

Keeping Real Assets Real

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What are real assets? They are assets that retain purchasing power when paper currencies lose buying power. That is, real assets increase in nominal price at least as fast as inflation. In contrast, traditional capital assets – stocks and bonds – have historically lost buying power during inflationary episodes.

The investment benefits of real assets differ from those of capital assets. We will describe these differences. Then we will discuss what assets belong in a real asset portfolio, and why some perceived real asset substitutes fall short of the twin goals of retaining purchasing power and diversifying portfolios. Investors are better served to keep it simple and get exposure to genuine real assets.

We believe, based on economic theory, that the historical differences we document between real and capital assets are likely to continue to hold going forward, and are not unreliable conclusions drawn from data analysis. Instead of relying exclusively on historical performance, we will describe an economic framework that distinguishes capital from real assets. Because consumers, producers, and the limitations of physical storage are responsible for creating the distinctions, we believe these distinctions will sustain into the future as long as commodities are produced for human consumption – even if “markets converge” or real assets attract more attention.

Real asset returns are driven by inventory imbalances and, for gold, by the so-called “Gibson’s Paradox” mechanism.¹ In contrast, capital assets, as financial claims with long duration, have prices that are grounded in expectations and discounting. Any revision in expectations about future payments to investors, interest rates, or risk premia over the duration of the payout schedule changes the price of capital assets. As a result, changes in the cost of a firm’s physical assets or cost of raw materials do not pass through dollar-for-dollar to its equity or debt investors.

IDENTIFYING REAL ASSETS

1. Inflation Hedging

As shown in Figure 1, diversified stock, bond, and real estate investment trust (“REIT”) portfolios failed to maintain their real buying power during periods of rising inflation. This is because stocks and bonds are claims on multi-year duration cash streams. Their prices fluctuate with expectations about the buying power of

¹ Gibson’s Paradox (in brief): In a free market gold prices should move inversely with real interest rates.

Commodities and TIPS have the potential to hedge and diversify a stock and bond portfolio

future cash flows, interest rates, and risk premiums. REIT shares behave like stocks because they are equity investments in mid- and small-cap companies.

The right side of Figure 1 shows that commodities (represented in Figure 1 by the S&P GSCI Index) have historically earned outsized real returns during periods of rising inflation – in contrast to stocks and bonds. This is the well known inflation-hedging property of commodities: on average during inflationary periods, they tend to generate positive returns that exceed the rate of inflation. During periods of rising inflation, commodities are expected to provide spillover inflation protection that can help make up for losses in buying power of the stock and bond components of a well-diversified portfolio.

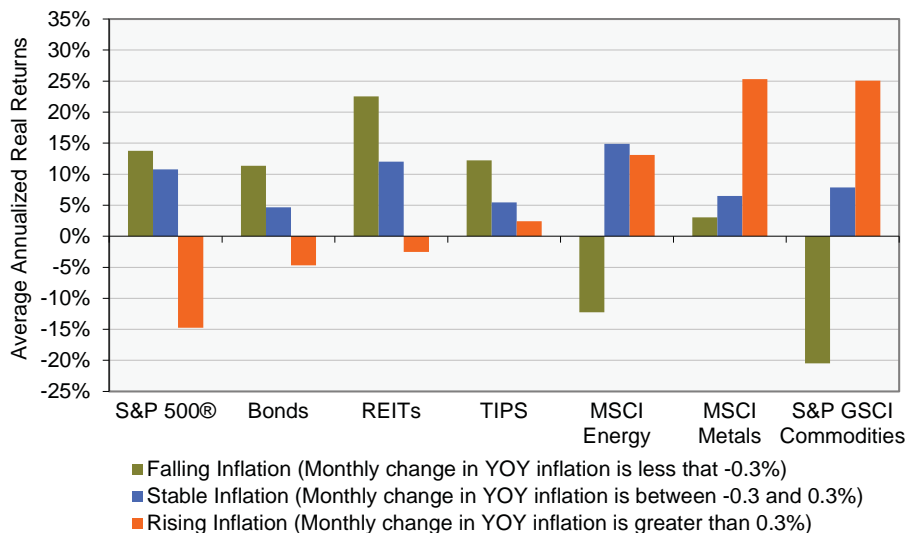
The middle of Figure 1 shows the response of long duration Treasury Inflation-Protected Securities (“TIPS”) and specialized stock portfolios of energy and metal stocks that are sometimes advertised as liquid alternatives to real assets. As indicated, long duration TIPS do retain their real value during rising inflation. However, their performance during rising inflation is not as nearly as good as that of commodities. This means that TIPS – as they were designed to do – retain buying power during rising inflation. However, they are unable to provide the spillover inflation protection that commodities can provide.

**Figure 1: Real Returns by Change in Inflation
January 1974 – November 2010**

In contrast to stocks and bonds, commodities have historically earned outside real returns during periods of rising inflation.

Indexes:

Stocks = S&P 500® Composite Total Return Index
Bonds = Barclays Capital U.S. Aggregate Bond Index
REITs = FTSE EPRA/NAREIT United States Index
TIPS = Barclays Capital U.S. 10+ Year Total Return Index
MSCI Energy = MSCI World Energy Net Return Index
MSCI Metals = MSCI World Metals and Mining Net Return Index
S&P GSCI Commodities = S&P GSCI Index



Data sources: Thomson Reuters Datastream, Bloomberg, Mellon Capital

Like commodities, energy and metal stocks (represented in Figure 1 by the MSCI Energy and MSCI Metals indices) outperform during rising inflation. In this sense, baskets of selected energy and metal stocks behave like commodities. However, as we shall show below, energy and metals stocks are highly correlated to other stocks. Commodity-related stocks and REITs do not provide the diversification benefit that physical commodities or physical real estate does.

2. Diversification

The second benefit of real assets comes from their status as “alternative” assets, so named to highlight their historically low correlation to traditional capital assets. That is, genuine real assets have an ability to diversify stock and bond portfolios. While this second feature is not typically part of a traditional textbook definition of a real asset, it is a desirable benefit we believe institutional investors want and, with properly designed real asset portfolios, can potentially achieve. Hence, we will regard this to be an essential real asset benefit in the rest of this paper.

Figure 2 shows the correlations of TIPS, energy and metals stocks, REITs, and commodities to a 60% stock/40% bond portfolio. As indicated, the energy and metals stock portfolios and REITs are highly correlated to the 60/40 portfolio. These high correlations are not surprising; commodity stocks and REITs are small- and mid-cap stocks that strongly correlate to the traditional stock-bond portfolio. Consequently, commodity-related stocks historically have not diversified a traditional stocks and bonds portfolio.

In contrast, TIPS and commodities do diversify stock-bond portfolios. As indicated in Figure 2, they have had relatively low correlation to stocks and bonds over the last ten years. TIPS have low correlation despite the fact that the 60/40 portfolio is comprised of 40% nominal bonds.

Figure 2: Correlation of Assets to a Portfolio of 60% Stocks and 40% Bonds
January 2001 – December 2010

TIPS and commodities have diversified a 60% stocks/40% bond portfolio.

Indexes:

Stocks = S&P 500® Composite Total Return Index

Bonds = Barclays Capital US Aggregate Bond Index

TIPS = Barclays Capital US 10+ Year Total Return Index

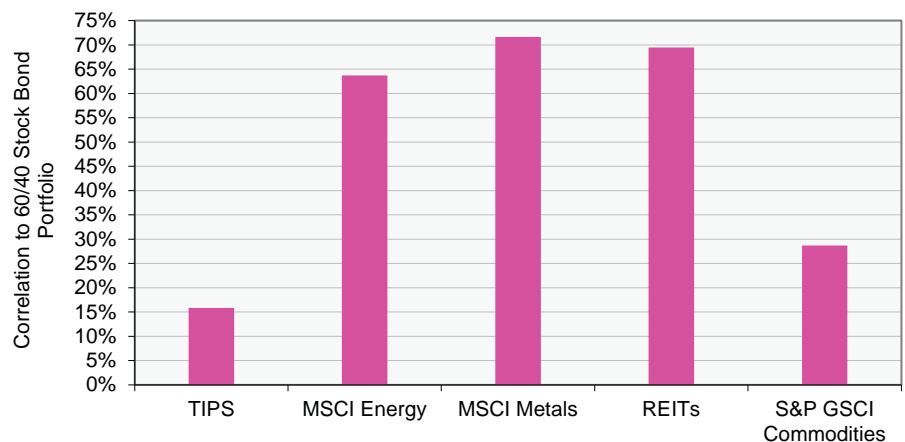
MSCI Energy = MSCI World Energy Net Return Index

MSCI Metals = MSCI World Metals and Mining Net Return Index

REITs = FTSE EPRA/NAREIT United States Index

S&P GSCI Commodities = S&P GSCI Index

Data sources: Thomson Reuters Datastream, Bloomberg, Mellon Capital



ECONOMIC FUNDAMENTALS DRIVE ASSET FEATURES

Since Figure 2 is based on historical data, investors should question whether these correlations (or lack thereof) will persist into the future. Some may ask, “Aren’t markets converging?” We too are skeptical about statistical claims that are not grounded in common economic sense. In this section, we will describe a structural economic framework that explains why we believe commodities are better – and expected to remain better – inflation hedgers and diversifiers than commodity-related stocks.

We believe that commodities will continue to diversify stock and bond portfolios going forward because commodities respond to economic growth and inflation differently than capital assets. Figure 3 depicts our view of the best-to-worst expected relative performance of stocks, bonds, commodities, and TIPS over four economic regimes. Inflation is low or falling on the left-hand side of the Figure. Low or falling inflation tends to favor the performance of stocks and bonds and disfavors commodities and TIPS. In the Goldilocks regime (low inflation plus real growth), stock prices typically rise in response to real growth (or the prospect of rising growth) while TIPS, which do not benefit from growth, underperform. In the Too Cold regime, we expect bonds to outperform because low growth causes capital to migrate away from stocks into bonds, a fall-back asset. Commodities tend to underperform due to low or falling consumption demand in this regime. On the right-hand side of the Figure, high or rising inflation favors the performance of commodities and TIPS, and disfavors stocks and bonds. In the Too Hot regime, growth drives consumption demand, which normally supports rising commodity

prices and drains capital away from bonds, which underperform. In the Stagflation regime, low or falling growth depresses consumption demand for commodities and favors TIPS, which are self-protected against inflation. In this regime, the low or falling growth causes capital to migrate away from stocks into TIPS and commodities.

Figure 3: Past Trends in Asset Performance in Four Economic Climates

Best (top) to worst (bottom) performing assets historically in four economic regimes. Because capital assets (stocks, bonds, and TIPS) are forward-looking and have durations that exceed the regimes' lifetimes, their performance may anticipate switches to the subsequent regime. Hence, the rankings shown may not reflect performance in the final months or weeks of a regime.

Data source: Based on Mellon Capital research

		Inflation	
		Low or Falling	High or Rising
Real Growth	High or Rising	<p style="text-align: center;">Goldilocks</p> <p>Stocks Commodities, Bonds TIPS</p>	<p style="text-align: center;">Too Hot</p> <p>Commodities Stocks, TIPS Bonds</p>
	Low or Falling	<p style="text-align: center;">Too Cold</p> <p>Bonds TIPS, Stocks Commodities</p>	<p style="text-align: center;">Stagflation</p> <p>TIPS Bonds, Commodities Stocks</p>

The rankings presented in Figure 3 should be taken with a grain of salt since markets anticipate regime changes. Because capital assets (stocks, bonds, and TIPS) have durations that exceed the regimes' lifetimes, their performance may reflect anticipated switches to the subsequent regime. As a result, return performance during a regime's late stage may deviate from what's listed in the Figure because the market is anticipating regime change ahead of the actual event. Hence, the Figure 3 rankings should be interpreted as conditional on market beliefs about subsequent regime changes.

To further complicate matters, the economy does not cycle through each of the four regimes in a predictable or chronological way. For instance, the U.S. has avoided stagflation since the 1970s and early 1980s even though there have been several periods of Too Hot (or expansion) and Too Cold (or recession) since then. It is also possible to have double-peak Goldilocks or double-dip Too Cold regimes. Hence, when and whether markets anticipate and react to the next regime change varies from one occurrence to the next. Capital asset returns may respond to the next regime change months ahead of time or not until after the fact. Accordingly, capital asset returns vary with expectations and revising expectations.

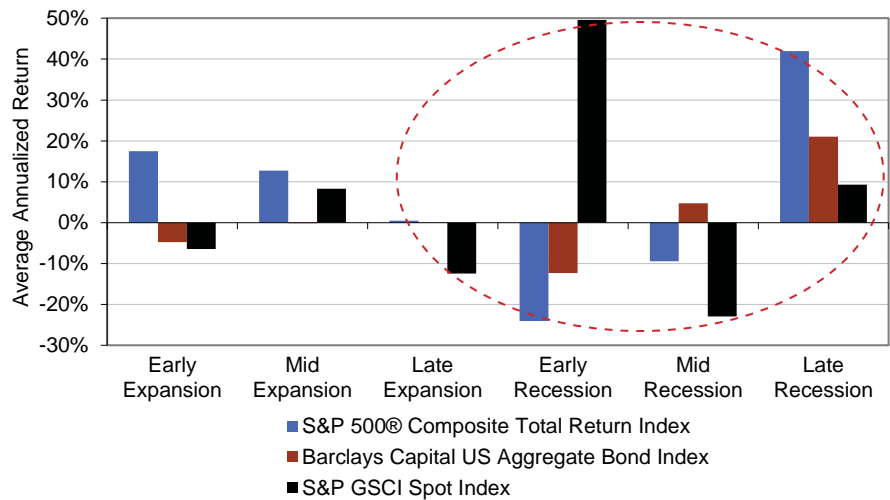
We conclude this section by examining how stocks, bonds, and commodities have historically performed over different stages of the business cycle from 1973 through 2010.² TIPS are excluded because their more limited history includes only two recessions. Again we see that commodities respond to economic conditions differently than stocks and bonds. In Figure 4, commodities diversify stocks and bonds late in expansions and early in recessions, when growth is flattening or slowing and inflation may be rising. In early recessions, stocks and bonds historically draw down while commodities rise along with inflation. In mid recession, when consumption demand nears a bottom level, commodities draw

2 The economic stages are defined by the National Bureau of Economic Research.

Figure 4: Return by Economic Stage
February 1973 – December 2010

Commodities diversify stocks and bonds through the business cycle by outperforming during early recessions, when stocks and bonds tend to fall.

Data sources: Thomson Reuters Datastream, National Bureau of Economics Research, and Mellon Capital



GETTING TO REAL—ASSESSING THE OPTIONS

As shown in Figures 1 and 2, adding commodities and TIPS to a traditional stock and bond portfolio potentially can provide the joint benefits of inflation protection and portfolio diversification. Commodities provide spillover inflation protection while TIPS mainly only protect themselves against inflation. In contrast, energy and metals stocks can offer inflation protection but not diversification benefits. REITs are less beneficial; they offer neither inflation protection nor diversification.

These results suggest that not all assets commonly proposed for inclusion in real asset products are genuine real assets. Commodities and TIPS are genuine real assets whereas REITs and commodity stocks fall short. Which other so-called real asset candidates provide reliable real asset benefits? Will the instruments used to obtain exposure to these assets pass through their real asset benefits? We address these questions in this section and argue that commodity futures, commodity index swaps, and TIPS are the most liquid and cost effective means of achieving genuine real asset exposure.

Treasury Inflation-Protected Securities

TIPS or global linkers are often referred to as real assets because, by design, they return the inflation rate plus a premium related to the “real” rate of return. The inflation rate for TIPS is defined by the (not seasonally adjusted) All Urban CPI, which includes food and energy. The yield on TIPS is the real yield and the duration on TIPS is the real duration.³ The difference between the yields on a 10-year Treasury bond and a 10-year TIPS is “breakeven inflation.” Breakeven inflation reflects the market’s expectation for inflation along with possible illiquidity and other risk premia stemming from institutional differences between U.S. Treasuries and TIPS. We believe the break-even inflation rates are more responsive to energy and agricultural commodity shocks than core CPI because TIPS payouts are benchmarked to a measure of inflation that includes food and energy prices.

³ M. Barnes, Z. Bodie, R. Triest, and J. Wang, “A TIPS Scorecard: Are They Accomplishing Their Objectives?,” *Financial Analyst Journal*, Volume 66, Number 5, pp. 68-84.

It is important to keep in mind that TIPS are designed to protect the purchasing power only of TIPS; they do not offer spillover inflation protection for other portfolio assets. Moreover, U.S. TIPS self-protect against only U.S. inflation.

Investors seeking global inflation protection may benefit from adding a basket of global linkers diversified among developed and emerging markets. In addition to protecting against global inflation, such a basket comes with a globally diversified real rate of return. However, global diversification comes at the cost of exposure to currency and sovereign credit risks. Attempting to lessen these risks may undercut the original goal of inflation protection.

The hedging and diversification benefits of commodities are rooted in their unique characteristics

Physical Commodities

Physical commodities – energy, lumber, industrial metals, and food – are examples of fungible assets with price support coming from consumption demand. Three distinguishing characteristics of physical commodities give rise to their inflation hedging and diversification benefits.

Their first and most important distinguishing characteristic is their limited “shelf life”, that is, their limited storability. In contrast, stocks can be “stored” indefinitely while bonds can be stored until maturity. We emphasize that storability does not refer to storage costs, although costs are also a concern. Rather, storability refers primarily to the fact that most commodities degrade in quality and some eventually perish altogether in storage. Unlike fine wine, commodities do not age well! Even without deterioration and spoilage, limited storage capacity restricts how much some important commodities, such as crude oil, can be stored without constructing expensive new facilities – which takes time. As a result, even during periods of strong demand, producers and speculative long investors cannot withhold as much supply from the market as might be optimal to wait for a rebound in demand. Likewise, commodity consumers cannot rely on stored inventory to meet demand during droughts and production shortfalls. Consequently, unexpected shifts in short-term supply and demand move commodity spot prices significantly, and spot commodity prices are typically more volatile than prices of long-dated (e.g., one to ten-year) futures prices associated with the same commodity. This stands in contrast to prices of capital assets, which may react to revisions in both long- and short-term expectations.

The second distinguishing feature of physical commodities is that (except for gold) they are often purchased for immediate consumption or use. This is important because commodities not yet harvested or mined cannot be consumed.⁴ That is, a consumer cannot make bread in May with September wheat. In other words, commodity supply and demand are time stamped in ink – commodities expected in the future cannot help alleviate a current shortage. Thus, commodity prices fluctuate based on contemporaneous (or “buy as you go”) supply and demand – not expectations about future supply and demand. In contrast, intermediate- and long-term expectations largely determine the prices of capital assets with long duration.

Because commodity prices are sensitive to short-term supply and demand, and both supply and demand can change rapidly, commodity spot prices are volatile. Supply is subject to weather, business conditions, and geopolitical shocks. Likewise, demand varies based on the business cycle, emerging market growth rates, and international trade and currency relationships. As discussed in the next section, supply shortages or demand surges have caused sharp short-term price spikes in

⁴ We use “consumption” here to mean any form of utilization, including human consumption or industrial production.

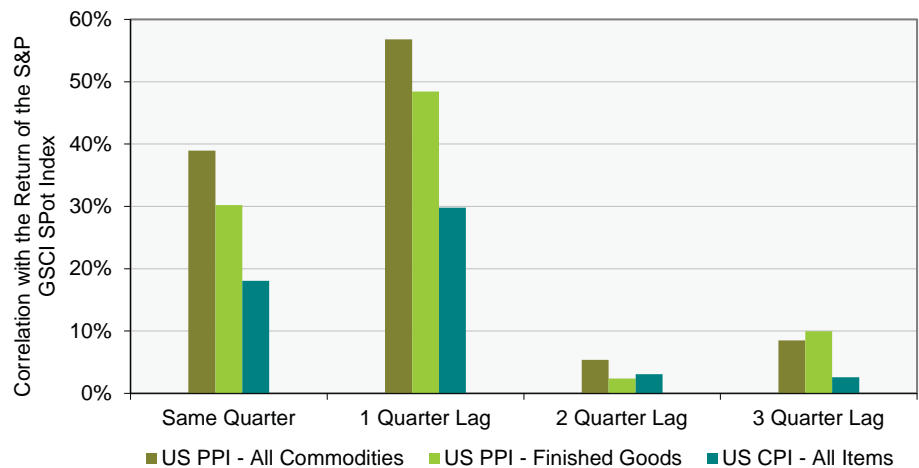
most commodities. Such price spikes only revert when the supply or demand imbalances are remedied, perhaps following one or more production cycles.

The third distinguishing characteristic of commodities is that they are components of consumer and producer price indices used for measuring inflation while capital assets are not. Accordingly, commodity price changes affect the PPI and CPI by design. Moreover, as suggested by Figure 5, rising commodity spot prices tend to cause rising producer and consumer prices in both the current and subsequent quarters. This suggests that cost push inflation, under which rising raw materials costs drive higher consumer prices, requires about three months to propagate through the supply chain from producers to end users.

Figure 5: Correlation between Rising Spot Commodity Prices and Inflation Measures
1Q 1968 — 4Q 2010

Rising commodity spot prices tend to be associated with rising producer and consumer prices for the same quarter and next following quarter (1 Quarter Lag). The time lag is suggestive of cost push inflation, under which higher marginal production costs drive higher consumer prices.

Data sources: Thomson Reuters Datastream and Mellon Capital



Because CPI includes many, less volatile end products, monthly inflation (as defined by headline CPI) is less volatile than the major commodity indices. Consequently, the “inflation beta” of the major commodity indices exceeds one.⁵ Commodities have the potential to provide spillover inflation protection within a portfolio. Because their inflation beta exceeds one, they help protect other assets in the portfolio.

Commodity Index Swaps, ETFs, and Managed Commodity Indices

Due to the storage and spoilage issues discussed above, one cannot buy, hold, or trade physical commodities (except gold) as if they are exchange-traded assets. Investing in physical commodities requires operational infrastructure and capability. To circumvent these obstacles, financial vehicles have emerged to facilitate indirect commodity exposure in a liquid, securitized format. We review each of their pros and cons in this section.

- Commodity-linked notes, commodity index swaps, or forward contracts⁶: These privately negotiated over-the-counter derivative instruments come with credit, tracking, and liquidity risks.
- Commodity exchange traded funds: Because ETFs are committed to rolling futures contracts according to mechanical rules, they are subject to the “contango trap,”⁷ which can lead to substantial tracking error between ETF returns and

⁵ The inflation beta of a commodity is the correlation of its returns to the inflation rate multiplied by the volatility of its return divided by the volatility of the inflation rate.

⁶ We will not talk about Master Limited Partnerships, which are illiquid. We will also not discuss leveraged instruments such as leveraged notes, principal-guaranteed notes, and commodity options.

⁷ As we will discuss below, contango and backwardation occur for several reasons, including oversupply of inventory, limited storage capacity, and temporary price distortions when ETF and long-only indexers roll their expiring contracts forward. For example, if a large group of traders roll their contracts at the same time, the resulting surge of buying can temporarily push up the prices of the contracts being rolled into. The resulting higher purchase prices translate into lower realized returns.

We see gold, not equities tied to gold, as a true real asset

- commodity prices. For example, during 2009, the spot price of natural gas rose 3.6% while the natural gas ETF (UNG) returned -56.5%.
- Managed commodity indices: Because traditional commodity indices have suffered from periods of negative roll returns (see Figure 11 below). Mellon Capital has been developing techniques to mitigate adverse roll returns. Managed indices attempt to mitigate negative roll returns by using less contangoed or longer-dated contracts along the futures curve and rebalancing less frequently. Roll returns are discussed later in this document.

Gold

As noted in the first section, we see gold as a bona fide real asset that both hedges inflation and helps diversify stock- and bond-heavy portfolios. Furthermore, gold is a somewhat unique asset subject to a somewhat unique economic framework. Gold, unlike other physical commodities, does not derive its value primarily from industrial or end-user consumption demand. Further, unlike most other commodities, gold can be stored indefinitely without spoilage or degradation. Because of these distinctive characteristics, gold has long been a globally accepted medium of exchange. Unlike currencies, gold carries no flag and has no national or political identity. Investors hailing from areas as diverse as China, India, the Middle East, and G10 countries have used gold as a store of value not pegged to the prospective health of any single country. For this reason, gold is often called a “commodity currency,” a unique currency without sovereign credit risks.

Asset allocation provides a framework for making sense of gold prices. According to the Consumption Capital Asset Pricing Model (C-CAPM), investors make their consumption and investment decisions taking into account the prospective real returns of the assets in their investing universe.⁸ For example, suppose they believe (not unreasonably) that gold’s expected return is some multiple of the U.S. inflation rate; that is, gold has an inflation beta exceeding one, but zero real return. Then, the opportunity cost of buying gold is the real rate of return on TIPS. Investors are inclined to allocate away from gold (surrendering spillover inflation protection) and into TIPS when real rates are high. On the other hand, when real rates are sufficiently low or negative (as they were in 2010), the cost of spillover inflation protection is low and holding gold is more attractive. This is consistent with the historical evidence. As shown in Figure 6, gold enjoys its strongest price support and best returns when real rates are low, precisely when stocks and bonds suffer their worst performance.

A closely related interpretation of Figure 6 is that the real rate is an (inverse) proxy for persistent inflation. According to the Fisher equation,⁹ the Fed raises real rates whenever it raises the risk-free interest rate because inflation does not respond point for point to the rate hikes. Since the Fed has historically raised interest rates at a conservative pace that lags behind rising inflation, real rates tend to become smaller or negative during periods of rising inflation. Historically, gold tends to perform well when real rates are low (Figure 6) because real rates are low during periods of rising inflation. Stocks and bonds usually underperform when real rates are low because they typically perform the worst in periods of rising inflation.

⁸ Long before his service as U.S. Treasury Secretary, Larry Summers wrote a paper shedding light on the link between gold prices and real interest rates: R. Barsky and L. Summers, “Gibson’s Paradox and the Gold Standard,” *The Journal of Political Economy*, Volume 96, Issue 3 (June 1988) 528-550

⁹ In this paper, the Fisher equation is computed as:

Real rate during the month = Risk-free rate at beginning of month - Inflation rate during the month.

Figure 6: Return by Real Interest Rate Environment

December 1977 – July 2011

Historically, gold outperforms in low real-rate environments, when stocks and bonds tend to underperform. Like other commodities, gold has low correlation to stocks and bonds.

Indexes:

Gold = S&P GSCI Gold Spot Index

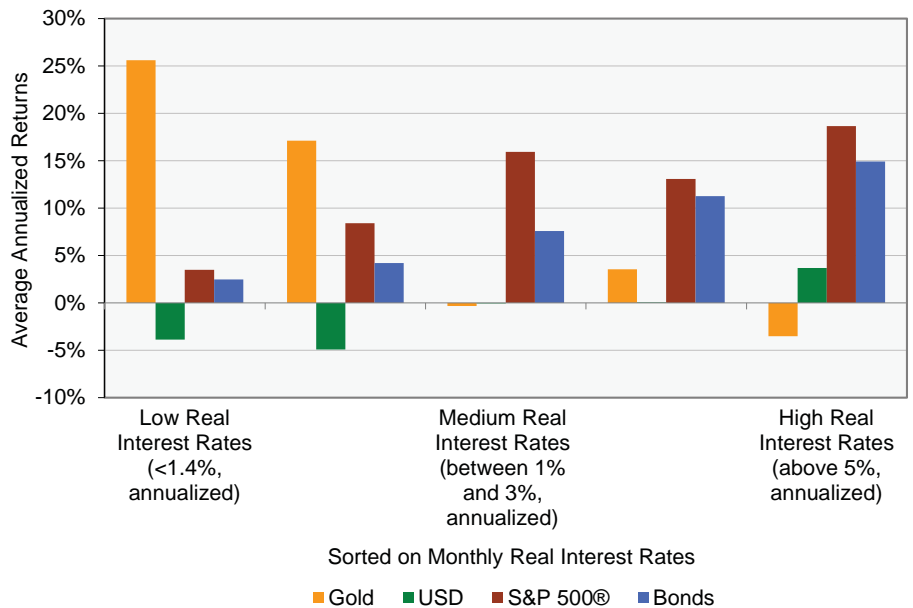
USD = Exchange Value of U.S. Dollar*

Stocks = S&P 500® Composite Total Return Index

Bonds = Barclays Capital U.S. Aggregate Bond Index

*Per Thomson Reuters Datastream

Data source: Thomson Reuters Datastream and Mellon Capital



This is not to suggest that gold is a risk-free investment. Since the early 1970s when the U.S. went off the gold standard, the volatility of dollar-denominated gold returns has been comparable to other commodities and that of stocks. Also, because demand for gold is not ensured by its intrinsic utility as a source of food, shelter, or energy, its value relies on the eye of the beholder. Gold would cease to be a store of value as soon as investors collectively believe that it isn't. Although this "eye" risk is probably slim barring an unanticipated structural shift (triggered by, for instance, the unexpected discovery of a mammoth gold repository under Antarctica), investors should be aware that gold, like any other asset, is not immune to structural shifts.

Gold's performance prior to the early 1970s cannot be disentangled from its role as a U.S. dollar peg. Inflation during the 1980s solidified the market's view that, post gold standard, gold acts as a talisman against the loss of buying power during inflation. However, the price surge of gold over the last five years has not (yet) been justified by developed market inflation. Instead, we suspect a combination of related factors contributed: concerns about potential future inflation; currency debasement following global government deficit spending; growing demand for gold from China and other emerging markets; the 2011 European banking crisis; and political economic uncertainty.

Physical Real Estate

No discussion of real assets is complete without mentioning physical real estate, including land. Physical real estate should not be confused with REITs, which are packaged real estate-related securities. Comparable to physical commodities, physical real estate, if properly selected, diversified, and managed, offers inflation protection and diversification. Unfortunately, individual real estate properties are idiosyncratic and vary by industry and geography ("location, location, location"). Purchasing and maintaining a diversified sample of real properties broad enough to reflect real estate performance across geographic regions and operating sectors entails active property selection and ongoing management of the properties. Even the pricing of some real estate indices is a guessing game since the true market prices of component properties cannot be determined until they are sold.¹⁰ This is one reason that index futures and swaps on paper real estate indices have been slow to garner institutional interest.

¹⁰ We do not present physical real estate return series because they do not necessarily reflect realizable returns in a timely fashion. See G. Marcato and T. Key "Smoothing and Implications for Asset Allocation Choices," *The Journal of Portfolio Management*. Special Issue, volume 32, pp. 85-98, 2007.

Another possible reason is that there is an insufficient number of natural risk bearers to take the short positions in real estate swaps or futures contracts. From our perspective, institutional investors need better instruments for getting liquid exposure to representative physical real estate.

Real Estate Investment Trusts (REITs)

REITs pay dividends generated from the REIT's holdings. A form of securitized real estate, REITs proliferated in the 1990s and continue to be popular investments today. Because REIT investments are equity shares, they are similar to commodity-related stocks. Accordingly, we believe REITs fail to fully capture the real asset benefits of physical real estate ownership. As documented in Figures 1 and 2, REITs neither hedge inflation nor diversify a stock and bond portfolio.

Global Currency Baskets

As indicated in Figure 7, the U.S. dollar falls relative to a global currency basket during rising U.S. inflation. Thus, shorting the greenback tends to hedge against rising U.S. inflation. Moreover, the U.S. dollar tends to have low correlation to domestic stocks and bonds. One might think then, that the carry trade of borrowing U.S. dollar (or using cash on hand) to buy a non-U.S. global currency basket is a cheap way to synthesize real asset exposure. Unfortunately, if global inflation rises faster than U.S. inflation, this would not work since the U.S. dollar would appreciate relative to the more rapidly depreciating global currency basket in this scenario. Also, currency carry trades come with confounding risk factors, such as exchange rate risk.

Figure 7: Returns by Inflation Environment
January 1973 – November 2010

During rising inflation, the buying power of gold increases whereas the buying power of the U.S. dollar and cash falls. Although not depicted here, gold, the U.S. dollar, and cash all have low correlation to a 60-40 stock bond portfolio.

Indexes:

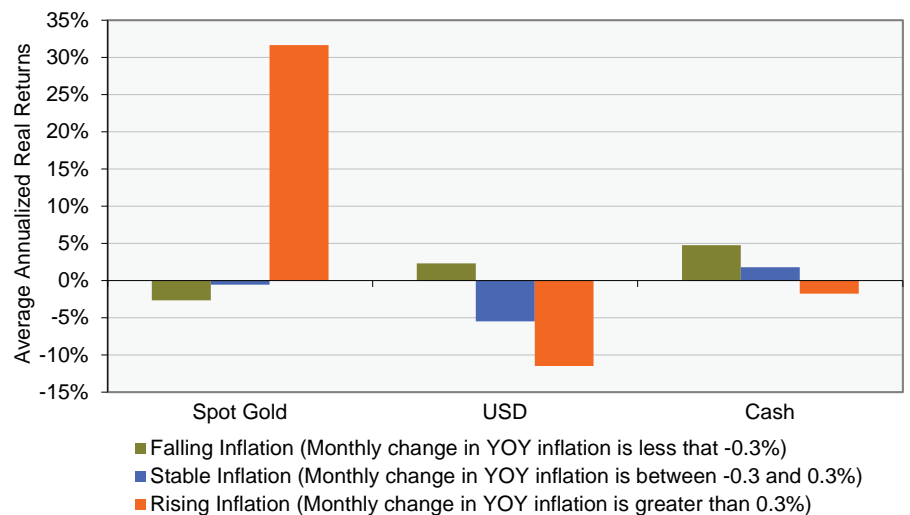
Gold = S&P GSCI Gold Spot Index

USD = Exchange Value of U.S. Dollar*

Cash = U.S. CD Secondary Market 1-month Middle Rate

*Per Thomson Reuters Datastream

Data sources: Thomson Reuters Datastream and Mellon Capital



Commodity Currencies

Can currencies of commodity-producing countries such as Australia, Canada, or New Zealand proxy for the performance of commodities? Since many factors besides commodity prices impact the currencies of these countries, there is no guarantee that the historical correlations between their currencies and commodities will manifest going forward.

Cash (or Risk-free Term Deposits)

Since risk-free interest rates rise along with expected inflation – albeit with time lag depending on Fed policy – one might think that the buying power of cash would track inflation. It doesn't because the risk-free rate doesn't predict unexpected inflation. Thus, as indicated in Figure 7, cash loses buying power during periods of high/rising inflation.

Commodity related stocks
are long duration securities
whose prices reflect all factors
influencing expected cash
flows and discount rates

Stocks and Bonds in Commodity-Related Companies

Stocks and bonds in commodity-related companies are inadequate commodity proxies and fall short as real assets. As indicated in Figure 1, energy and metals stocks generally outperform during periods of high inflation. However, as documented in Figure 2, they fail to diversify stock and bond portfolios as physical commodities do. Like other equities, they are long duration instruments whose returns are impacted by intermediate- and long-term expectations about factors such as future growth rates and capital costs—these have little to do with commodity prices.

In other words, duration is a key feature that distinguishes physical or commodity futures positions from commodity stocks and bonds. Stocks and bonds, including those issued by commodity-related companies, have duration ranging from several years up to as much as twenty-five years. Mellon Capital estimates that the duration of stock indices like the S&P 500®, for example, falls between fifteen and thirty years. During the long period of time that stock dividends and bond coupons are paid out, a firm's commodity inventories may fall in price, be mismanaged, or be liquidated and the proceeds reinvested. Accordingly, commodity stocks and bonds prices reflect expectations about intermediate- and long-term commodity spot prices and discount rates. Consequently, they do not respond to short-term spot prices changes on a dollar-for-dollar basis. Because of their longer duration, capital assets (including commodity stocks) are less sensitive than commodity spot and futures prices to unexpected near-term inflation shocks.

In contrast, physical commodities and short-term (one to fourteen months) commodity futures have near zero or short duration. They pass through the impact of spot price movements on an almost dollar-for-dollar basis.

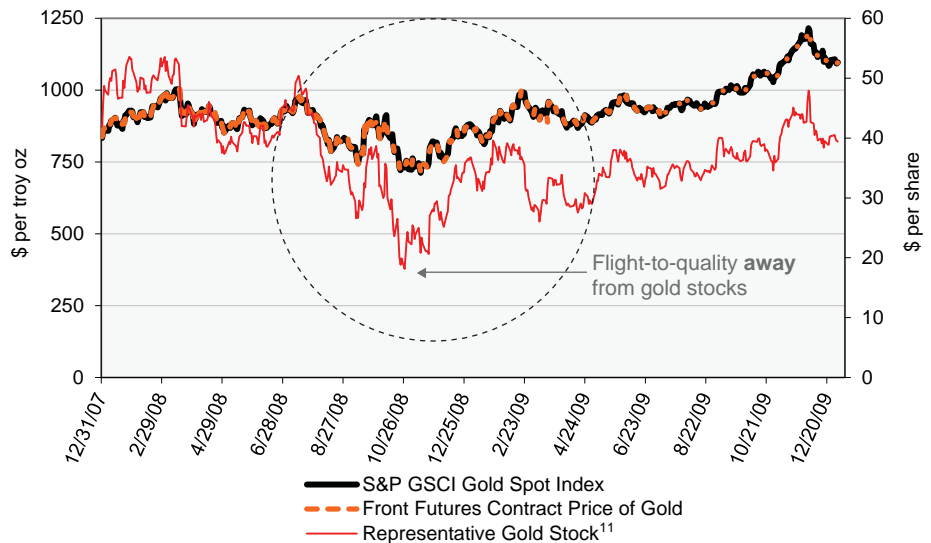
An easy way to see the difference between commodity stocks and physical commodities is to compare the performance of gold mining stocks to that of gold. Figure 8 compares the daily share price of a leading gold mining company to gold spot and futures prices during 2008. As shown, the gold mining stock underperformed physical gold significantly during the fall of 2008, when global stocks crashed. *Gold stocks behaved more like stocks than like gold when diversification versus stock underperformance was needed most.* In contrast, gold futures continued to closely track the spot price of gold.

In Figure 8, the gold futures price tracked the gold spot price extremely well. This is because the time to maturity (or duration) of the gold futures is less than three months.

Figure 8: Prices of Gold, Gold Futures and a Share of a Gold Mining Firm
December 2007 – December 2009

Gold mining stocks underperformed physical gold during the stock market crash in the fall of 2008. That is, unlike physical gold, gold stocks did not provide diversification when diversification was needed most.

Data sources: Thomson Reuters Datastream, Bloomberg and Mellon Capital



Exchange-traded Commodity Futures Contracts

Short-duration commodity futures contracts are exchange-traded instruments that pass through the benefits of physical commodities. Thus, investment in a suitably diversified and rolled basket of commodity futures is a viable means for obtaining liquid exposure to physical commodities. For tracking standard indices like the S&P GSCI commodities index or Dow Jones UBS Commodities Index, swaps on the performance of these indices are another low-cost option.

This is not to say that the “tracking error” between a futures contract and the underlying spot price is negligible for non-gold commodities. As will be discussed below, the roll return of futures contracts for non-gold commodities can be substantial if not mitigated by active management.

MANAGING COMMODITY FUTURES

We believe that a suitably diversified and rolled basket of commodity futures is the most appropriate vehicle for obtaining exposure to physical commodities. In this section, we review the dynamics of the returns to commodity futures. Since futures prices differ from spot prices, investors might wonder whether the tracking error distorts away the real asset benefits of the underlying commodities. This section examines this question. The differential between futures and spot returns could be viewed as the cost to investors of inflation hedging and diversification. Managing the futures positions intelligently helps to mitigate this cost.

Commodity futures and index swaps come with three bundled sources of returns: spot, roll, and collateral. We will assume that the collateral is held in short-term Treasury bills so that collateral earns the cash rate.

Spot Returns

The spot return is the (hypothetical) return from holding physical commodity inventory. It is gross of storage and financing costs. There are several difficulties in measuring spot returns. First, physical commodities are not traded on regulated financial exchanges and comprehensive records of spot transactions are unavailable. For the purposes of this paper, we use the S&P GSCI spot price indices to proxy for

¹¹ The representative gold stock is being shown only as an illustration of, and proxy for, gold stocks generally and is not a recommendation for the sale or purchase of any security.

We believe the dynamic nature of commodity futures pricing calls for active management

spot prices, but these prices are snapshots based on the prices of the front exchange-traded futures contracts. At times, the “basis” or difference between spot and futures prices can be significant.

The second problem, while sometimes overlooked, is equally important. Physical commodities are produced and traded around the world in local currency. Due to transportation costs and other obstacles to cross-border arbitrage, purchase price parity is not assured. Moreover, commodity returns expressed in U.S. dollars terms come with a time-varying foreign exchange rate. For example, because the euro rose and gold rose by even more in U.S. dollar terms between December 1999 to December 2010, the price of crude oil increased 270% in U.S. dollar terms over this period while it increased only 180% in euro terms and lost 23% in gold terms.

The meeting of supply with demand determines spot prices. The spot price rises when either demand rises or supply falls. The spot price dips when either supply rises or demand dips. Weather, technological innovation, and government regulation cause supply shocks. Fads, rapid economic expansion or recession causes demand shocks.

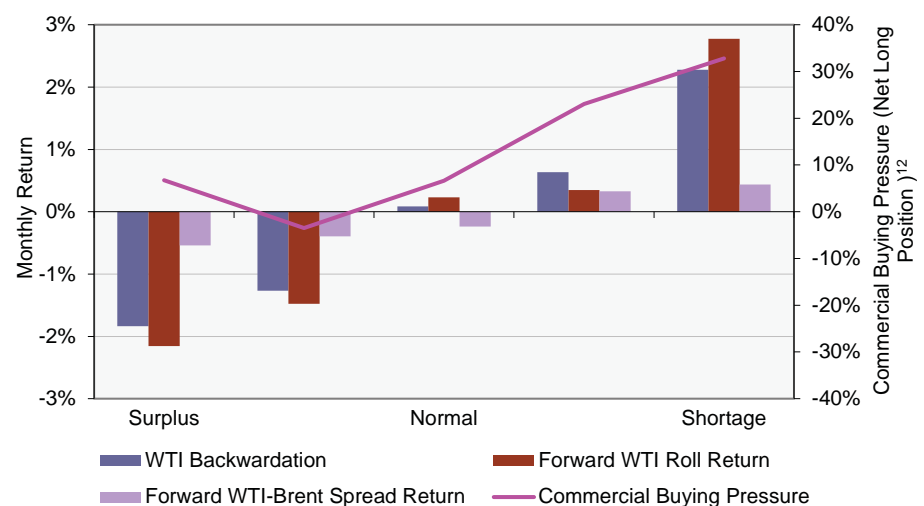
Commodity inventories not only serve as a source of buffer supply; they also help to indicate the temporary imbalances between new supply and unexpected demand. When supply is inadequate to meet demand, prices rise and inventory draws down, leading to an inventory shortage. On the flip side, when demand falls below supply, prices fall and inventory in storage rises, creating an inventory surplus. Thus, inventory shortages are associated with rising prices and inventory surpluses with falling prices.

Because a full production cycle is required to fix an inventory imbalance, price trends caused by inventory surpluses or shortages can persist. For this reason, as shown in Figures 9A and 9B, inventory imbalances have historically exhibited an ability to forecast spot returns. The bars in Figure 9A show that inventory surplus predicts negative spot returns one month forward and shortage predicts positive spot price returns one month forward. Figure 9B shows that supply and demand work together to determine the one-month forward return, as suggested by the Theory of Supply and Demand. In other words, when an inventory surplus exists, the one-month forward return tends to fall (the left-most bar in each quintile). Figure 9A also shows that inventory shortages are associated with backwardation and forward roll returns. We will return to this phenomenon when we discuss roll returns.

Figure 9A: Returns and Inventory Levels: West Texas Intermediate
January 1990 – December 2010

The state of inventories determines subsequent roll and spot returns. Whether the inventories are in surplus or shortage is based on the Energy Information Administration's actual measure of WTI inventory as compared to Mellon Capital's estimate of normal inventory levels.

Data sources: Thomson Reuters Datastream, Energy Information Administration, Commodity Futures Trading Commission, and Mellon Capital



¹² The average of the trailing end-of-month long and short positions in WTI futures for the last 12 months

Figure 9B: Supply and Demand Conditions and Spread Returns: West Texas Intermediate and Brent Crude Oil¹³

January 1993 – August 2011

WTI-Brent spread returns best in a low WTI supply and high WTI demand environment. It returns worst in a high WTI supply and low WTI demand environment. Whether the inventories are in surplus or shortage is based on the Energy Information Administration's actual measure of WTI inventory as compared to Mellon Capital's estimate of normal inventory levels. Capacity utilization is based on the American Petroleum Institute's measure of operating capacity relative to Mellon Capital's estimate of normal operating capacity.

Data sources: Thomson Reuters Datastream, Energy Information Administration, Commodity Futures Trading Commission, and Mellon Capital

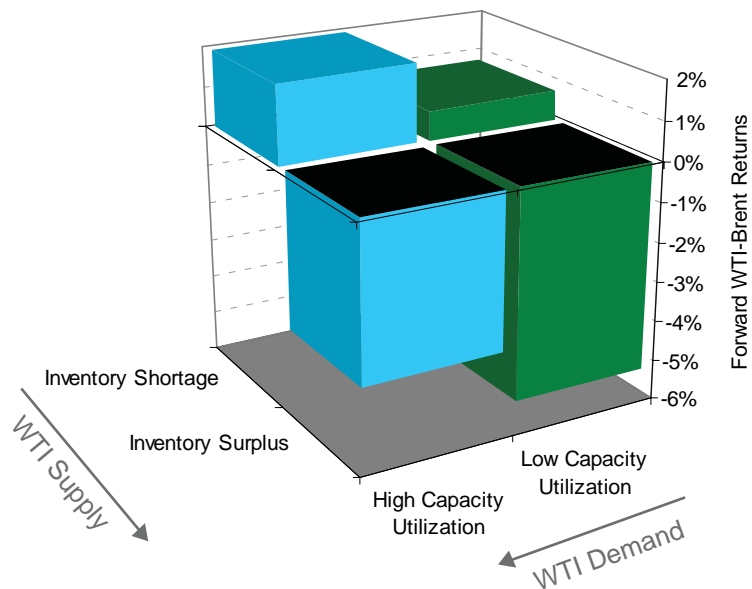


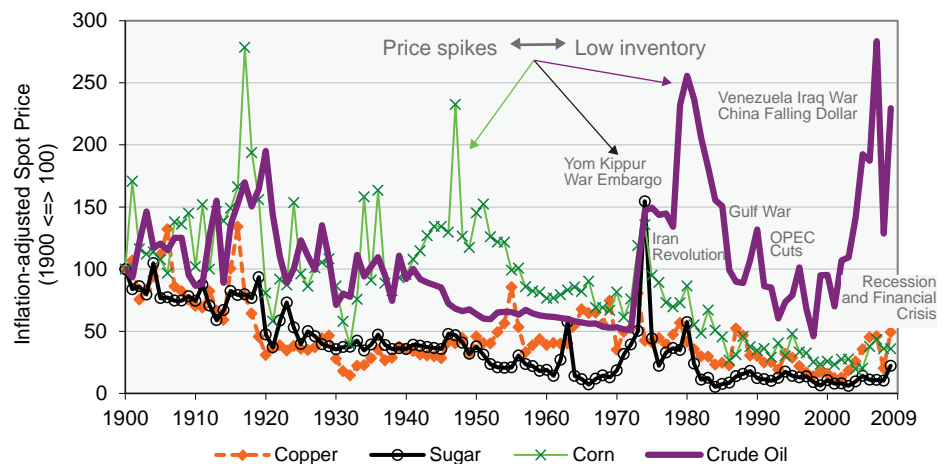
Figure 10 depicts spot prices of four commodities representing four major sectors: industrial metals, agricultural softs, agricultural produce, and energy.¹⁴ The spot prices have been adjusted for U.S. inflation. Two striking patterns emerge. First, in the long run, inflation-adjusted spot prices do not trend up. In the long run, commodity prices either move sideways or trend down. This is because long run “supply equals demand” price equals the marginal cost of production. Due to the innovation of substitutes and improvements in production efficiency, marginal costs of production can only decrease. If long run marginal costs of production increased for a given commodity, most consumers would seek out substitutes and shift away from using that commodity.

Figure 10: Inflation Adjusted Spot Prices for Certain Commodities

1900 – 2009; (1900 = 100)

Commodity-level spot prices spike during inventory shortages and drift towards long run levels when demand and supply imbalances revert.

Data sources: Thomson Reuters Datastream and Mellon Capital



The second outstanding pattern in Figure 10 is that commodity spot prices are prone to short-term spikes. The short term spikes are attributable to supply shortages caused either by production shortfalls (due to bad weather, drought, geopolitical tensions, etc) or by unmet demand surges (recently from China and other high-growth emerging economies). Except for crude oil, each price spike in Figure 10 has subsequently mean-reverted, although it may have taken some several years to revert. Crude oil has been exceptionally volatile over the last forty years

¹³ Brent crude is the benchmark European oil standard while West Texas Intermediate (WTI) is a domestic U.S. crude.

¹⁴ Although not shown in Figure 10, the inflation adjusted price of gold behaves similarly to that of the other commodities in the Figure. The U.S. dollar price of gold does not exhibit definitive long-term direction. In short windows spanning a decade or less, gold exhibits run-ups and subsequent pull backs.

due to supply and geopolitical issues. Only time will tell if the run up in crude oil prices in the last five years will reverse, (perhaps due to technological innovation or substitution into alternative energy sources).

These spikes in individual commodities do not diversify away in the major commodity indices, where they have translated into periods of heightened index volatility and deep, prolonged drawdowns. For example, the S&P GSCI and the DJ-UBS Commodity Index, the most widely cited passive commodity indices, suffered high volatility and deep, prolonged drawdowns as recently as 2008.¹⁵

Roll Returns

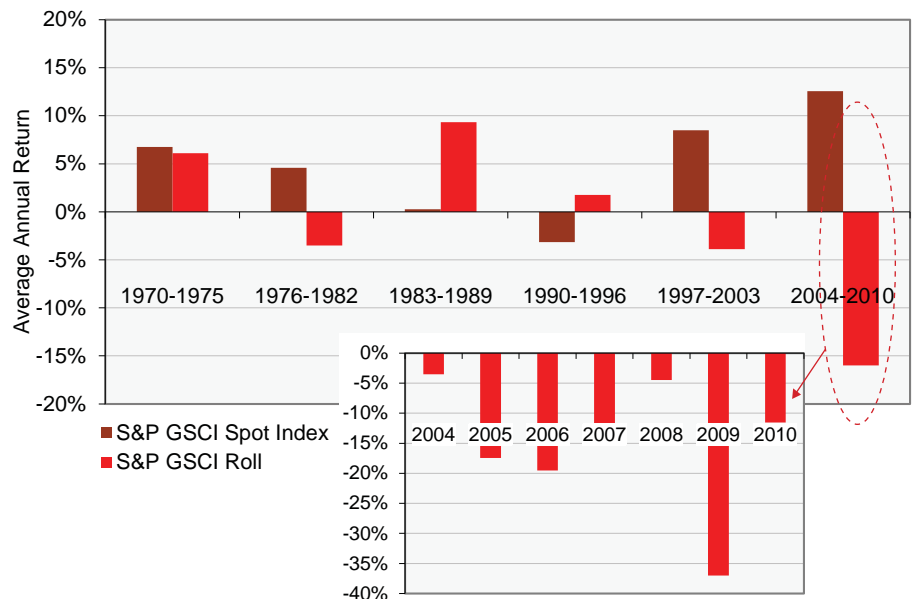
Roll return is the return difference between futures and spot returns for a given commodity. They arise because futures prices and returns do not track spot prices and returns exactly. The difference is not trifling. As indicated in Figure 11, roll returns can be worse than negative 10% per year, as the S&P GSCI roll returns were in 2005 through 2007, 2009, and 2010. During the last seven years (2004-2010), most of the S&P GSCI spot returns of over 15% per year were eaten away by roll returns that averaged negative 15% per year.

Figure 11: Spot and Roll Returns

Roll returns negative every year since 2004.

S&P GSCI Roll is computed as the difference between the returns of S&P GSCI Excess Return Index and S&P GSCI Spot Index.

Data sources: Thomson Reuters Datastream and Mellon Capital



At any given time, there is a “curve” of commodity futures prices, one price for each futures contract maturity being traded. Futures prices do not equal or rigidly track spot prices because physical inventory is not exchange traded, which means spot-futures price inconsistencies cannot be easily arbitrated away. In other words, commodity futures contracts are not redundant securities that can be priced by parity relationships enforced by arbitrage. It is useful to think of the futures price of some given maturity as being given by the following relationship:

$$\text{Futures price} = \text{Spot price} + \text{Expected financing cost} + \text{Expected storage cost} + \text{Shadow price of storage} - \text{Convenience yield}$$

¹⁵ Kenton K. Yee, “Cracking the Commodities Code: A Fundamentals Approach To Commodities Investing,” BNY Mellon Asset Management, April 2010.

To understand this expression, first consider a stylized “perfect” world with infinite physical storage capacity and cost-free shorting of physical commodities. In this perfect world, whenever the futures price exceeds the sum of spot + expected financing + expected storage, arbitrageurs would lock in a risk-free profit with cash and carry trades (shorting the futures contract, buying physical inventory on borrowed capital, and storing). Whenever the futures price falls below spot + expected financing + expected storage, arbitrageurs would lock in a risk-free profit with reverse cash and carry trades (by shorting physical inventory, earning interest on the collateral, and buying the futures position). Thus, in this perfect world with infinite physical storage capacity and cost-free shorting, arbitrageurs would drive the price of futures contracts to parity indicated by the following relationship:

$$\text{Futures price} = \text{Spot price} + \text{Expected financing cost} + \text{Expected storage cost}$$

Now, let’s leave the perfect world and return to the real world. In the real world, the shadow price of storage and convenience yields are not identically zero because arbitrageurs cannot always buy, store, or short physical commodities (except perhaps for gold) as necessary to enforce the perfect-world parity relationship.¹⁶ Most physical commodities (except gold) cannot be shorted. As a result, when futures prices are low relative to spot price, arbitrageurs cannot short physicals and buy futures. On the flip side, when inventory builds up to the storage capacity, arbitrageurs cannot buy and store additional units. As a result, the shadow price of storage is positive, a scenario often referred to as “super contango.”

The expected roll return is the convenience yield net of the expected financing and storage costs and the shadow cost of storage. Actual roll returns, however, can deviate substantially from expectations because convenience yields and the cost factors vary in response to economic events, including supply and demand shocks. Historically, realized roll returns have been either positive or negative and comparable in magnitude to spot returns. Negative roll returns, sometimes referred to as the “contango trap,” have surfaced as a problem for passive commodity indexers. As indicated in Figure 11, the contango trap has hurt S&P GSCI returns substantially in the last six years due in part to super contango in the aftermath of the financial crisis, when energy inventories pushed storage capacity.

Historically, roll returns, and spot returns have varied over the business cycle. As indicated in Figure 12, roll returns tend to be the worst in recessions and early expansion.¹⁷ This is because demand is typically the lowest and inventories levels the highest during these periods of the business cycle. In other words, recessions induce lower convenience yields and the possibility of positive shadow storage prices.

¹⁶ The shadow price of storage takes on a positive value whenever storage capacity binds and prevents arbitrageurs from storing and, hence, buying additional physical inventory. Likewise, the convenience yield is the shadow cost of shorting or, equivalently, the marginal benefit of holding physical commodities.

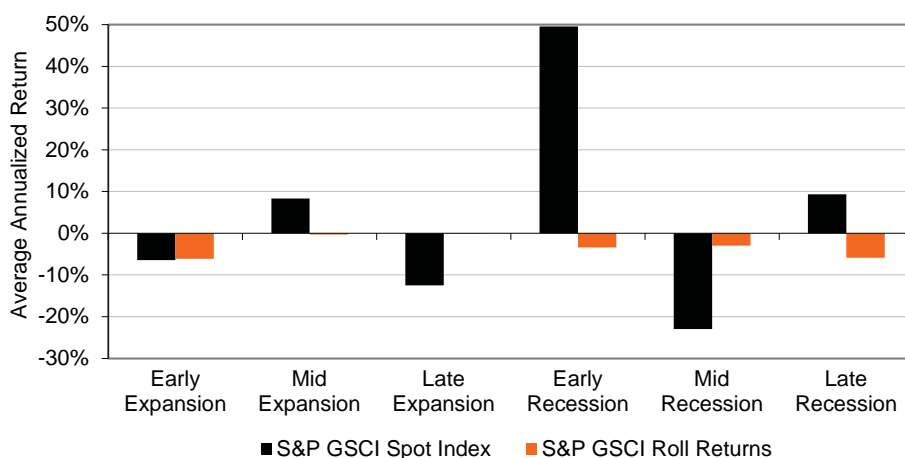
¹⁷ The economic stages are defined by the National Bureau of Economic Research.

Figure 12: Roll Returns by Economic Stage
February 1973 – December 2010

Roll returns have been more negative during mid and late recessions and early expansion.

S&P GSCI Roll is computed as the difference between the returns of S&P GSCI Excess Return Index and S&P GSCI Spot Index.

Data sources: Thomson Reuters Datastream, National Bureau of Economics Research, and Mellon Capital



IMPLEMENTING COMMODITIES EXPOSURE

One can either accept negative roll returns shown in Figure 11 as the cost of inflation protection and diversification or attempt to mitigate negative roll returns by proactively managing the rolling procedure. Roll management strategies work by overweighting futures contracts with greater expected roll yield and underweighting (or shorting) contracts with less (or negative) expected roll yield. For example, three common roll management practices involve:

1. Buying longer-date futures contracts to avoid the “overbuying” of the front futures contracts used by the largest traditional indices
2. In conjunction with using longer-dated futures contracts, rolling less frequently during contangoed markets
3. Increasing weight on backwarddated futures contracts and reducing weight on contangoed (or shorting less backwarddated) futures contracts

Calendar spread trades are one common way to implement #3, above. For example, consider the bull spread¹⁸ consisting of a long position on an August soybean contract and short position on the subsequent-November soybean contract.¹⁹ The expected return on this bull spread is the August-November convenience yield differential net of expected financing, storage costs, and shadow cost of storage between August and November.

The realized return is generally different from the expected return. Figure 13 depicts the price series of the August-November soybean bull spread. The price series was constructed by rolling the spread once a year in early August. As depicted, just like spot prices, the spread price has experienced sharp spikes in the past. Moreover, as indicated in the Figure, many spikes can be identified with real-world events that have reduced inventory in the months preceding August. Since November soybeans cannot alleviate an August shortage, the price of August soybean jumps, causing the August-November spread price to jump. In the technical language of the futures pricing framework given above, an expected shortage of consumable soybeans between August and November has caused the convenience yield between August and November to

¹⁸ A “bull spread” (and its opposite “bear spread”) is a calendar spread consisting of a long (short) position on the nearer contract and a short (long) position on the farther contract. We described several spread trades in “Cracking the Commodities Code” referenced in Footnote 15.

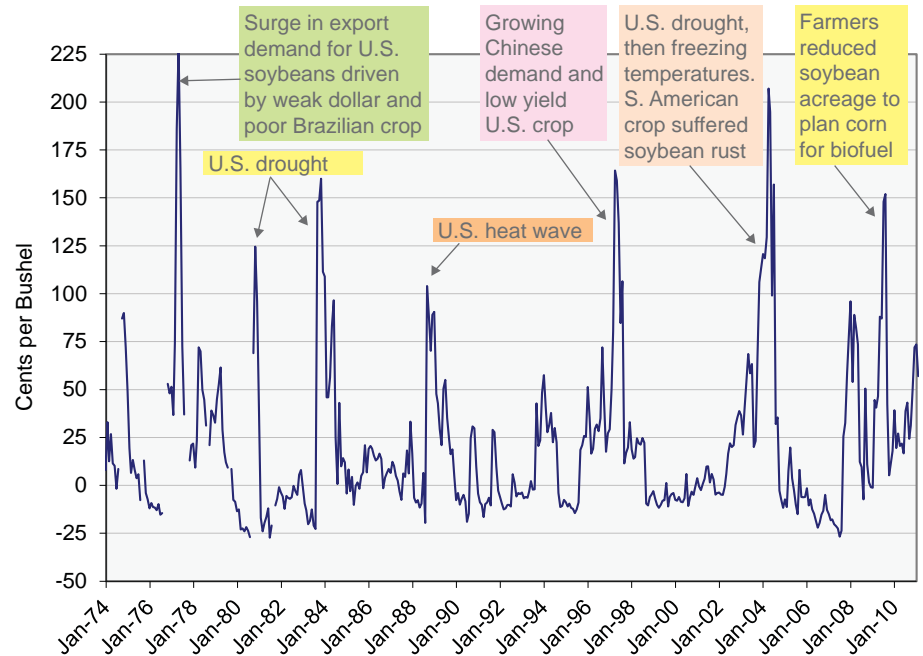
¹⁹ Some readers may recognize the calendar spread trade as being analogous to a currency carry trade where, for example, one shorts (borrows) the U.S. dollar to buy a foreign currency. The expected return is the interest rate differential between the foreign currency and the dollar. Not a riskless arbitrage, the trade is subject to exchange and interest rate risks.

spike. This is because convenience yield reflects the incremental benefit of holding physical (August) inventory over holding future (November) soybeans.

Figure 13: Price of Soybean Aug-Nov Calendar Spread
January 1974 – March 2011

Like spot returns, roll returns are also impacted by events that cause supply and demand imbalances.

Data source: Thomson Reuters Datastream and Mellon Capital



CONCLUSION

Real assets include physical real estate, land, physical commodities (including gold), and TIPS (or global linkers). Each of these has hedged inflation and diversified stock- and bond-heavy portfolios in the past due to an underlying economic framework. However, these real assets are not equally accessible to institutional investors. Managing diversified physical real estate and land requires selection and operational skill. In contrast, exchange-traded commodity futures and index swaps provide low-cost, transparent, and liquid exposure to physical commodities. Likewise, exposure to diversified baskets of TIPS and linkers is available at large capacity.

Therefore, we believe investors seeking to hedge inflation and diversify a balanced portfolio should add real assets consisting of a diversified basket of commodity futures (or swaps) and TIPS. These instruments have sufficient capacity and liquidity for institutional portfolios. TIPS are self protected against inflation while physical commodities can provide spillover inflation protection for stocks and bonds. TIPS are expected to return inflation plus the real rate whereas physical commodities, depending on roll yield management, may add a risk premium.

We believe that adding a mix of TIPS and managed commodity futures can provide inflation protection and diversification for a traditional stock and bond portfolio, and do so without sacrificing much in risk adjusted expected return in the long haul. Moreover, we believe real asset portfolios can and should be managed to target acceptable volatility, mitigate negative roll yields, help ensure liquidity, and enhance the portfolio rebalancing benefits between TIPS and commodities.

APPENDIX

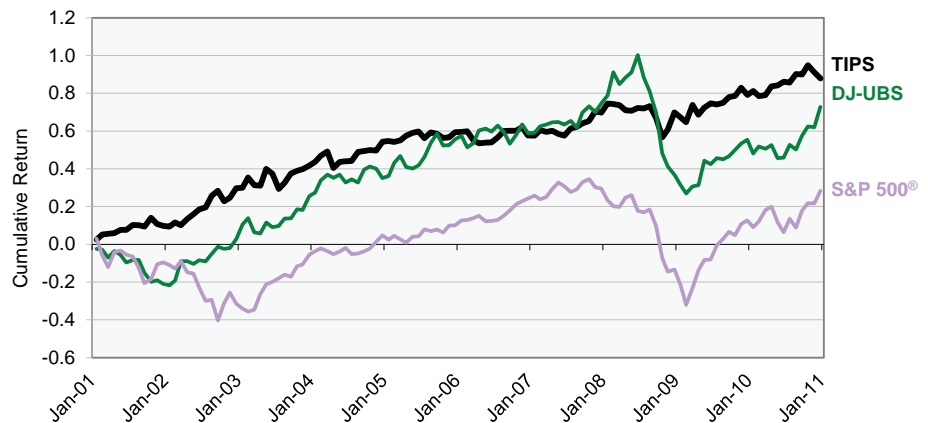
Figure 14 depicts the cumulative returns of 1) TIPS, 2) the DJ-UBS Commodity Index, and 3) the S&P 500® over the ten-year period from December 31, 2000 through December 31, 2010. Needless to say, it is unrealistic to expect returns for the next ten years to resemble returns for the past ten years. However, a “real asset” portfolio comprised of a combination of TIPS and the DJ-UBS index historically has had comparable volatility relative to the S&P 500®.

Figure 14: Historical Cumulative Returns
January 31, 2000 – December 31, 2010

In the low inflation environment of the last ten years, TIPS have outperformed.

Indexes:
TIPS = Barclays Capital US 10+ Year Total Return Index
DJ-UBS = Dow Jones-UBS Commodity Index Total Return

Date sources: Thomson Reuters Datastream



Many “real asset” products on the market attempt to enhance performance by including assets with a risk premium, such as REITs and commodity-related stocks. But, as indicated in Figure 2, what you exclude from your real asset basket may add as much benefit as what you include. Products with REITs and commodity-related stocks tend to have higher correlation to stocks and, therefore, less diversification benefit. In other words, for investors who have substantial pre-existing allocations to stocks and bonds, we recommend avoiding REITs and commodity-related stocks in their real assets portfolio to maximize its diversification benefit.

We see the simplicity of anchoring a real asset portfolio to a mix of TIPS and commodities structure as a virtue. More complicated portfolios may have costs and risks that may be unrecognized. Investors should be skeptical about whether the capital asset components of a real asset product provide both the dual real asset benefits of inflation protection and diversification.

This is not to say that TIPS or commodity futures are not without limitations. Generally, their expected returns are lower than that of equities and bonds. While actively managing roll returns will typically mitigate negative roll returns with a goal of seeking positive roll returns, the capacity for doing this may become more limited as roll management strategies gain traction. One way to potentially enhance returns is to overlay portable uncorrelated alpha strategies on top of core real assets. If the alpha strategies do not correlate to stocks and bonds, they may also help to provide diversification. Another way to potentially enhance returns is to go beyond passive indexation and to use fundamental and other information to tactically allocate between TIPS and the commodity sectors.

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- Advised the founder of HedgeStreet Exchange on futures-contract design and regulatory issues
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