TEACHERS' RETIREMENT BOARD

INVESTMENT COMMITTEE

SUBJECT: Research Report on Commodities – Part II ITEM NUMBER: 7

CONSENT: ____ ATTACHMENT(S): 2

ACTION: ____ DATE OF MEETING: April 8, 2010 / *30 mins.*

INFORMATION: X PRESENTER(S): Steven Tong and Carrie Lo

POLICY

This item complies with the CalSTRS Investment Policy & Management Plan and Innovation Portfolio Policy.

BOARD STRATEGIC PLAN GOAL

Goal 5: Ensure a financially sound retirement system through adequate contributions and optimal investment returns.
Objective A: Explore different alternatives to portfolio management.

HISTORY OF THE ITEM

The Investment Committee (Committee) requested Staff to research commodities and determine its role in the CalSTRS Total Fund as part of the work plan for the 2009/10 fiscal year. In February 2010, Staff discussed what commodities are, what drives their returns and the role that they can play in the CalSTRS Portfolio (Portfolio). Additionally, Staff invited two industry experts to provide testimony on a wide variety of issues that institutional investors face when investing in commodities. After review of the report from Staff and the testimony of industry experts, the Committee directed Staff to further study commodities as a potential investment for the Portfolio.

PURPOSE

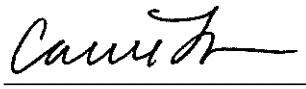
This is the second presentation of a three-part study for the Committee. The presentation examines the merits of various commodity benchmarks, the relevance of active and passive strategies, and the primary vehicles to access commodities. This agenda item is intended to help the Committee determine if the opportunity can improve the risk-return characteristics of the Portfolio.

CONCLUSION

Based on the research and analysis, Pension Consulting Alliance and Staff have determined that commodities can serve a beneficial role in the CalSTRS' Total Fund as a hedge against inflation or negative shocks impacting other investment markets.

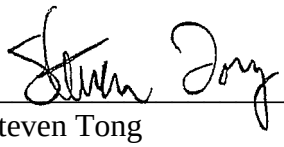
This report is an information item; no recommendation is being made at this time. If the Committee elects to move forward with an allocation to commodities, Staff could make a follow-up presentation at the June 2010 Investment Committee meeting and make a formal recommendation regarding what is the appropriate asset class commodities should be placed in, allocation size, benchmark and management style (e.g., active or passive).

Prepared by:



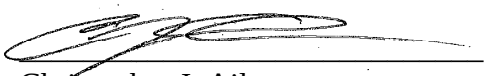
Carrie Lo
Investment Officer

Approved by:



Steven Tong
Director, Innovation and Risk

Concur:



Christopher J. Ailman
Chief Investment Officer

CALSTRS
HOW WILL YOU SPEND YOUR FUTURE?

Research Report on Commodities, Part 2

Investments – Innovation & Risk

INTRODUCTION

In our first presentation to the Investment Committee, Staff asserted that commodities can serve a beneficial role in the CalSTRS Portfolio as a hedge against inflation or against negative shocks impacting other investment markets. Inflation can damage both equity and fixed income returns while boosting commodity returns. As a result, commodities can exhibit insurance-like characteristics. Over long periods, the returns from commodities may be lower than other investments (representing an "insurance premium") but can produce very high returns in the event of high inflation or an investment market crisis (producing a return analogous to an "insurance claim").

Although commodities are the most sensitive asset to inflation, this comes with significant risks and costs. During the majority of investment periods, commodities exhibit more volatility than equities. However, commodity portfolio volatility can be mitigated to a significant degree by adopting certain investment policies, such as selecting an appropriate policy benchmark. Selecting a benchmark with an acceptable level of expected volatility and adequate sensitivity to inflation is critical. However, based on historical analysis, there can be a trade-off between reduced volatility and higher correlation to inflation. For example, energy-related commodities and industrial metals have been the commodity sectors most sensitive to inflation. However, they also tend to be the most volatile. Less volatile commodity sectors, such as livestock, have had lower sensitivity to inflation.

Commodity futures can also have an embedded cost when prices are upward sloping (prices on futures contracts that mature later are higher than prices on futures contracts that mature sooner). Owning a futures contract obligates the holder of the contract to buy a commodity for a specific price at a designated time in the future (when the contract matures). If the contract owner lets the contract mature, the owner must accept delivery of the physical commodity (e.g. 1,000 bushels of soybeans). To avoid taking delivery of the underlying commodity and to maintain commodity futures exposure, the contract holder must sell the contract that is maturing in the near-term and purchase another contract that matures later. This is called "rolling" a futures contract. When prices are upward sloping, the investor will sell the current contract at a lower price and buy a similar contract at a higher price. Selling low and buying high results in a negative roll return.

Investors should view commodity performance as analogous to insurance. Commodity investments may not always produce high returns and may impose some form of opportunity costs similar to an insurance premium. During unexpected investment-related events, such as high inflation, commodities are expected to outperform. One key risk from inflation is that both equities and fixed income, which comprise 64 percent of the Portfolio, tend to produce lackluster results when inflation rises. On the other hand, commodities are more sensitive to inflation.

addition, investors often incur a cost with futures-related vehicles that are used to replicate commodity investment performance. This negative roll cost results from selling lower-priced futures and buying higher-priced futures to avoid taking delivery of the commodity.

In this second research paper, Staff discusses the various commodity benchmarks available, active and passive investing and the primary methods to access commodity exposure.

COMMODITY BENCHMARKS

CalSTRS' objective in selecting a commodities benchmark is to select an investable index, with volatility at or below equities that is sensitive to inflation. We considered the following industry-standard policy benchmarks:

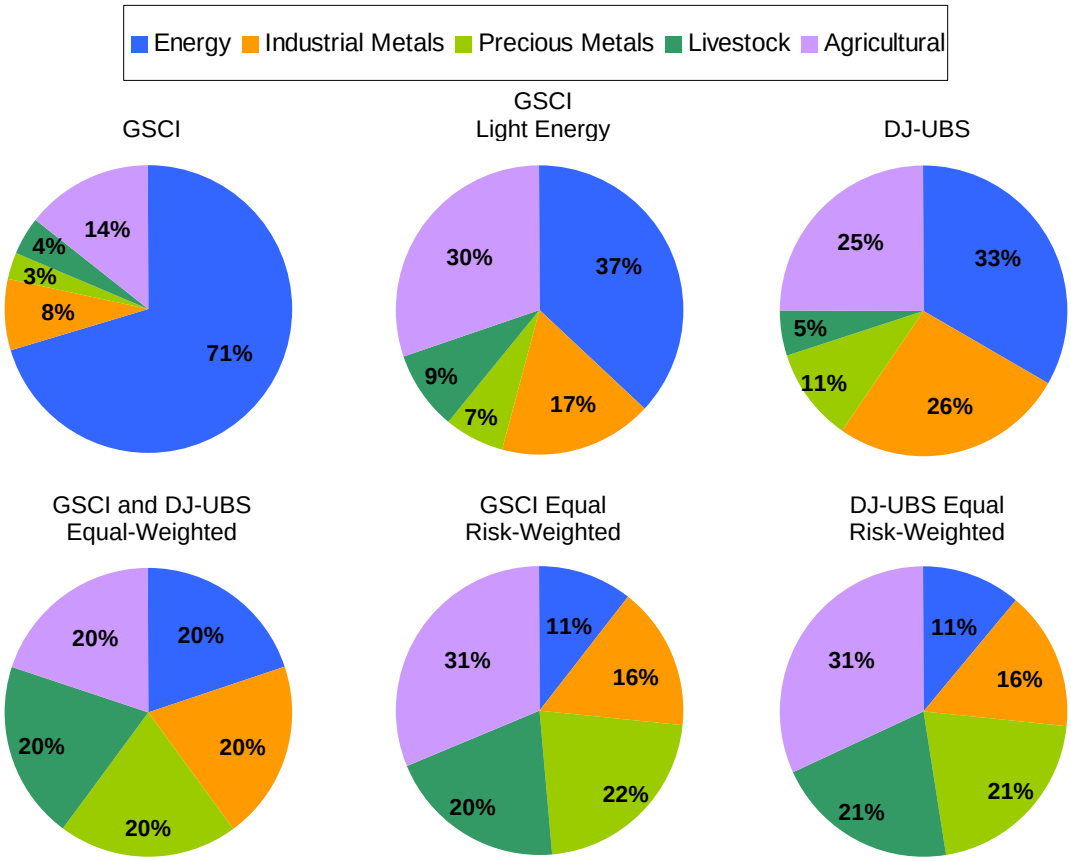
1. Standard & Poor's Goldman Sachs Commodity Index (GSCI),
2. Standard & Poor's Goldman Sachs Commodity Index Light Energy (GSCI LE),
3. Dow Jones-UBS Commodity Index (DJ-UBS), and
4. Custom Benchmarks: each commodity sector equal-weighted or equal risk-weighted.

The two main indices employed by the majority of institutional investors are GSCI and DJ-UBS. Because of the generally high volatility of energy-related commodities, we will also discuss the GSCI Light Energy Index and custom indices that have less weight in energy and, therefore, lower volatility than GSCI and DJ-UBS.

GSCI consists of futures contracts on 24 commodities weighted by their world-production. Production weights are based on the average quantity of production in the last five years of available data and are similar to the market capitalization weighting convention used to structure benchmarks in the public equity and fixed income asset classes. GSCI is a more concentrated and volatile index when compared to DJ-UBS. Energy currently accounts for approximately 70 percent of GSCI and contributes to its relatively higher volatility. GSCI Light Energy is similar to GSCI but uses one-fourth of the overall production weight for energy, resulting in a 37 percent energy weight in the index.

In contrast to GSCI, DJ-UBS includes 19 commodity futures contracts. Its sector weightings are based upon the five-year average liquidity/trading activity of the underlying commodities and dollar-adjusted production. Although one-third liquidity and two-third production weighting is a less transparent weighting methodology compared to the GSCI weighting methodology, the DJ-UBS is a more diverse index. DJ-UBS is also more balanced across commodity sectors because it imposes limitations on the weight of any one sector or contract. The most weight any sector may account for is 33 percent and the most weight of any contract is 15 percent. Energy is at the 33 percent limit and crude oil contracts are at the 15 percent limit. These limits lead to a more evenly-weighted index compared to GSCI because no commodity or commodity sector dominates the index. As a result, the historical volatility of DJ-UBS has been approximately 30 percent lower than that of the GSCI.

Decomposition of Commodity Indices as of December 31, 2009



Staff also evaluated custom benchmarks that have less volatility than standard published benchmarks. The volatility can be reduced by using alternate weighting schemes, such as:

- Equal-weighted: each of the five sectors in GSCI or DJ-UBS has an equal market weight of 20 percent in the custom index, and
- Equal Risk-weighted: each of the five sectors contributes equally to the total volatility of the index.

Overview of and Selected Statistics for Standard and Custom Indices Based on Monthly Returns from 19 Years for the Period Ended January 2010

	Standard Benchmarks			Custom Benchmarks			
	GSCI	**GSCI Light Energy**	**DJ-UBS**	**GSCI Equal-Weighted**	**DJ-UBS Equal-Weighted**	**GSCI Equal Risk-Weighted**	**DJ-UBS Equal Risk-Weighted**
Weighting Methodology	Production	Production; except 1/4 of energy production	Trading and Production	Each of 5 sectors has 20% weight	Each of 5 sectors has 20% weight	Each of 5 sectors contributes equal risk to index	Each of 5 sectors contributes equal risk to index
Annualized Volatility *	21.2%	14.5%	14.6%	11.6%	11.9%	10.0%	10.4%
Volatility as multiple of MSCI World Equities Volatility of 14.9%	1.4x	1.0x	1.0x	0.8x	0.8x	0.7x	0.7x
Correlation to CPI	0.27	0.24	0.22	0.24	0.22	0.21	0.19
Beta to CPI	6.27	3.86	3.44	2.97	2.81	2.25	2.18
Correlation to DJ-UBS	0.90	0.94	1.00	0.94	0.96	0.85	0.87
Energy Weight (12/09)	70%	37%	33%	20%	20%	11%	11%
Max Sector Weight	100%	100%	33%	20%	20%	100%	100%
Max Contract Weight	100%	100%	15%	20%	20%	100%	100%
Number of Commodities	24	24	19	24	19	24	19
Roll Frequency	Monthly	Monthly	Bi-monthly	Monthly	Bi-monthly	Monthly	Bi-monthly

* Volatility of MSCI World Equities Index: 14.9%. Source for statistics: State Street Associates.

The table above shows that alternative weighting schemes can produce indices with even lower volatility than the standard indices. For example, DJ-UBS Equal-Weighted had 11.9 percent volatility versus the 14.6 percent volatility of DJ-UBS. This is a 25 percent reduction in volatility by equally weighting each of the five sectors in the DJ-UBS index at 20 percent rather than using the trading and production-based weighting scheme currently employed by DJ-UBS.

In addition, Staff calculated the correlation of each index to DJ-UBS, one of the less volatile standard indices available. The correlation of approximately 0.90 between DJ-UBS and each index is very high. Although the volatility of each index can be very different, the relatively high correlation indicates these indices still move in the same direction most of the time.

Indices with lower weights in energy are typically much less volatile and slightly less volatile than equities. Energy and industrial metal futures tend to be more volatile than the other commodity sectors but have the benefit of being the most sensitive to inflation and most liquid. Livestock futures have demonstrated opposite characteristics of low volatility, low sensitivity to inflation and low liquidity. Reducing the weight of energy reduces the volatility of the index and potentially the index's correlation to CPI. For example, GSCI, which has a 70 percent weight in energy and volatility of 21.2 percent, has a correlation to CPI of 0.27. GSCI Equal-Weighted has

a lower correlation to CPI of 0.24, with a 20 percent weight in energy and about half the volatility of GSCI at 11.6 percent.

Some investors utilize an absolute return benchmark, which can dramatically reduce volatility. For example, a benchmark, such as Consumer Price Index (CPI) plus 3 percent, has volatility of approximately 1 percent. However, with more absolute return-oriented mandates, the Committee must be comfortable with strategies that employ both long and short positions. For example, the net volatility of long positions and short positions can be low if the volatility of the long positions and the short positions is very similar. A number of other variations of custom benchmarks or combinations of an index and an absolute return benchmark also exist.

ACTIVE VERSUS PASSIVE

Related to the question of which benchmark to invest in is whether to manage commodity exposure actively or passively.

Passive Indexing

Most institutional investors began investing in commodities passively in an index. Index investing allows for easy, instant access to a diversified pool of commodities with low fees, favorable liquidity, and independence from reliance on the trading skill and risk management of managers. Investing in an index also provides access to a wider range of managers and counterparties if commodity swaps are employed as part of the commodity allocation. As institutional investors became more comfortable with passive investing, some began to implement active strategies, such as enhanced indexing and long/short investing.

The standard commodity indices are rules-based and transparent. Rules applied within the commodities indices include:

1. how sector weights are determined,
2. how the contract maturities are selected and rolled, and
3. how these construction rules should be updated.

Passive commodity investing is not a “buy and hold” process. Rather, it requires regular, on-going futures trading and investment management. Commodity indices are comprised of a basket of long-only positions in specific commodity futures. These futures have a finite maturity and the index holder is forced to trade each month by selling their expiring future and buying another future. Hence, it is not possible for an investor to simply buy a commodity index and hold it until the investor wants to reduce the position.

The two major indices, GSCI and DJ-UBS, roll their positions forward on the same five days each month or every other month. Twenty percent of an index is rolled each day from the 5^{th} through the 9^{th} business day of the month. These indices hold the nearby futures contracts, which are scheduled to mature the earliest. Because a large amount of passive institutional money tracks the benchmark indices, the nearby contract is typically the most crowded trade. Index investors’ moves to sell the nearby contracts often cause these contracts to increase their volatility. Moreover, the rigidity of the rolling rules often forces the prices of the contracts that investors must sell to be pushed down and the prices of the contracts that investors must buy to

be bid up. This concentration of index money can adversely impact investment performance in the index as investors are forced to sell contracts at a lower price and buy contracts at a higher price.

The commodity indices have several additional flaws. First, they provide long only commodity exposure and give full exposure to the volatility of commodities which can be exceptionally high at times. Second, the index component weightings can change dramatically and become very concentrated in particular sectors, increasing risk unknowingly. Finally, frequent re-weightings are based on increasing price and volume, potentially resulting in buying at high prices and selling at low prices.

Active Investing

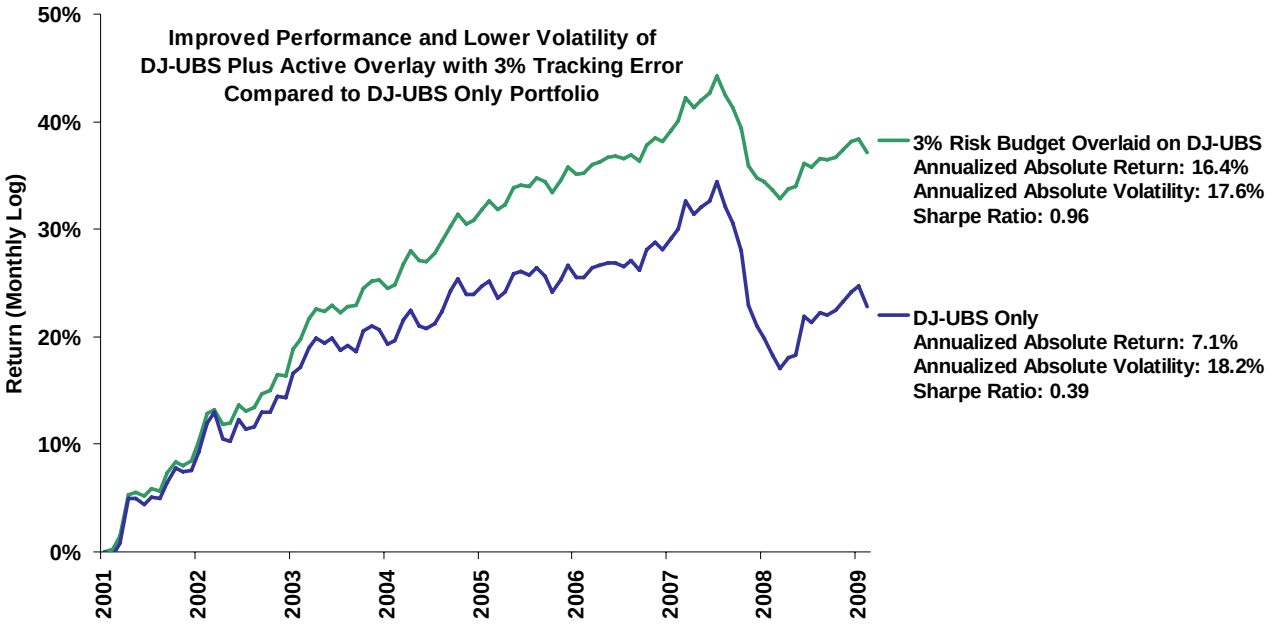
Some institutional investors have invested in commodities by using an active strategy. Compared to passive investing, similar or potentially higher returns can be achieved with much lower volatility by employing active strategies during bull markets and appropriate tactical short positions during bear markets.

Using an enhanced indexing strategy, an investor would maintain a long bias but be able to take advantage of passive indexers. Because index rules are transparent, many enhanced indexing players actively trade particularly around index contracts that are close to maturity. This strategy follows rules similar to the index by slightly diverting from the index and maintaining a high beta to the benchmark. Therefore, the volatility may be lower and the return higher by modifying the time period over which contracts are rolled or by modifying which contracts are traded.

One strategy that enhanced indexers utilize to reduce the negative roll return is to avoid the trading congestion in nearby contracts caused by passive investment flows. For example, investors can roll their contracts before or after the indexers trade. Investors can also employ contracts of maturities other than those used in an index when these prices may generate a positive roll return. Eventually, these can also become crowded trades.

Another active strategy is to take long and short positions in specific commodities. Shorting can better manage volatility and take advantage of negative fundamental views. This strategy gives discretion to an investment advisor and allows them to reduce exposure to or short commodities when commodity prices are expected to fall dramatically. This allows the advisor to potentially capture returns in a rising market by taking directional positions at opportune times and protect capital in falling markets.

A study by Hermes Investment Management concludes that a 3 percent active risk budget around a benchmark would have lowered the volatility and improved the returns of a portfolio consisting only of an investment in DJ-UBS. The chart on the next page illustrates the impact of this overlay of common enhanced indexing strategies with a 3 percent risk budget on DJ-UBS. Applying an active overlay can be very beneficial to returns and reduce the absolute level of risk, significantly improving the Sharpe ratio or return from alpha per unit of risk. The DJ-UBS plus 3 percent tracking error portfolio produced a return of 16.4 percent with 17.6 percent volatility compared to the DJ-UBS only portfolio, which returned 7.1 percent and 18.2 percent volatility from December 2001 through January 2010.



Source: Hermes Investment Management, which manages approximately $34 billion and is wholly owned by British Telecommunications Pension Scheme. Based on data from December 2001 through January 2010.

COMMODITY INVESTMENT VEHICLES

Selecting the appropriate investment vehicle is another tool to reduce volatility while maintaining inflation sensitivity. In addition to commodity futures, institutional investors can access commodities via swaps, exchange traded funds (ETFs), public equity in natural resource companies, ownership of physical commodity investments, through a master limited partnership (MLP) or limited partnership (LP) and direct purchase of an operating company. Each of these has benefits and considerations as summarized in the following table.

Tradeoffs Associated with Various Commodity Investment Vehicles

Investment Vehicle	Benefits	Considerations
Futures	- Liquid - Leverage	- Physical delivery - Operational complexity
Swaps	- Liquid - Customizable - No delivery risk - Leverage	- Counterparty risk
Exchange Traded Funds (ETFs)	- Easy access	- Added management fee
Physical (via LP or operating company)	- Direct control of asset - Tracks spot return more closely - Assymetric information	- Storage costs - Transportation costs - Insurance costs - Illiquid
Public Equities	- Liquid	- Equity market correlation - May hedge commodity exposure

Individual Commodity Futures

Individual commodity futures are simple, liquid, standardized, low cost investment vehicles. It is possible to access a variety of commodities via futures. The counterparty is the commodity exchange on which the future is traded, which virtually eliminates counterparty risk. The investor can post collateral for the future via a margin account rather than fully fund the position. This activity frees up cash to earn an additional return. The investor may be able to capture spot price commodity returns from short-term, event-driven occurrences. Futures also have low correlation to equity markets over the long-term.

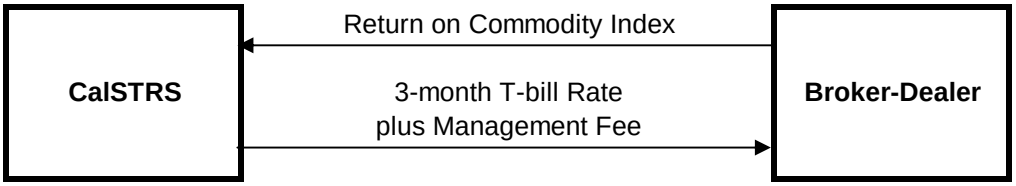
However, as discussed, rolling futures can result in a negative return. Exchange requirements and the potential lack of market depth make some futures unattractive for large scale, long-term exposure to commodities. In addition, some commodities impose the risk of delivery of the underlying commodity. These factors make trading individual futures more operationally intensive than other investment vehicles. Trading individual futures requires a complex operational structure because the investor must trade before the future matures to avoid delivery of the commodity as well as maintain a specific exposure over time. Commodity futures trading also requires a system to value the futures, monitor collateral positions against the futures and provide intraday market data on multiple futures over the roll period.

Other Derivatives: Swaps

A swap is a direct counterparty to counterparty transaction that is not executed on an exchange. An investor would receive the return on the commodity index and pay a broker-dealer a cash rate plus a management fee. The broker would receive the cash rate plus a management fee and pay the index return to the investor. The only amounts exchanged, or swapped, are the payments

described above. No cash is exchanged upfront and little, if any, collateral is posted. This frees up capital to be invested elsewhere.

Cash Flows of Standard Swap



Compared to futures, swaps are more straightforward from an operational perspective. CalSTRS would be able to implement a swap-based strategy relatively quickly. One trade can be executed for all commodities in an index at once for a competitive price. Swaps are used for long-term exposure and alpha opportunities because they offer flexibility for enhancement and customization (e.g., to a desired basket of commodities). There is no risk of delivery of the underlying commodity and swap markets are very liquid.

However, swaps are costly to adjust for small trades. An investor would be exposed to counterparty risk if the broker-dealer defaults on its payments. This can be mitigated by careful selection of counterparties with strong credit ratings, monitoring of the counterparties' credit ratings, management of collateral posted by the counterparty and diversification of the investor's counterparty exposure by using multiple broker-dealers.

There is a risk that the counterparty will hedge the swap knowing the investor's position or may communicate its knowledge to the market. The counterparty has no fiduciary obligation but is bound by fair dealing laws, Chinese walls, and conflicts of interest policies. The counterparty has the choice to signal the market whereas futures will certainly signal the market. Nonetheless, it is helpful to have a breadth of counterparties among which to spread trades. If the investor were to discover that a broker's actions are detrimental, the investor could cease to conduct business with this broker.

Exchange Traded Funds (ETFs)

An Exchange Traded Fund is a single security listed on a public equity exchange that represents an ownership interest in a portfolio of securities held in trust by a custodian. The custodian is responsible for maintaining the portfolio of securities, publishing the net asset value, performing creations and redemptions of shares, and all other mechanical aspects of running the fund.

ETFs are simple and can be bought and sold like a listed stock. They not only offer great flexibility for small scale investments, but also have a small dimension of credit risk and imbed extra management costs. ETFs themselves typically invest in a combination of swaps, futures and physicals with all of their costs plus a management fee. In effect, two separate fees are embedded in an ETF that replicates a passive mandate. As an example, USO, an ETF that tracks crude oil futures, discloses futures execution and clearing fees of $3.50 per transaction plus a 0.45 percent management fee. In addition, ETFs are fully funded. In other words, the investor must use the full amount of cash to invest in an ETF that does not free up cash to be invested elsewhere.

Physical Investment

Investment in physical commodities is possible by investing in a master limited partnership (MLP) or limited partnership (LP) that purchases natural resource companies or by purchasing a company directly. Investing in physical assets can more closely track the spot returns of a commodity than can financial derivatives. However, the liquidity is limited and can be difficult to manage. Physical investments may not provide enough liquidity to hedge against inflation shocks. In addition, an operating company is usually tied to a specific investment in only one commodity (e.g., a sugar mill or oil refinery) and offers less potential diversification than instruments such as swaps.

An LP may purchase a commodity company to operate, manage growth and maximize profitability. The investor could also own and operate a commodity-based company to directly gain exposure to changes in commodity prices. This removes management fees associated with managing the LP but requires operating and management expertise. The company's management must also be able to handle physical delivery and carry costs (e.g., transportation, storage and insurance costs), which are generally high.

Physical investment is operationally intensive and complex. The market for certain commodities may be opaque, simultaneously fragmented and highly concentrated in other regions. While many of these investments will introduce illiquidity into the portfolio, it is a purer exposure to the macroeconomic value drivers that justify a commodity investment from a strategic allocation perspective.

Additionally, the physical commodity gives the benefit of additional information flow and can put the investor in a better position to take advantage of fundamental mispricings in commodity markets. Owning and operating physical assets may provide asymmetric information flow on fundamental supply and demand dynamics not available from other sources. In some cases, transacting physical assets may help a commodity investor avoid a financial squeeze or assist in the optionality of the trading strategy.

Oil and natural gas exposure can be obtained through direct investments in oil and natural gas reserves, income and royalty trusts, and through LPs. Some diversified LPs capture exposure to industrial metals but many of these sectors (e.g., iron, steel, aluminum, platinum/palladium, copper) are dominated by large national enterprises. Precious metals, such as gold, can be easily purchased directly and stored in a bank vault. Agricultural exposure can be obtained from direct farmland ownership or through an LP that purchases farmland. Agricultural investment is an emerging opportunity in both the U.S. and international markets and is one approach to capture the long term scarcity of soft commodities.

Public Natural Resource Equities

Investors can also purchase the common stock of natural resource companies. Out-performance can be gained from certain natural resource companies that create value over the business cycle or have high quality assets and low cost structures. Commodity equities also provide access to non-exchange traded commodities such as water, salt, iron ore and potash. Natural resource equities offer greater upside potential in rising equity markets.

Although public equities are a viable option to capture commodity exposure, this would come with higher correlation to global equities. In addition, a commodity producing company may hedge commodity exposure and operate under capital structures that magnify the results of their commodity operations. In the case of oil and gas, producers often hedge their production by selling future contracts on future production to lock in prices and avoid a significant portion of the commodity's volatility.

SUMMARY

Commodities have a role in an institutional portfolio as a hedge against inflation or negative shocks to other investment markets. However, commodity performance is often accompanied by high volatility. This volatility can be mitigated by selecting an appropriate policy benchmark. Industry-standard indices, such as DJ-UBS, may have volatility levels that are in-line with global equities over long periods, but custom benchmarks can meaningfully decrease commodity volatility.

Because of the rules-based nature of standard commodity indices, active management can also significantly reduce commodity volatility as well as enhance returns. Each type of commodity investment vehicle also presents alternatives to reduce commodity volatility.

This page left blank intentionally.

COMMODITY INDICES

Individual Commodity Weighting

Commodity	BBG	Exchange	GSCI Weight	GSCI LE Weight	DJ UBS Weight
WTI	CL	NYMEX	36.84%	20.04%	14.53%
Brent	CO	ICE	14.39%	7.88%	N/A
RBOB	XB	NYMEX	4.71%	2.59%	3.80%
Heating Oil	HO	NYMEX	4.43%	2.44%	3.52%
Gas Oil	QS	ICE	5.52%	3.07%	N/A
Natural Gas	NG	NYMEX	4.31%	2.17%	10.32%
Aluminum	LA	LME	2.54%	5.60%	5.61%
Copper	LP	LME	3.64%	7.93%	N/A
HG Copper	HG	Comex	N/A	N/A	7.72%
Lead	LL	LME	0.49%	1.10%	N/A
Nickel	LN	LME	0.84%	1.81%	2.86%
Zinc	LX	LME	0.70%	1.60%	2.68%
Gold	GC	COMEX	2.81%	5.86%	9.48%
Silver	SI	COMEX	0.33%	0.71%	3.12%
Wheat	W	CBOT	3.00%	5.86%	4.62%
Red Wheat	KW	MGE	0.59%	1.17%	N/A
Corn	C	CBOT	3.26%	6.45%	6.96%
Soybeans	S	CBOT	2.24%	4.69%	7.81%
Cotton	CT	NYB-ICE	1.25%	2.56%	2.38%
Sugar	SB	NYB-ICE	2.48%	4.35%	2.57%
Coffee	KC	NYB-ICE	0.68%	1.46%	2.50%
Cocoa	CC	NYB-ICE	0.35%	0.72%	N/A
Soybean Oil	BO	CBOT	N/A	N/A	3.10%
Live Cattle	LC	CME	2.63%	5.54%	4.01%
Feeder Cattle	FC	CME	0.43%	0.93%	N/A
Lean Hogs	LH	CME	1.53%	3.49%	2.40%

Source: J.P. Morgan. All weights as of February 26, 2010

Commodity Primary Use

Commodity	Main Use
Energy	
U.S. Crude Oil (CL)	Light, sweet crude oil delivered into Cushing, OK; refined into petroleum products such as gasoline, kerosene, gas oil; can be manufactured into lubricants and used for asphalt
European Crude Oil (CO)	Waterbourne light, sweet crude oil sourced from the North Sea, fungible for WTI; refined into petroleum products such as gasoline, kerosene, gas oil; can be manufactured into lubricants and used for asphalt
Natural Gas (NG)	Residential and commercial heating, electricity generation
Heating Oil (HO)	Fuel to heat homes and buildings
Reformulated Gasoline (XB)	Transportation fuel, solvents, dilutants
Gas Oil (QS)	Home-heating, transportation fuel, electricity, back up fuel for natural gas
Grains	
Corn (C)	Food, livestock feed, ethanol production
Hard Red Winter Wheat (KW)	Planted in winter, grown predominantly in Kansas, Nebraska, Oklahoma, bread production
Soft Red Winter Wheat (W)	Food and petroleum replacement in plastics
Soybeans (S)	Food, Livestock Feed
Softs	
Coffee (KC)	Beverages, flavorings, food
Cocoa (CC)	Food, food flavoring, liquor, butter, beverages, soap, cosmetics
Sugar (SB)	Sweetener, sugar-based ethanol
Cotton (CT)	Apparel, home furnishings, medical supplies, textiles, cooking oil
Livestock	
Live Cattle (LC)	Growing stage to become feeder cattle (from calf-stage to 6-10 months of age)
Feeder Cattle (FC)	Food , dairy
Lean Hogs (LH)	Food, pork products
Precious Metals	
Gold (GC)	Jewelry, electricity, ornamental uses, store of value/currency backing, electronics, dentistry
Silver (SI)	Jewelry, industrial production, photography, silverware
Industrial Metals	
Aluminum (LA)	Packaging, foil wrappings, electrical uses, corrosion resistance, planes, alloys
Copper (LP)	Electrical wiring, alloys, brass, plumbing and heating applications, pipes, cooking utensils
Lead (LL)	Batteries, alloys, x-ray equipment, radiation protection, ammunition, metal casting, cable covering
Nickel (LN)	Stainless steel and steel alloys, electroplating
Zinz (LX)	Anti-corrosion coating for steel, brass, pharmaceuticals, chemicals, cosmetics

Source: Goldman Sachs

GLOSSARY

ASYMMETRIC RETURNS – Investment opportunities whereby the potential profit or probability of profit is higher than the potential loss or probability of loss. The risk/reward relationship is asymmetric with respect to the magnitude and frequency of positive versus negative returns.

BACKWARDATION – Futures contracts with a later maturity date trade at a discount to futures contracts with an earlier maturity date, generating a positive roll return when a futures contract is rolled.

BETA – The relative volatility of an investment compared to the market as a whole, often proxied by a broad index. The market itself has a beta of 1.0. A beta above 1.0 is more volatile than the overall market, while a beta below 1.0 is less volatile.

CARRY COSTS – Costs associated with holding a physical commodity, such as storage, insurance and transportation costs.

CASH YIELD – A component of the futures return equivalent to the interest earned on the cash not required as collateral for the futures contract.

CBOE – Chicago Board Options Exchange

CME – Chicago Mercantile Exchange

CONTANGO – Futures contracts with a later maturity date trade at a premium to futures contracts with an earlier maturity date, generating a negative return when futures contract is rolled.

CONTRACT/DELIVERY MONTH – The specified month within which a futures contract matures and can be settled by delivery of the underlying commodity.

CORRELATION – Measure of the strength or direction of a relationship between two assets.

COUNTERPARTY – The opposite party in a bilateral contract or transaction such as a swap. There are two counterparties to each trade.

DIVERSIFICATION – A risk management technique to reduce risk by investing among a variety of assets within a portfolio.

DOWNWARD SLOPING – A situation in which nearby futures contract prices are higher than futures contract prices with later maturities.

EQUAL-WEIGHTED – Each sector in an index is given the same weight in that index.

EQUAL RISK-WEIGHTED – Each sector in an index is given a weight such that the volatility that each sector contributes to the index is equal.

FRONT-MONTH CONTRACT – Futures contract with the earliest maturity date. Also called the "nearby contract."

FULLY FUNDED – The investor must invest cash equivalent to the full value of the investment, also called an "unlevered" investment.

FUTURES CONTRACT or FUTURE – A publicly traded, standardized agreement to buy or sell a specified quantity of a given commodity at a future date at an agreed-upon price.

ICE – Intercontinental Exchange, which operates OTC electronic exchanges.

KURTOSIS – A statistic used to measure the "peakedness" of a probability distribution and occurrence of fat tail events. The standard normal distribution has excess kurtosis of zero. Positive kurtosis indicates a "peaked" distribution with fatter tails and negative kurtosis indicates a "flat" distribution with thinner tails.

LONG – One who has bought a futures contract to establish a market position or one who owns an inventory of commodities.

MASTER LIMITED PARTNERSHIP (MLP) – Limited partnerships that are publically traded on a U.S. securities exchange. MLPs pay no income tax, and instead pay out their income to their shareholders.

MATURITY DATE – The date on which a futures contract expires and the holder of the future must accept the underlying commodity for delivery in exchange for a pre-specified price.

MEAN-VARIANCE OPTIMIZATION – A quantitative asset allocation tool used to identify the maximum return portfolio for a selected level of risk.

MERC – The Chicago Merc is the Chicago Mercantile Exchange (CME). The New York Merc is the New York Mercantile Exchange (NYMEX).

NEARBY FUTURES CONTRACT – Futures contract with the earliest maturity date, also called the "front-month" contract.

NOMINAL RETURN – The real return plus the inflation rate.

NYMEX – New York Mercantile Exchange.

OPEN INTEREST – The total number of futures contracts that are not closed or delivered on a particular day, or the total number of contracts held by market participants at the end of the day.
OVER-THE-COUNTER (OTC) MARKET – The trading of commodities, contracts or other instruments directly between two parties off of a regulated exchange.

PRICE DISCOVERY – The process of determining the price level for a commodity based on supply and demand conditions.

REAL RETURN – The nominal return less the inflation rate.

ROLLING A FUTURES CONTRACT – Selling (buying) a nearby contract and buying (selling) a contract with a later maturity date to avoid taking delivery (delivering) of the underlying commodity.

ROLL RETURN – Return generated from the difference in price between a nearby contract and a contract further out on the curve.

SHARPE RATIO – Measure of the excess return (alpha or return over a cash yield) per unit of risk in an investment.

SHORT – The selling side of a futures contract.

SKEW – A statistic used to measure the symmetry of a distribution around its mean value. Normal distributions are perfectly symmetrical and have zero skew. Negative skew indicates a distribution with a downside bias. Positive skew indicates a distribution with an upward bias.

SPOT MARKET – Market of an immediate delivery of and payment for the commodity.

SPOT PRICE – The current market price of the commodity.

SWAP – An agreement between two counterparties to exchange a stream of payments over time according to specified terms. For example, in a commodity swap, Counterparty A may pay Counterparty B a payout based on the price of a commodity, while Counterparty B pays Counterparty A a payout based on the level of a commodity index.

UPWARD SLOPING – A situation in which nearby futures contract prices are lower than futures contract prices with later maturities.

VOLATILITY – Measure of the dispersion of returns for a security or market index.

This page left blank intentionally.