers, and other intermediaries—a system that lacks transparency, is prone to accounting errors, and reduces incentives to invest in clean energy projects. Blockchain technology could ameliorate these issues and potentially even ease the way toward a decentralized system of clean electricity production from the generally centralized and inefficient power grid systems predominant today.

**“China seeks dominance of global AI industry”** by Louise Lucas

<https://www.ft.com/content/856753d6-8d31-11e7-a352-e46f43c5825d?mhq5j=e7>

While the U.S. artificial intelligence industry currently dwarfs that of China, the Chinese government is making development of its AI ecosystem a strategic priority. According to a July [“State Council Notice on the Issuance of the Next Generation Artificial Intelligence Development Plan”](#) and subsequent reporting, China aims to grow its AI sector to \$150 billion by 2030, through a combination of investments in state-owned enterprises (SOEs), universities, and promising private companies, as well as by encouraging the hiring of leading AI experts from overseas. Like other nations, China sees AI as having a potentially enormous economic and military impact, and sees an opportunity to create an advantage as other countries scale back their national research budgets.

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