

TEACHERS' RETIREMENT BOARD
INVESTMENT COMMITTEE

SUBJECT: Research Report Panel on Commodities Investing

ITEM NUMBER: 6

CONSENT: ____

ATTACHMENT(S): 1

ACTION: ____

DATE OF MEETING: February 4, 2010 / 60 mins.

INFORMATION: X

PRESENTER(S): Steven Tong, Carrie Lo

POLICY

This item complies with 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.
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Objective A: Explore different alternatives to portfolio management. Including: Internal vs. external management; Passive vs. active management; Liability-driven investments; Infrastructure; and Multi-asset class opportunities

HISTORY OF THE ITEM

The Investment Committee requested Staff to research commodities and determine its potential role in CalSTRS' total fund as part of the workplan for the 2009/10 fiscal year. This presentation is the first of three parts that Staff will bring to the Investment Committee (Committee). In this presentation, we discuss what commodities are, what drives their returns and the role that they can play in CalSTRS' 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, if the Committee wants to further explore commodities, follow-on presentations will discuss the strategies for obtaining exposure to commodities, what allocation is appropriate and how to implement a commodity portfolio.

PURPOSE

The purpose of the Innovation and Risk unit is to research and test strategies that are new to CalSTRS. Based on our analysis, we have determined that commodities may serve a beneficial role in CalSTRS' total fund as a hedge against inflation or negative shocks.

DISCUSSION

Institutional investors have made allocations to commodities based on the premise that commodities have low correlation to traditional asset classes, provide a hedge against rising inflation, and tend to generate positive performance when negative events occur. Because CalSTRS' portfolio return is highly correlated with the equity market performance, the attributes of commodities are worth considering. However, although past performance is not necessarily indicative of future performance, the Committee must carefully consider that the 20-year historical return of commodities is less than that of equities, weigh the different methods of investing in commodities and gain comfort with commodity's high volatility.

This presentation identifies the benefits, limitations and concerns related to investing in commodities. Some of the key points of discussion include:

- Commodities are real assets as opposed to financial assets, such as stocks and bonds. Commodities do not yield an ongoing cash flow stream, but are tangible assets with intrinsic value. Other examples of real assets include real estate, infrastructure, and land.
- Over the long-term, commodities have low correlation to stocks and bonds, providing a source of diversification. This is due to several reasons, including:
 - The high volatility of commodities, particularly of those that are energy-related.
 - Stock and bond prices tend to be driven by the outlook for economic growth. Meanwhile, commodity prices are generally driven by current supply and demand for that commodity. Differences between forward-looking expectations and the current state of the economy can cause commodity and financial asset returns to diverge.
 - Commodity prices can be influenced by supply and demand factors that are independent of global growth expectations. Sudden decreases in supply, such as the 1970 oil embargo, can benefit commodities while being detrimental to traditional financial assets. Other examples of supply shocks include a hurricane that destroys a field of oil rigs, a drought that reduces crop yields, or a strike by workers at a major steel production plant. There have been multiple equity bear markets when commodities generated a positive return. In this sense, commodities act as a form of “insurance” against negative shocks. This characteristic of commodities is demonstrated by its positive asymmetric monthly returns distribution. Commodities have produced more positive monthly returns than negative monthly returns during the previous 20 years. Furthermore, commodity downside volatility is greater than its upside volatility, or commodities are more volatile when generating positive returns than when generating negative returns. This gives investors a greater chance of generating large positive returns rather than large negative returns.

- Many industry experts argue that commodities can also serve as an inflation hedge, potentially providing another form of portfolio diversification. During periods of rapidly changing inflation expectations, both equities and fixed income will likely underperform because of the increased uncertainty associated with those assets' cash flows. In contrast, commodities may produce strong returns during high inflation environments because they are viewed as a store-of-value. Because of this feature, commodities might be included in CalSTRS' Absolute Return asset class upon successful graduation from the Innovation Portfolio.
- Commodity investment performance can be more volatile than equities. At times in the past, the volatility of commodities has been greater than 30% when equity volatility was approximately 20%. Prices can rise or decline sharply due to abrupt changes or perceived changes in supply or demand. This volatility severely reduces the ongoing inflation-hedging argument for commodities because inflation is not as volatile. Commodity values can also follow long supply/demand cycles that may or may not coincide with inflation. Sometimes these cycles last more than 50 years. Due to the high variation in return on a year-to-year basis, investors should evaluate the benefits of commodities on a long-term basis (e.g. a full economic cycle).
- Each commodity sector and method of investing in commodities has overlapping and distinct risk and return characteristics. Thus, it is important for investors to evaluate each of these combinations. The commodity sectors include energy, industrial metals, precious metals, agriculture and livestock. Investment vehicles to access commodities include but are not limited to futures, physical ownership, equity in commodity producers, other derivatives and external managers. Our analysis in this paper is based on the performance of owning a commodity index. Commodity indexes invest in commodity futures. However, the return from commodity futures can be very different from the return on holding the physical commodity. There are various suitable investment vehicles for institutions to invest in commodities. Staff will explore the attractiveness of these options as well as other alternatives in a future presentation should the Committee request further research on commodities.
- Pension funds typically invest in commodities by participating in the futures market. The Commodity Futures Trading Commission (CFTC), which regulates the commodity futures and options markets, defines pension funds as speculators. Speculators are commodity market participants who do not aim to minimize commodity price risk because they own or consume a commodity. Rather, speculators aim to gain from the price changes of commodities. There have been accusations that institutional investors, including pension funds, hedge funds and investment banks, increased the amount of speculation in commodity futures and drove oil prices higher in 2008. Meanwhile, a study released in November 2009 by EDHEC-Risk Institute suggests that there is no excessive speculation in the oil markets. A large investment banking firm also found that more than 90% of the oil market volatility since 2006 was due to inventories of crude oil and movements in the U.S. dollar. Nonetheless, the CFTC has proposed to limit the number of energy-related futures contracts that can be held by certain speculators.

Staff has invited Mr. Ronald Liesching, Chairman of Mountain Pacific Group, and Mr. Drew Demakis, Co-Head of Alternatives for AllianceBernstein LP, to present and debate the pros and cons, respectively, of an institutional investment plan investing in commodities. Their bios are below. Mr. Allan Emkin, Pension Consulting Alliance (PCA), will act as a moderator to facilitate the presentation and panelist debate.

**Ronald G. Layard-Liesching,
Chairman/Research
Mountain Pacific Group, LLC**

Ron is a founding principal and serves as the Chairman of investment manager Mountain Pacific Group, LLC (“MPG”), overseeing all investment activities of MPG. Prior to founding MPG, Ron was Chairman of Pareto Partners NY, LLC, after having been the Chief Research Officer of Pareto LLC since its inception in 1991. Ron was a cofounder of Pareto and a key person in building this \$55 billion business.

In his research work, Ron focuses on commodities, currencies, global bonds and alternative strategies. Ron has over 30 years of experience in quantitative modeling and currency management. He has written and lectured extensively on risk management techniques. Ron was formerly Director of Quantitative Products for County NatWest Investment Management Ltd. Prior to this, he spent his career in senior positions at Chase Manhattan Bank, Chase Bank and Chase Investment Bank during which he managed the bank’s currency and interest rate exposure, introduced new interest rate swaps and co-invented commodity swaps.

Ron has undertaken assignments for central banks and regulatory agencies, training and lecturing on currency exposure management and risk allocation. He has been an advisor to the U.S. Risk Standards Working Group and was a member of the Advisory Board for the DJ-AIG Commodity Index from its inception. Ron holds a BA in Mathematics and Economics (Hon) from Lancaster University.

**Drew W. Demakis
Co-Head—Alternatives
AllianceBernstein LP**

Mr. Demakis co-heads AllianceBernstein’s Alternative Investments group. Prior to assuming this role, Mr. Demakis was CIO-U.S. Structured Equities. He was also a senior member of the core/blend services investment team. Previously, he served as the director of product development for structured equities for two years. He joined the firm in 1998 as a senior portfolio manager for Global and International Value equities. For many years he has focused his efforts on risk-management, portfolio construction, asset-allocation and quantitative-research issues. Before coming to Bernstein, Mr. Demakis was managing director and head of research at Rogers Casey, an investment consulting firm, which he joined in 1988. He earned a BA in economics from the University of Chicago and an MBA from Washington University.

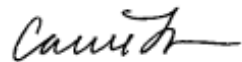
CONCLUSION

Despite the concern that commodities exhibit higher volatility and sometimes lower return than do equities, commodities are included in many institutional portfolios. Commodities can play a valuable role in an institutional portfolio as a hedge against inflation or event risks. Commodities historically exhibited low correlation to equities and bonds and produced double-digit returns when equities fell. In effect, commodities may act as an insurance policy, realizing low single-digit returns over the long run but generating large double-digit payoffs in the event of a negative shock.

Long-term commodity prices are set by the underlying economics of the commodity (e.g., supply and demand). In the commodities speculation debate, critics have accused speculators of driving up prices of oil and food. Studies have been undertaken in an attempt to answer whether there has been excessive speculation in the U.S. oil futures market and as a result exacerbated its price volatility. At present, there is no consensus on this issue if speculators are behind big oil-price swings. There are a number of regulatory initiatives underway designed to limit the impact of speculators on exchange-traded commodities.

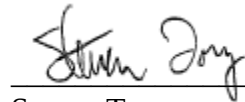
As this report is an information item, there is no recommendation on whether CalSTRS should invest in commodities at this time. After review of the report from Staff and the testimony of industry experts, should the Committee direct Staff to conduct further research on commodities, Staff will make follow-on presentations and recommend the appropriate allocation to commodities as well as discuss the various strategies to gain exposure to commodities.

Prepared by:



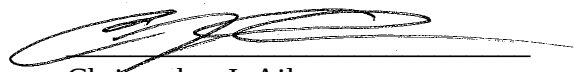
Carrie Lo
Investment Officer

Approved by:



Steven Tong
Director, Innovation and Risk

Concur:



Christopher J. Ailman
Chief Investment Officer



Research Report on Commodities

Investments – Innovation & Risk

INTRODUCTION

The purpose of the Innovation and Risk unit is to research and test strategies that are new to CalSTRS. Based on our analysis, we have determined that commodities may serve a beneficial role in CalSTRS' total fund as a hedge against inflation or negative shocks.

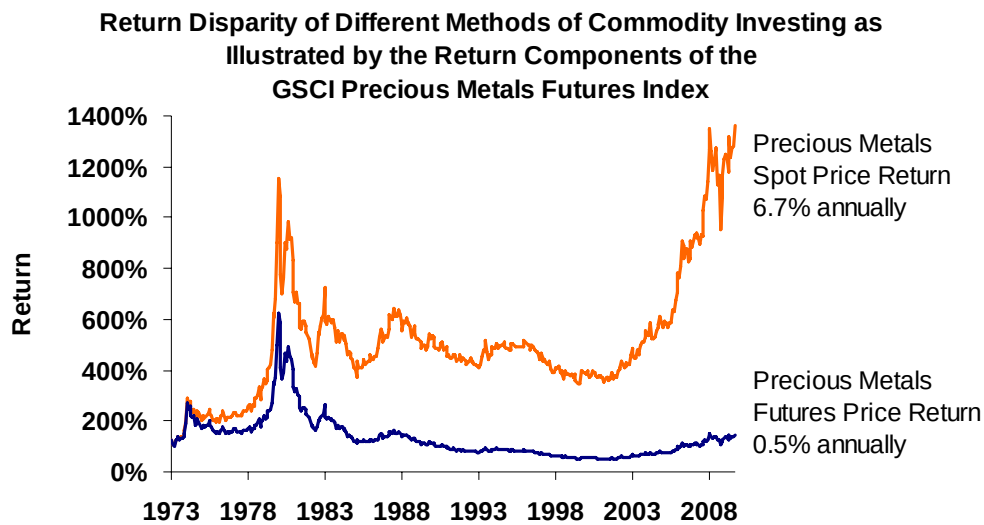
COMMODITIES – DISCUSSION

Overview

Commodities are consumable, transformable real assets as opposed to financial assets. As mentioned previously, financial assets, such as stocks and bonds, are claims on a company's future cash flows. Real assets, such as commodities, real estate, infrastructure and land, are physical assets that are themselves a store-of-value. Commodities can be consumed as food, such as wheat, or they can be transformed, such as crude oil into gasoline.

In this paper, we will describe what commodities are, how the performance of these assets behave in different inflation and growth environments, and the advantages and disadvantages of investing in commodities. Investors can obtain commodity exposure in several ways, including purchasing the physical commodity, shares in a commodity-related firm, exchange-traded funds (ETFs), exchange-traded futures contracts, or over-the-counter (OTC) derivatives. Our analysis in this paper is based on investing in the GSCI Commodity Index ("GSCI") and its five sub-indexes. GSCI is divided into the following sectors: energy, industrial metals, precious metals, agricultural and livestock indexes. The two main commodity indexes utilized as benchmarks by institutional investors are the GSCI and DJ-UBS Commodity Indexes. Both are comprised of commodity futures contracts but, due to differences in the actual futures traded and weighting of the commodity sectors within the indexes, the returns from these indexes can be very different. In our analysis, the GSCI and DJ-UBS Indexes led us to similar conclusions. Consequently, we only show analysis based on GSCI, which is more widely used by investors.

It is important to note that, in addition to indexes, there are various ways that investors can obtain commodity exposure and the returns from each type of investment can be significantly different. For example, purchasing precious metals and purchasing precious metals futures over the past 36 years would have yielded drastically different returns. Precious metal spot prices, or market prices, rose at an annualized rate of 6.7% while precious metals futures' prices gained only 0.5%. We discuss the components of futures contracts returns in Appendix A to explain why futures contracts may generate negative returns while the underlying commodity's spot price rises.



Source: Bloomberg

Should the CalSTRS Investment Committee be interested in allocating a portion of the total fund to commodities, Staff will provide follow-up materials on the entire spectrum of investment vehicles to access commodities, differences among the major commodities indexes and sectors, and a recommendation on how to implement a commodities program.

Commodity Sectors

Commodities can be broadly grouped into two categories (“hard” or “soft”) and five sectors (energy products, industrial metals, precious metals, agriculture and livestock). Non-perishable real assets, such as energy and metals, are considered hard commodities. Perishable and consumable real assets, such as agricultural products and livestock, are considered soft commodities. Each commodity sector is distinct with its own characteristics, return drivers and investment risks. CalSTRS’ decision to invest in commodities should include whether the portfolio should be exposed to all or only specific commodity sectors. See Appendix B for an overview of these commodity sectors.

Commodity Cycles and Correlations

Historically, institutional portfolios have benefited from commodities because, over long periods, they exhibited low correlations to traditional stocks and bonds, provided a hedge against inflation and produced equity-like returns. However, commodities can follow long investment cycles, be highly volatile, and as observed during the current financial crisis, become more correlated to traditional stocks and bonds. We will discuss the merits and drawbacks of commodities in general as well as each commodity sector.

Commodity prices are driven by the current global supply and demand of that commodity, while financial assets are based on forecasts of GDP growth. However, when demand is dependent on GDP growth, commodities tend to be more correlated with financial assets. For example, during a global financial and economic meltdown, commodity prices and financial prices may both fall.

In 2008, equity and commodity prices declined significantly as a result of the global economic slowdown as well as outlook for negative global GDP growth. However, the difference between the economic outlook and current supply and demand can cause commodity and financial asset returns to diverge. Commodity prices can also be influenced by supply and demand factors that are independent of global growth expectations. Consequently, there have been multiple equity bear markets when commodities generated a positive return.

Equities, represented by the MSCI World Index in the table below, posted negative returns in ten of the past 39 calendar years. Meanwhile, commodities posted positive returns in seven of those ten equity bear markets. Some of those equity bear markets were triggered by oil shocks that benefited commodities.

GSCI Commodity Index Performance During Equity Bear Markets

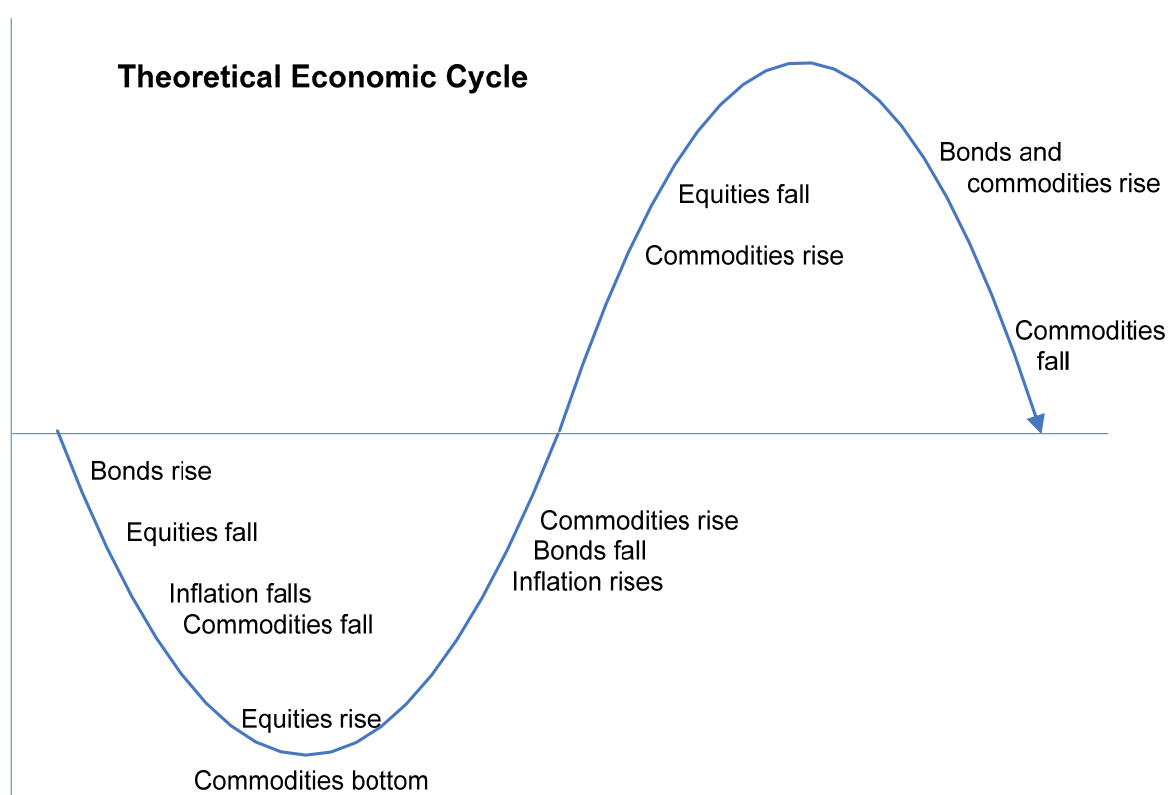
	MSCI World	GSCI Commodity	Industrial Energy	Precious Metals	Agriculture	Livestock
1970	-2.0%	15.1%			22.0%	0.4%
1973	-14.5%	75.0%			138.7%	2.9%
1974	-24.5%	39.5%			20.6%	74.8%
1981	-3.3%	-23.0%		-23.9%	-45.2%	-39.0%
1990	-16.5%	29.1%	39.0%	39.3%	-11.6%	-17.6%
1992	-4.6%	4.4%	-1.9%	3.0%	-7.3%	-11.5%
2000	-12.9%	49.8%	84.1%	-7.7%	-4.6%	-4.5%
2001	-16.5%	-31.9%	-42.1%	-18.1%	-1.2%	-24.7%
2002	-19.6%	32.1%	48.2%	-3.1%	20.8%	8.9%
2008	-40.3%	-46.5%	-52.3%	-48.9%	0.6%	-28.8%

We also observe that individual commodity sectors can sometimes dominate the returns for the commodity composite. For example, the weight of the energy component of the GSCI Commodity Index at the end of 2008 was 65%. This underscores our previous assertion that it is important to consider the benefits and risks of each commodity sector as well as a composite of commodities.

Current and anticipated macroeconomic factors, such as inflation and GDP growth, can affect financial and real asset values differently at different points in the business cycle. This leads to potential portfolio diversification from the lower correlation between commodities and financial assets.

During periods of anticipated declining growth, equities generally decline and bonds generally rise. Commodity prices can also fall if current demand is insufficient for finished goods or raw materials. As the business cycle approaches the bottom of a recession, equities tend to rise as growth prospects improve. Stocks perform best when the economy appears the worst but the prospects for improvement are the highest. Real assets, however, show the opposite pattern. Commodity prices are determined less so by the future prospects of the economy, but by the current level of economic activity. Consequently, commodity prices are at their lowest when economic activity is at its lowest and growth has not yet been realized.

During mid-cycle expansions, the increased current demand for commodities will push real assets higher. This is because demand for goods and the raw materials needed to make them increases, which raises commodity prices. Consequently, periods of strong economic growth are often associated with accelerating inflation. Inflation reduces the values of stocks and bonds but is expected to improve commodity values. The inflation fears and concern about the sustainability of high growth caused by this strong economic growth may cause financial assets to decline. Thus, as economic growth accelerates, stock prices begin to decline but commodity prices continue to increase. Higher inflation rates may also lead central banks to raise interest rates, which would cool the economy and cause financial assets to suffer. These characteristics are why commodities may be an attractive diversifier: commodities prices are determined by the current supply and demand for the good while equities and bonds are driven by the expectations for GDP growth.



Economic State:	Decline	Bottom	Expansion	Peak	Decline
Inflation	↓	↓	↑	↑	↓
Equities	↓	↑	↑	↓	↓
Bonds	↑	↑	↓	↑	↑
Commodities	↓	↓	↑	↑	↑

Commodities are not only a potential portfolio diversifier but also a potential inflation hedge. Currently, CalSTRS allocates 66% of its portfolio to public and private equities. These assets tend to perform well during periods coinciding with high GDP growth and low inflation. The portfolio's bias towards low inflation environments makes commodities worth considering as a hedge or "insurance" during periods of high inflation.

In fact, one argument is that commodities are actually a source of inflation. Commodities comprise 40% of the Consumer Price Index (CPI), the most commonly accepted benchmark for U.S. inflation. Rising commodity prices are factored into governments' inflation computations, so if commodity prices rise, inflation does as well. Based on the correlation of CPI to the real annual returns of the assets in the table below, commodities have a strong positive relationship to inflation. A positive correlation of 0.55 indicates that since 1970, commodity annual real returns and CPI tended to move in the same direction. Of the five commodity sectors, the energy, industrial metals and livestock indexes had the highest correlations. Financial assets are negatively correlated with changes in the inflation rate. Stocks had a low correlation of -0.05 and bond prices were negatively correlated with inflation at -0.32. Bonds' negative correlation of -0.32 indicates that bond prices tended to decline when CPI rose. The reverse is also true. As inflation decreases, capital asset prices tend to increase, but commodity futures prices may not rise as quickly or may decrease.

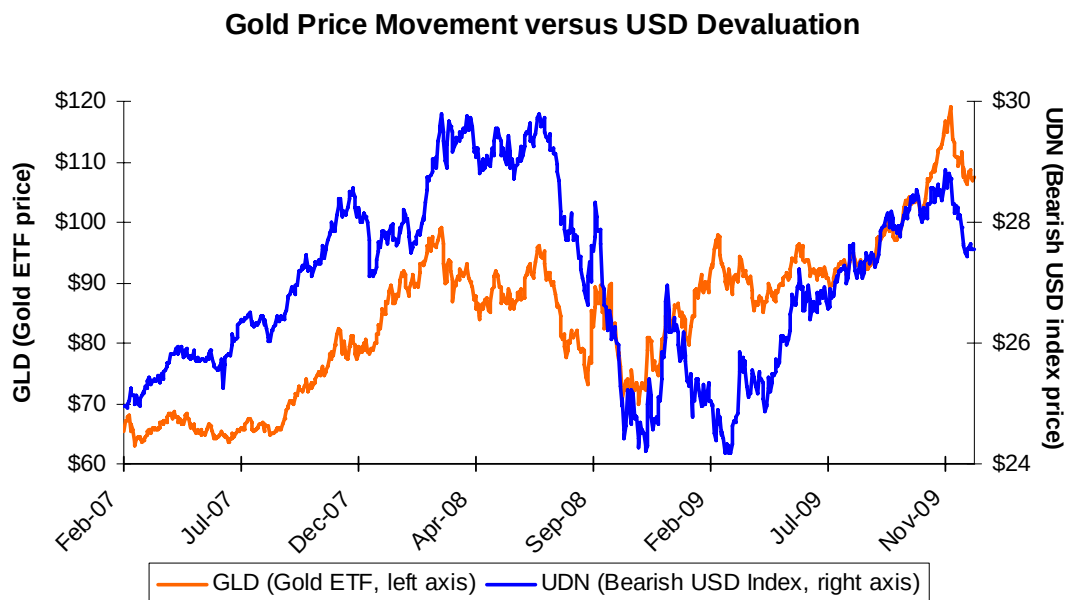
However, not all commodity sectors are highly correlated to inflation. The GSCI Agricultural Index shows a low correlation of -0.02 to CPI but this may be because of the lagged effect of agriculture on CPI. When agricultural prices rise, higher raw material costs may not be readily passed on to consumers in the prices they pay for the goods that are included in the CPI calculation. Precious metals, such as gold, also have a low correlation to inflation.

Equity, Fixed Income and Commodity Correlations to Inflation (CPI) and Traditional Asset Classes

	Equities	Fixed Income	Commod- ities	Energy	Industrial Metals	Precious Metals	Agriculture	Livestock
Correlation to CPI	-0.05	-0.32	0.55	0.52	0.36	-0.08	-0.02	0.56
Correlation to Equities	1.00	0.00	0.12	0.05	0.28	0.14	0.38	0.10
Correlation to FI	0.00	1.00	-0.14	-0.16	-0.62	-0.20	0.30	-0.08

Note: Based on real annual returns for GSCI commodity indexes available from 1970 through 2009. Equities based on MSCI World Index and Fixed Income based on Barclays U.S. Aggregate Index.

Gold is typically thought of as a store-of-value and is often used to hedge currency or sovereign risk. Over the past several years, it has been more correlated to the U.S. dollar than to inflation. In the following chart, gold prices have tended to move in the same direction as bearish views on the U.S. dollar.



Source: Bloomberg

As noted, commodities encompass a diverse set of sectors, each which has its own cycle and price influences. This results in low correlations among the sectors. However, the correlation between oil and agricultural products such as corn could be rising due to greater usage of ethanol as fuel. In addition, the agricultural sector's dependence on oil for fuel and fertilizers may also increase correlations between the two sectors. Generally, however, the factors that influence the supply and demand for each commodity, and therefore their prices, are very different.

Historical Return and Volatility

In this section, we present historical returns based on the GSCI Commodity Index. Liquid commodity indexes are not comprised of physical commodities but rather futures contracts whose value is linked to underlying commodities. As we stated previously, the returns from investing directly in physical commodities and futures will differ. This is detailed in the following table. Since 1991, commodity spot prices returned 6.2%. However, rolling the futures resulted in a loss of -4.8%. This reduced the net excess return to only 1.4%. Should the Investment Committee be interested in further discussions on commodities, Staff will then present return analysis for physical commodities, commodity futures and other commodity derivatives.

GSCI Return Decomposition: 1991 Through September 2009

	GSCI Commodity	Energy	Precious Metals	Industrial Metals	Agriculture	Livestock
Spot Return	6.2%	9.5%	6.6%	6.2%	4.3%	0.9%
Roll Return	-4.8%	-5.0%	-3.4%	-4.8%	-8.0%	-5.4%
Excess Return	1.4%	4.5%	3.2%	1.4%	-3.6%	-4.5%

Source: JPMorgan

The spot return results from the change in the market price of the physical commodity from the time the futures contract is entered into to the time the futures contract matures. The roll return results from rolling a futures contract to avoid taking delivery of the underlying commodity when the contract matures. In order to avoid the delivery process and maintain a long futures position, the buyer of the futures contract must sell the contracts currently held prior to expiration and purchase contracts that have a later maturity date. This process of selling a nearby contract and buying a longer-dated contract is known as "rolling" a futures position. The return from rolling the futures position may be positive or negative. More details on the return components of commodity futures contracts, including the roll return, are detailed in Appendix A.

On average, the commodity composite index underperformed both equities and fixed income while exhibiting higher volatility. However, in most cases, commodities were more volatile when producing positive returns than when producing negative returns. In other words, commodity upside volatility is generally higher than commodity downside volatility. This means that commodities have a higher probability of generating outsized positive returns than outsized negative returns.

Twenty-Year Statistics of Equities, Fixed Income and Commodity Indexes
(based on underlying futures instruments monthly returns, October 1989 through September 2009)

	Equities	Fixed Income	Commodity Index	Energy	Industrial Metals	Precious Metals	Agri-culture	Live-stock
Annualized Return	5.91%	7.19%	4.55%	5.97%	6.06%	5.68%	-1.97%	-0.09%
Annualized Volatility	15.41%	3.86%	21.80%	33.31%	20.05%	15.13%	17.06%	13.86%
Downside Volatility	10.83%	1.89%	14.39%	20.35%	12.69%	9.32%	12.22%	10.18%
Upside Volatility	11.10%	3.92%	16.44%	26.47%	15.63%	12.03%	11.86%	9.37%
Correlation to Equities	1.00	0.15	0.15	0.08	0.33	0.10	0.24	0.06
Correlation to FI	0.15	1.00	0.02	0.01	-0.08	0.11	0.06	0.03
Skew *	-0.72	-0.29	-0.08	0.53	-0.06	0.09	-0.08	-0.45
Kurtosis **	1.55	0.69	2.19	1.91	2.02	1.90	1.25	0.43

Note: Equities based on MSCI World and Fixed Income based on Barclays US Aggregate Indexes.

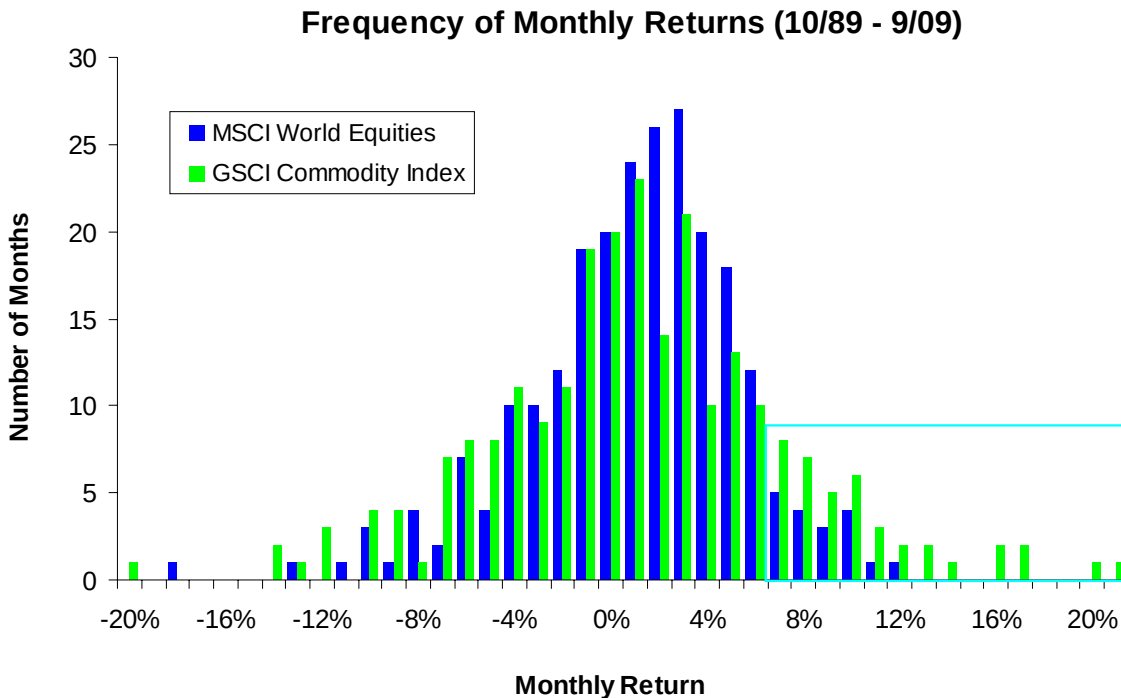
* Skew indicates the symmetry of the indexes' 20-year monthly returns. A positive skew indicates that the monthly returns were positive more often than they were negative, and vice versa. A higher positive skew is more desirable.

** Kurtosis is a measure of the peakedness or flatness of the distribution of the indexes' 20-year monthly returns. Positive kurtosis indicates a distribution with a sharper peak and longer, fatter tails. Negative kurtosis indicates a relatively flat distribution with shorter, thinner tails.

This attribute of producing positive returns more often than negative returns is further underscored by the histogram on the following page, which shows the number of months (y-axis) that posted returns within the ranges along the x-axis during the 20-year period from October 1989 through September 2009. As indicated by the light blue box in the histogram, commodities produced monthly returns greater than 7% more often than did equities.

Part of the reason that commodities generated positive double digit returns in more months than did equities is that commodity prices tend to react positively to negative shocks. Meanwhile,

these negative shocks may have no impact or a negative impact on stock and bond markets. Events such as OPEC's decreasing oil production, political unrest in a country with significant copper mines, or a drought that ruins crops tend to unexpectedly reduce the supply of the commodity to the market and increase short-term commodity prices. These shocks to the commodities markets are expected to be uncorrelated or negatively correlated with the financial markets, providing another layer of diversification benefits.

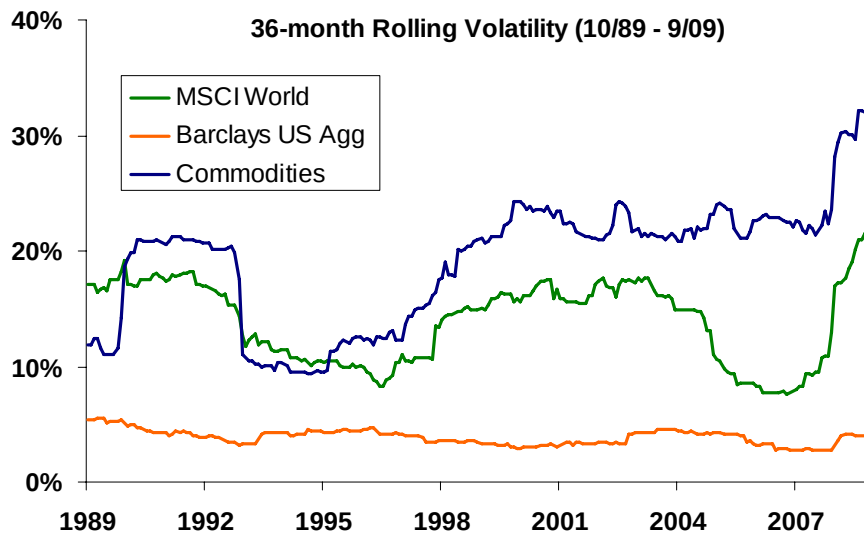
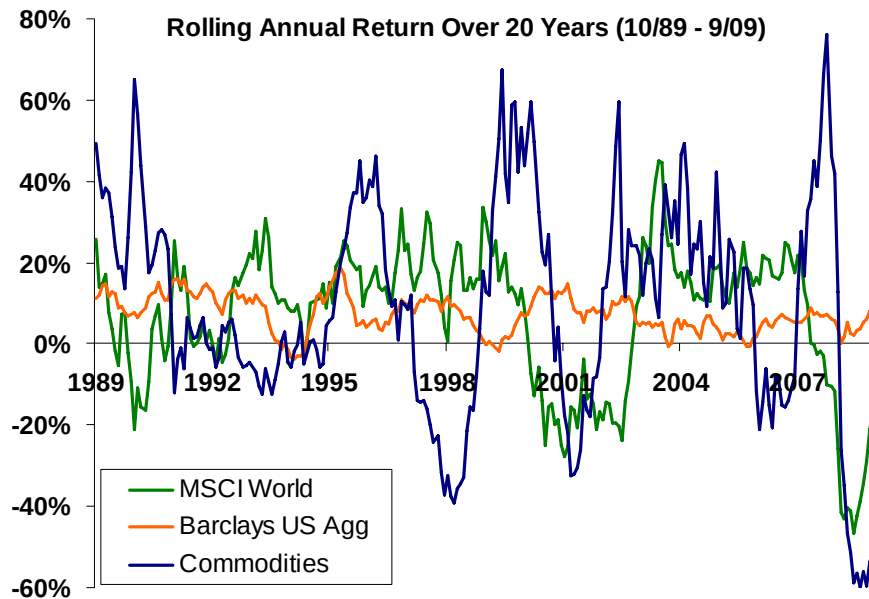


	MSCI World Equities	GSCI Commodity Index
Skew	-0.72	-0.08
Kurtosis	1.55	2.19

Over the long-term, commodities markets are expected to exhibit strong tendencies to revert to their average growth rate due to the basic principles of supply and demand. When there is an oversupply of a commodity, prices fall and profit margins decrease. Lower prices may induce more consumption and supply will be constrained to prevent prices from falling further. When price momentum pushes prices too high, consumers reduce their demand or suppliers increase supply to take advantage of the high prices. Higher commodity prices will generally trend back to their long-term average growth rate, or revert to the mean.

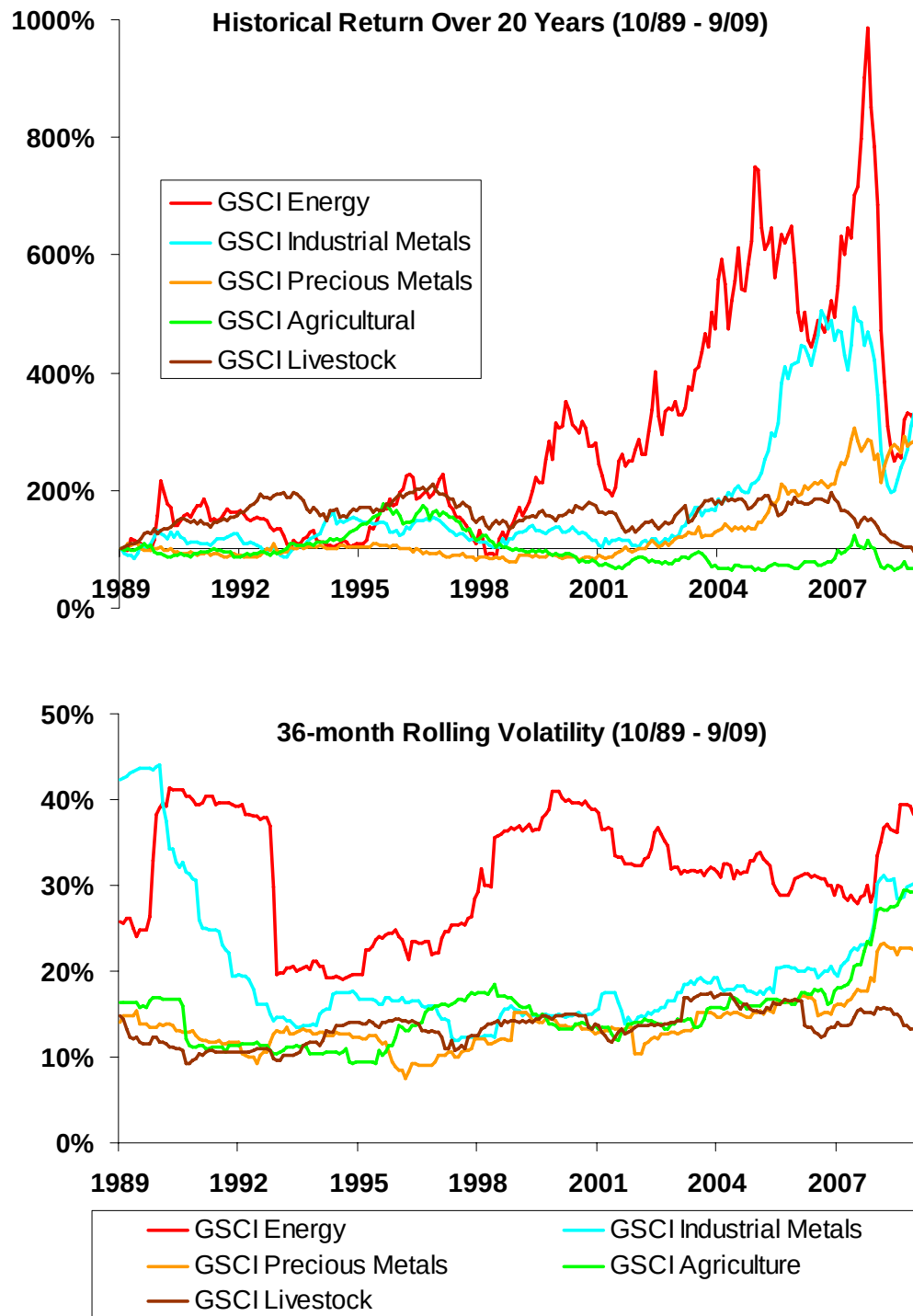
Equity, Fixed Income and Commodity Index Return and Volatility

Over the past 20 years, the GSCI Commodity Index realized a lower return than equities and fixed income and exhibited higher volatility. However, commodities' ability to outperform during periods of crises or high inflation may warrant their inclusion in an institutional portfolio.



Commodity Sector Indexes Return and Volatility

Not all commodity sectors behave the same. Historically, the GSCI Energy Index, which tracks the performance of energy-related futures, exhibited the highest return and volatility.



Risks

As discussed throughout this document, commodities pose several risks, which are summarized below.

Disappointing returns. Over the past 20 years, commodity futures have underperformed equities and fixed income. Moreover, commodity returns have been concentrated in energy and industrial metals. There is wide dispersion in returns for individual commodities, futures based on commodities and other forms of investing in commodities. Thorough consideration must be given to which commodity sector, if any, should be targeted, how CalSTRS accesses commodity exposure, and whether the allocation should be active or passive.

Long cycles and high volatility. Commodity futures can be more volatile than equities and returns can come in sudden, infrequent bursts after years of stagnant performance.

Commodities could be the next bubble. Commodities such as crude oil and copper doubled in price in 2009. Although developing markets have emerged from recession, the global economy still faces headwinds.

Contango in the futures market results in negative roll returns. Contango markets generate negative returns when investors buy futures at a premium to the spot price. In the table on page 6, we observe that rolling futures has resulted in a negative return in every commodity sector over the period from 1991 through September 2009. Should long-only passive investors flood the market, futures prices could trade at a greater premium to the spot price and further diminish the opportunity to earn positive roll returns. The components of commodity futures returns are further detailed in Appendix A.

Potentially adverse view of investor social responsibility. Many developing nations depend substantially on commodities for their economic growth and sustainable development. This may be threatened by scarce commodity supply or high commodity prices while investors who are long commodities would benefit.

Rising commodity prices, commodity futures speculation and regulation. Many commodities reached record high prices and volatility from 2003 through 2008 and the causes are being investigated. Dramatic increases in commodity prices and volatility present major challenges to companies that consume or produce commodities and consumers in both developed and developing countries. Some of the potential causes of the rise in commodity price levels and their volatility include a declining U.S. dollar, fundamental supply and demand, or speculative capital flows.

Many commodity prices are based in U.S. dollars. The level and fluctuations in this base currency will affect the price and volatility of commodities. A weakening U.S. dollar may boost commodity prices. For example, less oil can be purchased with a weaker the dollar so a higher price must be paid to obtain an equivalent amount of oil. When the U.S. dollar strengthens, commodity prices may fall.

The fundamental supply and demand drivers of commodity prices were discussed previously. Rapid economic growth in developing countries, such as China and India, increased the demand for commodities, including steel, copper and oil. Meanwhile, some commodity supplies fell and new sources were slow to be discovered. These simultaneous factors could have partially accounted for the rise in commodity prices.

In addition to supply and demand for the actual commodity, supply and demand of commodity futures and derivative contracts also influence the prices of physical commodities. Large purchases of commodity futures contracts create additional demand for the commodity and drive the price of the commodity for future delivery higher. Some point to the influx of capital from large financial institutions, hedge funds and pension funds into commodity futures markets as the cause for commodity price increases. The Commodity Futures Trading Commission (CFTC) defines these entities as speculators because they do not produce commodities, seek to hedge an exposure to physical commodities or consume a commodity. Rather, their sole objective is to profit from the changes in commodity futures prices.

By some measures, commodity index investor positions have risen from \$13 billion in 2003 to over \$300 billion in 2008. Investors, such as public pension funds, seek to replicate a commodity index's performance by buying and selling futures according to the same mechanics of the index. The CFTC has not declared that passive long-only investors are detrimental speculators.

Some level of speculation is economically necessary for a well-functioning market by balancing the hedging needs of commodity producers and consumers. However, excessive speculation can cause prices to fluctuate away from an asset's fundamental value. "Herding" by speculators, or purchasing commodity futures to capture and up-trend and selling commodity futures just because they are going down, also cause volatility. Speculators may not start a trend, but they may exacerbate it, cause prices to move away from fundamentals and generate volatility.

In its 2006 report, "The Role of Market Speculation in Rising Oil and Gas Prices: A Need to Put the Cop Back on the Beat," the U.S. Senate's Permanent Subcommittee on Investigations stated that "speculative trading brings greater liquidity to the futures market, so that companies seeking to hedge their exposure to commodity prices can find counterparties willing to take on those price risks. Speculative purchases of futures contracts can also, in effect, finance the production and storage of the underlying commodity to meet future demand. On the other hand, large speculative buying or selling of futures contracts can distort the market signals regarding supply and demand in the physical market or lead to excessive price volatility, either of which can cause a cascade of consequences detrimental to the overall economy." The report also states that "speculation has contributed to rising U.S. energy prices, but gaps in available market data currently impede analysis of the specific amount of speculation, the commodity trades involved, the markets affected, and the extent of price impacts."

A key responsibility of the CFTC is to ensure that prices on the futures market reflect the laws of supply and demand rather than manipulative practices or excessive speculation. The Commodity Exchange Act (CEA) directed the CFTC to establish such trading limits on the size of futures positions to prevent speculative bubbles. Traders on regulated exchanges are required to keep records of all trades and report large trades to the Commodity Futures Trading Commission (CFTC). This information assists the CFTC in determining whether concentrated or coordinated positions might be used to manipulate the market.

However, the CFTC's ability to monitor the nature, extent, and effect of this speculation has been diminishing as speculative capital has poured into commodity futures markets. Most significantly, there has been an explosion of trading of U.S. energy commodities on exchanges that are not regulated by the CFTC. OTC derivatives markets and electronic exchanges are less regulated, are not subject to these position limits and do not need to report large trades. This makes it difficult to calculate precise, reliable figures of the total dollar value of commodity

future investment. Available data on the nature and extent of speculation in the OTC markets is limited, so it is not possible for anyone, including the CFTC, to make a final determination about the current level of speculation.

A precise causal relationship between the influx of investor capital and commodity prices is difficult to ascertain and contrary findings have been made by other organizations. According to a September 2008 CFTC report, over the six-month period ending June 30, 2008, the number of long crude oil futures contracts held declined by 11% while crude oil prices rose 30%. This indicates that the rise in certain commodity indexes was due to the appreciation of the value of the commodity rather than the result of capital flowing into commodity index trading. Also based on data provided in the CFTC report, the EDHEC-Risk Institute concluded in November 2009 that according to their measures, speculative participation in outright U.S. exchange-traded oil derivatives contracts during 2007-2008 fluctuated within a normal range relative to historical levels.

Although Congress has not been able to quantify the role of speculators, it is considering policies to improve transparency and establish limits on speculators' positions. The CFTC proposed a rule on certain energy position limits and hedge exemptions on regulated futures exchanges, derivatives transaction execution facilities and electronic trading facilities. Congress and the CFTC are working together on legislation to give the agency authority in OTC derivative markets and to require large trader reporting compliance by OTC participants. Staff will continue to monitor the outcome of these discussions.

See Appendix C for additional detail on commodity futures markets participants.

SUMMARY

Although commodity index returns were below and volatility was higher than those of equities and fixed income over the previous twenty years, their low correlation to traditional assets makes them a compelling diversifier to CalSTRS' existing portfolio. Commodities are particularly useful as a potential hedge against inflation and negative shocks. It is during these types of events that commodities can generate outsized returns. It is also worthwhile for CalSTRS to consider other investment vehicles for commodities besides commodity indexes or futures.

Subsequent Discussions

Should the Committee wish to further explore an allocation to commodities, Staff will provide additional information on the following:

1. Which commodity sectors should CalSTRS have exposure to?
2. What is the appropriate allocation to these commodity sectors?
3. How should CalSTRS access commodities (e.g., purchase physical commodities, futures or other derivatives) and should external managers be utilized?
4. Is passive or active commodity investing more appropriate?

Appendix A. Commodity Futures Returns

Although commodities are real assets, investing in commodity futures does not involve owning the underlying physical commodity. Thus, the returns from investing in physical commodities and commodity futures are not equivalent. The value of commodity futures is not only affected by the spot, or current, price of the underlying commodity, but also by two other components: the yield and the roll.

$$\text{Futures Return} = \text{Spot Return} + \text{Cash Return} + \text{Roll Return}$$

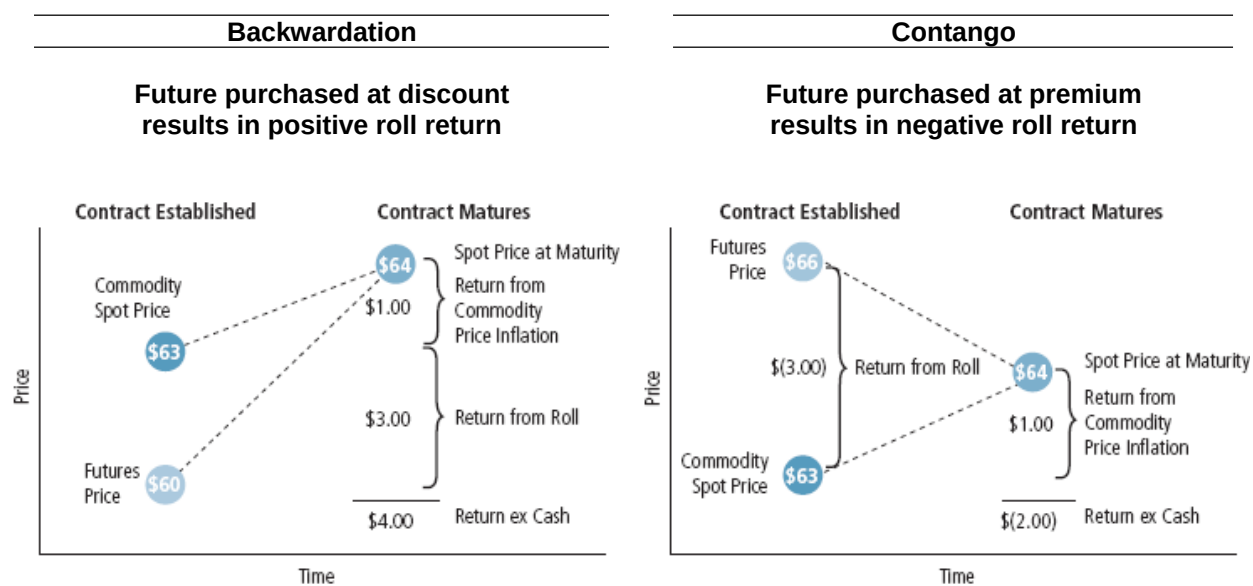
A futures contract is an agreement between two parties to buy and sell an asset in the future for a specific price. The seller of the futures contract must deliver the underlying commodity to the buyer at a specified time in the future. The buyer of a futures contract is obligated to pay the seller of the futures contract a set price for delivery of the underlying commodity at a specified time in the future.

Spot Return: The spot price is the market price of the commodity. The spot return results from changes in the market price of the underlying commodity over the duration of the contract. This is equivalent to the difference between the spot price at the time the futures contract is entered into and the spot price when the futures contract matures.

Cash Return: To enter into a futures contract, the parties need only to post a small percentage of the futures' value as collateral. The remainder of the investors' cash is often invested in short-term cash instruments. The interest earned on this cash that is not needed for the futures contract is called the cash return. Higher inflation typically benefits the cash return on commodity futures investments because higher inflation usually leads to higher short-term interest rates.

Roll Return: When the futures contract matures, investors typically do not actually want to take delivery of the commodity. In order to avoid the delivery process and maintain a long futures position, the buyer of the futures contract must sell the contracts currently held prior to expiration and purchase contracts that have a later maturity date. This process of selling a nearby contract and buying a longer-dated contract is known as "rolling" a futures position. This component of a commodity futures' return is not necessarily driven by the supply and demand of the underlying commodity. Rather, it is driven by the supply and demand of the commodity futures contract.

Futures contracts can be priced at either a discount or a premium to the commodity's spot price when it is entered into. As the contract nears its expiration date, the futures price will converge to the spot price at expiration. If the investor bought the future at a discount to the spot price, the investor can sell a more expensive future and buy a cheaper future dated further out. The investor realizes a positive roll return. When the roll return is positive, futures prices are said to be in “backwardation.” If the investor bought the future at a premium to the spot price, the investor will sell a cheaper future and buy a more expensive future dated further out. This results in a negative roll return and futures are in “contango.”



Source: AllianceBernstein

Appendix B.	Hard Commodities				Soft Commodities	
Sector	Commodities	Energy	Industrial Metals	Precious Metals	Agriculture	Livestock
Examples	Composite of the sectors in the next 5 columns	Crude Oil, Natural Gas, Heating Oil, Unleaded Gas	Aluminum, Copper, Zinc, Nickel	Gold, Silver, Platinum	Sugar, Coffee, Corn, Wheat, Soybeans	Cattle, Hogs
Proxy	GSCI Commodities Index	GSCI Energy Index	GSCI Industrial Metals Index	GSCI Precious Metals Index	GSCI Agricultural Index	GSCI Livestock Index
Return Drivers	Global economic cycle, supply (inventory levels, production) and demand	Has the strongest link to the global economy. Tends to rally the most before and after a U.S. recession	High correlation to emerging market growth and auto producers	Sensitive to USD, financial conditions, real interest rates, central bank policy. Less cyclical	Driven by weather. Food source but becoming more energy-like due to biofuels	Agriculture prices may impact livestock through feedstock
Inflation Relationship (previous 20 years correlation)	Strong. 40% of CPI is commodity-linked (0.55)	Strong. 9% of CPI (0.52)	Moderate. Metals price changes may not be as readily passed through to the consumer (0.36)	Weak. Expected to retain intrinsic value despite diminished value of U.S. dollar (-0.08)	Weak despite being 16% of CPI (-0.02)	Strong (0.56)
Hedging Benefits (Positive reaction to negative shocks)	Provides “insurance” by reacting positively to supply shocks, such as those in the next 5 columns	Geopolitical tension or unrest; reduced OPEC output	Geopolitical tension or mine strikes reduce supply	Geopolitical tension or mine strikes reduce supply	Severe weather, such as frosts, floods or droughts, crop diseases reduce supply	Animal diseases reduce supply
Investment Outlook	Despite 2008’s drastic correction, developing market demand and limited supply should continue upward trend	Supplies remain tight and emerging markets continue to grow. However, we have yet to see strong signs of growth	Recent sharp recovery presents some downside risk from current levels	Industrial demand is weak but outweighed by strong investor flows and inflation fears	Biofuels and developing markets demand more food but crop rotation increases supply and suppresses upside	Higher incomes in developing markets will increase demand for meat

Appendix C. Futures Market Participants

There are three main categories of commodity futures market participants, each with differing objectives.

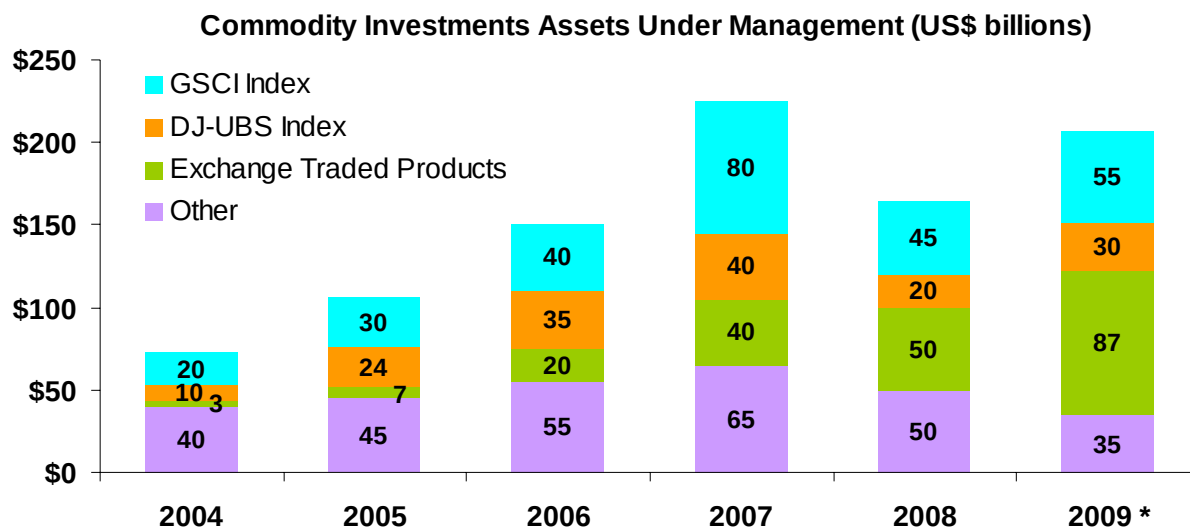
Type	Objective	Position
Producer	Hedge risk of falling prices	Seller (Short)
Consumer	Hedge risk of rising prices	Buyer (Long)
Speculator	Make money	Seller or Buyer

Source: AllianceBernstein

A producer, such as an oil exploration company, finds oil and, as the owner of this oil, is, in commodity terms, “naturally long oil.” Because the price of oil can be unpredictable, the producer may want to protect itself from a drop in the oil price. The producer can do this by selling an oil futures contract which will allow him to sell oil at a specified price when the contract expires. If the price specified by the futures contract is higher than the market price when the future expires, the exploration company benefits from selling oil at a higher price than the market price.

A consumer of commodities, such as an auto manufacturer, may want to hedge itself from an increase in the price of steel. The auto manufacturer can do this by buying a futures contract on steel that allows the manufacturer to purchase steel at a specified price when the contract expires. If the price specified by the futures contract is lower than the market price when the future expires, the manufacturer benefits from purchasing steel at a lower price than the market price.

Speculators and investors are commodity futures traders who buy or sell futures contracts with the sole intent to generate a profit. Some speculation is necessary. Speculators play a vital role to balance the hedging needs of the commercial market because the number of long hedgers does not always equal the number of short hedgers. Over the last five years, the commodities investor business has grown tremendously.



Source: JPMorgan. * Through September 2009.

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.

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.

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.

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.

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.

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.

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