

## *The Case for Diversifying With Commodity Futures*

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Commodity futures can be a worthwhile component of a well diversified portfolio. When held in certain disciplined manners they have historically generated investor returns in the same ball park as equities while having comparable downside risk. But perhaps their most attractive aspect is their very low, probably negative correlations to the returns of both stocks and bonds. This makes commodity futures an outstanding candidate for portfolio diversification, even if their future returns end up being somewhat lower than in the past.

Just about two years ago I began introducing commodity futures investments into most of our portfolios as a component of our then new alternative investments asset class. The level of commitment to date has been quite modest, however. Our target allocations for all alternative investments, (in those portfolios that have them) have ranged from 5% to 7% of total assets, and commodity futures generally account for about 30% to 40% of that category. So overall, commodity futures have constituted only 2% to 3% of total assets or so. Having researched commodity futures for two more years, I now have a better understanding of them and of the positive role they can play in our portfolios. As a result, I am now planning to modestly increase our level of commitment to them. In the next round of comprehensive portfolio reviews, I will probably increase our targets for commodity futures up to 4% to 5% of total assets for most portfolios. For now, this only applies to those of us who already have some level of commitment to alternative investments.

In addition, for purposes of portfolio design and management, I am now going to pull commodity futures out of the alternative investments class, and elevate it to a top level asset class in its own right. I now feel this investment type is sufficiently distinct in character and important enough in portfolio design to warrant this change. The other investment types heretofore counted in the alternative investments class, namely long/short equity strategies and merger arbitrage, will continue to be counted there. As a result, our asset allocation will now include five top level asset classes: equity, real estate, commodity futures, alternative investments and fixed income.

As a kind of shorthand for assessing the relative aggressiveness of portfolios, we can consider the first three of these to be our higher expected return, higher risk investments, and the last two to be our lower expected return, lower risk investments. For example if we allocated assets to the five asset classes as shown in Table 1, we would interpret this as having 87% of total assets in the more aggressive asset classes and 13% in the more conservative ones.

**Table 1 – Sample Top Level Allocation Targets**

<b>Higher Expected Return, Higher Risk</b>	
Equity	78%
Real Estate	4%
Commodity Futures	5%
<b>SUB-TOTAL</b>	<b>87%</b>
<b>Lower Expected Return, Lower Risk</b>	
Alternative Investments	4%
Fixed Income	9%
<b>SUB-TOTAL</b>	<b>13%</b>

You may be wondering what exactly are commodity futures and why should we bother to include them in our portfolios? I will answer these queries, but first, I would like to avoid possible misunderstandings by assuring you of a few things we are not doing:

1. We are not investing in commodities themselves, but in commodity futures (or derivatives and swaps that have the same effect). As you will see, buying commodity futures is significantly different from and preferable to buying the underlying commodities directly.
2. We are not attempting to forecast the prices or relative price changes of any individual commodities or commodity futures. Rather, we are simply attempting to replicate the holdings of a particular commodity futures index, namely, the Dow Jones AIG Commodity Index, as described below.
3. We are not directly buying any futures or derivatives on your behalf. Rather, we are investing in a mutual fund from PIMCO, managed by some high powered and thoroughly experienced professionals in the field. PIMCO has a top rung reputation for managing fixed income and other sophisticated investments. Further, the particular PIMCO fund in which we are invested comes highly recommended by both Morningstar and Litman Gregory, two outside sources that I rely upon for mutual fund and fund manager due diligence.

The Dow Jones AIG Commodity Index tracks the returns from holding futures contracts associated with 19 different commodities, including various types of energy, industrial and precious metals, livestock and agricultural products. There are numerous commodity indexes in existence, but a couple of distinguishing characteristics of the AIG index are (1) it limits the weight of any one commodity (like crude oil) to 15% of the index value, and of any one sector (like energy) to 36% of its value, and (2) the index is rebalanced each year based on prices rather than physical volumes. The first policy keeps any one commodity or sector from dominating the index, as is the case for indices weighted by the value of production or trade flows. For example, energy accounts for over 75% of the Goldman Sachs Commodity index. Rebalancing based on prices means that the index will decrease the volumes of commodities whose relative prices have gone up the most, and increase the volumes of those whose relative prices have gone down. We will see in a moment why this is important and beneficial.

Although commodity prices, especially oil and gas prices, have increased substantially in the past couple of years, most economists do not expect these trends to continue much longer. We are living in a low inflation world overall, as central banks seem to have learned how to

prevent the kind of hyper inflation we experienced in the 70's and earlier times. With signs that economic growth rates are moderating, not only in the U.S. and Europe, but also in the explosively growing Asian countries like China, why would we want to put long term savings into commodities related investments? The simple answer is that making money in commodities futures does not depend directly on commodities prices going up. And even though there is some observed statistical relationship between commodity price increases and returns on commodity futures, the linkage is not very strong.

A commodity future is a deceptively simple contract. The buyer simply commits to buying and taking delivery of the given commodity at a designated future time for a specific price agreed to today. When that future date comes about, the holder of the futures contract can either take physical delivery of the commodity, or sell the futures contract back on the market for a value equal to the current price of the commodity at that time (i.e., the spot price). So the futures buyer will make or lose money to the extent the current price of the commodity on the delivery date is higher or lower than the price agreed to earlier in the original future's contract.

For example, suppose in February the current price of soybeans is \$7.00 per bushel, but the market expects soybean prices to drop in the coming months. So in February we buy a soybeans futures contract for delivery in September for a price of \$6.50 per bushel. When September comes around, however, we find the soybeans price has only dropped to \$6.70 per bushel. Therefore, as the holder of the futures contract, we earn a profit of 20 cents per bushel, even though the soybeans price went down after we bought the futures contract. It just didn't go down as much as the market anticipated at the time of buying the contract. If the price had dropped to \$6.30 a bushel in September, we would have lost 20 cents a bushel. These examples are summarized in Table 2. We see that price related profits or losses on a futures contract are based on the unexpected changes in the commodities prices, not on the absolute changes. This source of gain or loss is called the expectational variance.

**Table 2 – Buying Commodity Futures: Example of Profit or Loss Scenarios**

<b>Date and Scenario</b>	<b>Current (Spot) Price</b>	<b>September Futures Price</b>	<b>Futures Buyer Profit or Loss</b>
<b>February</b>	7.00	6.50	
<b>September - Scenario 1</b>	6.70	6.70	0.20
<b>September - Scenario 2</b>	6.30	6.30	(0.20)

It is nice to make money due to being on the right side of expectational variance, but if our return from futures contracts depended on outguessing the market about future price changes we would be in big trouble.<sup>1</sup> It would probably make commodity futures purchases no more

<sup>1</sup> Actually the observed relationship between futures prices and the actual prices on the delivery dates are not very symmetrical. Prices tend to be a bit lower than expected more often than they are higher, but the magnitude of the differences tends to be much larger when the prices end up higher than expected. This is because unforeseen events, like hurricanes, early frosts, strikes or wars, have the effect of pushing prices way up for temporary periods. The kinds of events or trends that cause prices to be lower than expected are generally not so acute in nature.

than a breakeven proposition in the long run. Lucky for us, there are there are other sources of return for commodity futures buyers that are structural and enduring. These are summarized below.

**Insurance Return** – The most fundamental source of return for the buyer of a commodity futures contract is an insurance premium. The original reason that futures markets arose was to provide a way of ensuring the producers of a commodity in advance that they would be able to sell their product for a known price when it was finally ready to be delivered to the market. The investments in commodities production – planting fields, nurturing a herd of cattle, developing oil and gas wells – must occur well before the farmer, cattleman or oil man actually delivers his product to the market. Thus, it is a great benefit to the producers, or their banker, to take the uncertainty out of how much their product will ultimately fetch in the market. The buyer of a futures contract assumes all of the uncertainty and variability of future prices himself and leaves the seller with price certainty. Why would futures buyers do this for free? Well, they don't. Inherent in the market price of a futures contract is an insurance premium that provides fair compensation for taking the risk of price uncertainty off of the producer's hands.

So in the example above, if the market really anticipated that the actual September price of soybeans would be \$6.50 per bushel, the price of the futures contract in February would be lower than \$6.50, say \$6.35, in order to build in the insurance premium. So in this example there would be a 15 cents per bushel insurance premium earned by the futures buyer even if the September price turned out to be just as expected in February; that is, even if the expectational variance turned out to be zero.

**Collateral Return** – At the time one commits to a futures contract, no money actually changes hands. This happens only when the buyer of the contract takes physical delivery of the commodity or closes out his long position on the financial futures market. However, assuming there is no leverage involved (which is the case for our investments), the futures buyer does post collateral at the time he/she commits to the futures contract. But since the collateral is still the buyer's money, he/she can earn interest on it in between the purchase and delivery dates. This "collateral return" is another source of return for the futures buyer. In fact, the AIG index that our fund follows builds this return into the index values themselves, assuming the collateral is invested in short term T-Bills.

The PIMCO fund in which we invest goes one step further by trying to beat this implied T-Bill return. It does this by investing its collateral in TIPS bonds instead of T-Bills. TIPS bonds will generally earn more than T-Bills because they are much longer term securities. TIPS also constitute a strong inflation hedge, since they are indexed to inflation and have the full faith and credit of the government behind that pledge. So if inflation were to *unexpectedly* surge upwards, we would get a double return: a likely positive expectational variance on the prices of the commodities themselves, as well as a certain increase in total return on the TIPS collateral. Of course, there are also risks associated with TIPS, as we could do worse than T-Bills if inflation were much lower than expected and/or if real interest rates were to surge upwards.

**Rebalancing Return** – The third source of structural return is an intriguing concept that can be called "rebalancing return". As I mentioned earlier, the AIG index that our PIMCO fund seeks to replicate is regularly rebalanced amongst its 19 constituent commodities using price

based weightings. Under certain statistical conditions, the regular mechanical act of rebalancing based on price weightings will in itself generate a positive return for the futures buyers over and above any returns due to the other factors mentioned so far. And this is totally independent of whether commodity prices are going up or down. Various empirical studies have estimated that rebalancing adds 1% to 3% per year to the total return for a commodities index like the AIG.

The intuitive reason for the existence of a rebalancing return is that we are routinely buying low and selling high. We are regularly selling some of the commodities that have gone up in price and replacing them by those that have gone down in price. The statistical conditions necessary for rebalancing to generate a structural return are (1) that the price paths of the various commodities be statistically independent of one another, or at least have low correlations to one another, and (2) that they be “mean reverting.”

Mean reverting means that a variable is more likely to fall if it has moved above its long term mean value, and is more likely to rise if it has fallen well below its mean. In other words, when prices have been going up for a while, they are likely in store for a retrenchment. If they have been falling for a long time, then a rebound is relatively more likely. As the term says, the variable tends to revert towards its mean.

An alternative to mean reverting would be a “random walk.” If a variable is described by a random walk its past outcomes would have no influence whatsoever on its future outcomes. A coin flip is a good example. If you have flipped 9 heads in a row (with a fair coin), the probability of flipping a head on the tenth flip is still 50%, the same as on the first flip. If coin flipping were subject to mean reversion, then the tenth flip would have a higher probability of being a tail.

If commodity prices followed a random walk model, then rebalancing would not generate any excess returns. But empirical studies have concluded that commodity prices do in fact tend to be mean reverting<sup>2</sup>. It is beyond the scope to go into this issue in depth, but there are intuitive reasons why this might be so. Often commodities prices move up or down due to temporary conditions, like weather. If soybean prices go up one season because of unusually low rainfall, then it makes sense that next season they are more likely to revert back towards their previous levels or stay where they are than to go up by a similar amount the next season. Over a longer time horizon, if prices stay high for awhile this may spur further investments in production, and thus a decline in future prices. For example, if natural gas prices stay at the levels they are today, this will likely stimulate further development of natural gas reserves, including reserves that would be uneconomic to produce before the price increase. Prices affect demand too. As oil prices fell precipitously in the late 80’s and 90’s the trend towards smaller cars in the U.S. disappeared, and SUV’s and light trucks came to dominate our highways. Of course we have seen what has happened to oil prices since! And now many observers think the high oil prices will moderate demand and lead to some retrenchment of oil prices.

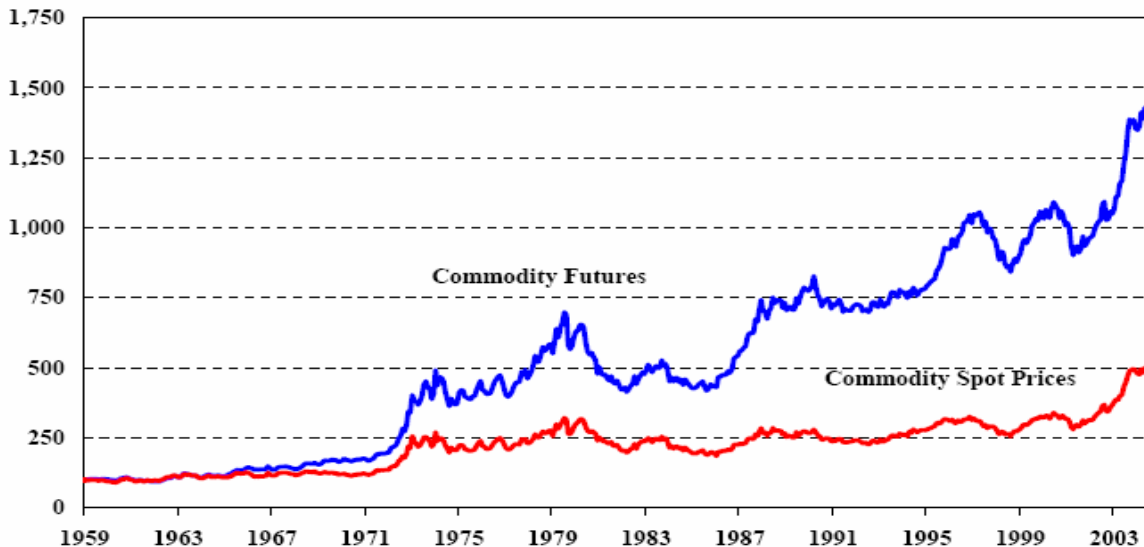
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<sup>2</sup> It seems fairly well accepted that commodity prices are mean reverting. On the other hand, the question of whether stock prices are mean reverting, or if they are better described by a random walk, is a hotly debated topic. The efficient market hypothesis is equivalent to saying stock prices are described by a random walk. But numerous papers have been published in recent years that purport to find mean reverting properties in stock prices as well.

I have described three conceptual reasons that buyers of commodity futures ought to be able to earn investment returns independent of the direction of commodity prices. These are insurance premiums, collateral returns and rebalancing returns. These are the reasons that buying commodity futures is very different from simply buying the commodities themselves. Is there empirical evidence that this is true? A compelling piece of evidence is shown in Figure 1, which comes from a recent Yale working paper. It shows the difference in performance of owning commodity futures versus owning commodities themselves (described by their spot prices) over a long time horizon, from 1959 to 2004. Based on that study, commodity futures earned about 11% per year over the four-plus decade period, versus only about 7% for the commodity spot prices. Notably, even the 7% return for commodities assumed annual rebalancing, so it does include one of the structural sources of returns discussed above. The study also tracked spot commodity prices without any rebalancing, and found returns in that case of only 3.5% per year, which was below the rate of inflation over the period. So the difference between holding regularly rebalanced commodities futures and just holding a fixed basket of the underlying commodities themselves was a whopping 7.5% per year. This study was based on a different commodities index than the Dow Jones AIG, since it has not been in existence that long, but the results should be similar for the AIG index.

**Figure 1**

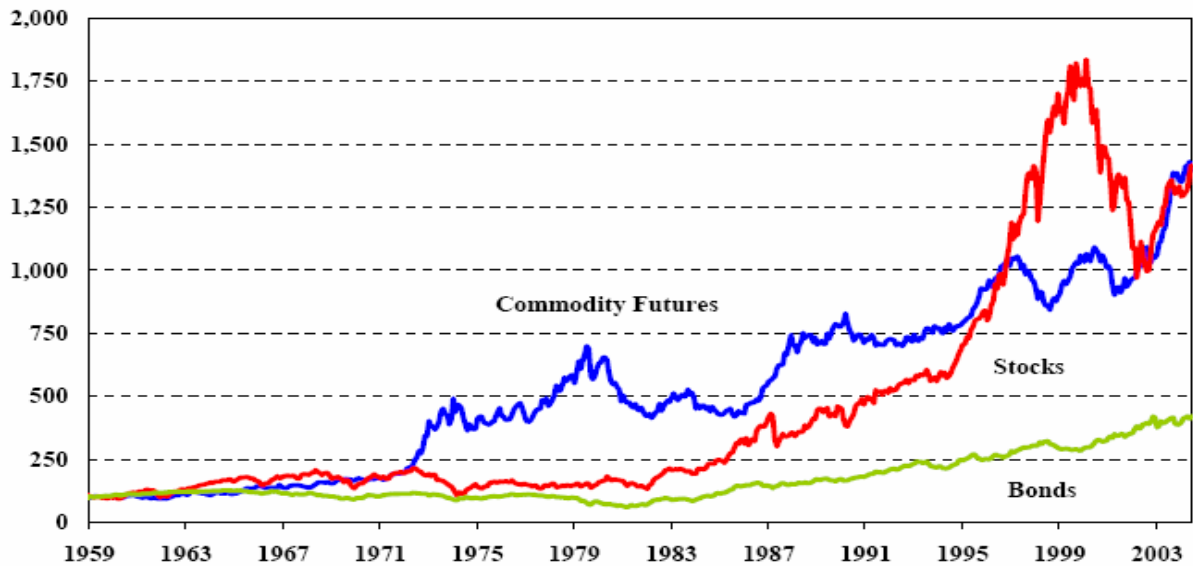
**Commodities Inflation Adjusted Performance 1959/7-2004/12  
Spot versus Equally-weighted Collateralized Futures Index 1959/7 = 100**



*Source: Reproduced from Yale ICF Working Paper No. 04-20*

I have long understood that commodity futures should generate positive returns for reasons other than rises in commodity prices, but I was surprised to see how robust they have been. In fact, the same Yale study compares commodity futures returns over the 46 year period to the returns of domestic stocks and bonds. The results are shown in Figure 2, where we can see that commodity futures returns were about the same over that period as stocks (the S&P500), and much better than bonds.

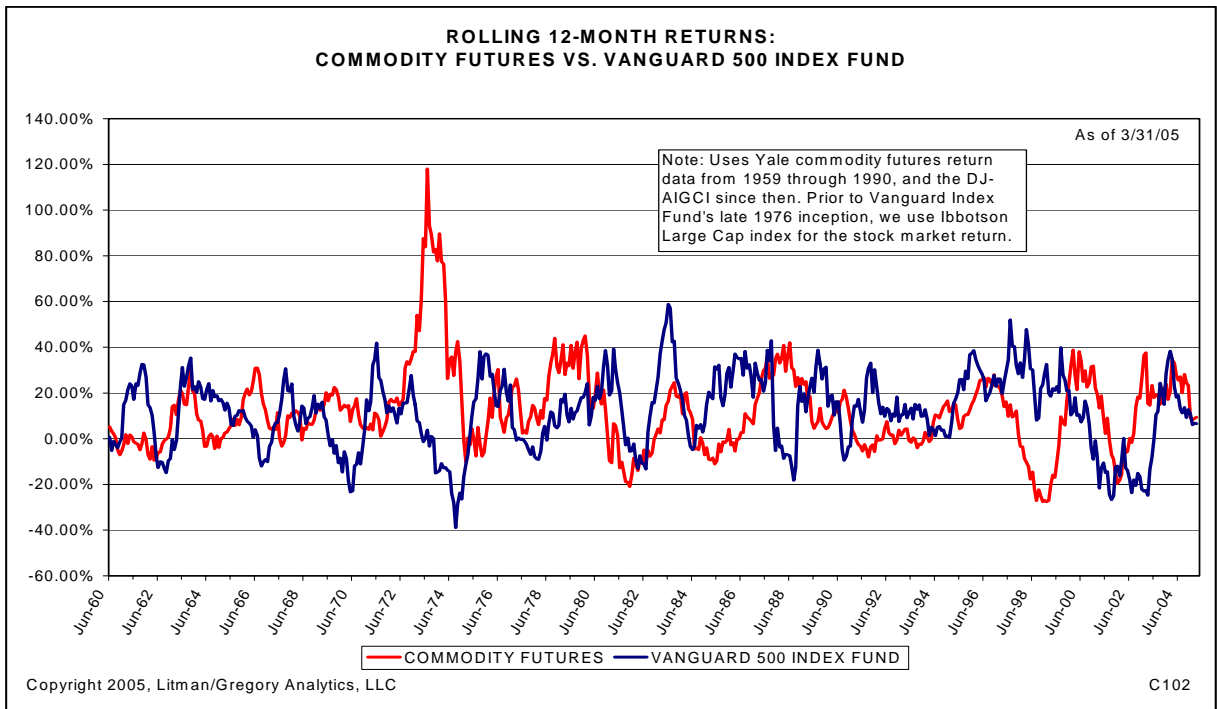
**Figure 2**  
**Stocks, Bonds, and Commodity Futures**  
**Inflation Adjusted Performance 1959/7-2004/12**



We should never consider performance without looking at riskiness as well. Commodity prices individually are known to be highly volatile. Commodity futures have considerable volatility as well, but it may not be much greater than that of stocks. Figure 3 shows the rolling 12 month returns for the Yale commodities futures index and the S&P 500 from 1960 to 2004. We can observe subjectively that the volatility and downside risk of commodity futures seem to be pretty comparable to those of equities.

The Yale study from which the past three figures are derived paints a very rosy picture for commodity futures. Personally, I don't count on the future being quite that good. For example, the AIG index lost 20% in 2001 and 27% in 1998. And despite what I said about commodity futures returns not depending on rising commodity prices, much of the past data that we have comes from times when commodity prices were rising, and empirically a degree of positive correlation between commodity price increases and commodity futures returns has been observed. So we shouldn't feel absolutely sure that we will continue to make good money from commodity futures even if we enter a prolonged period of falling commodity prices.

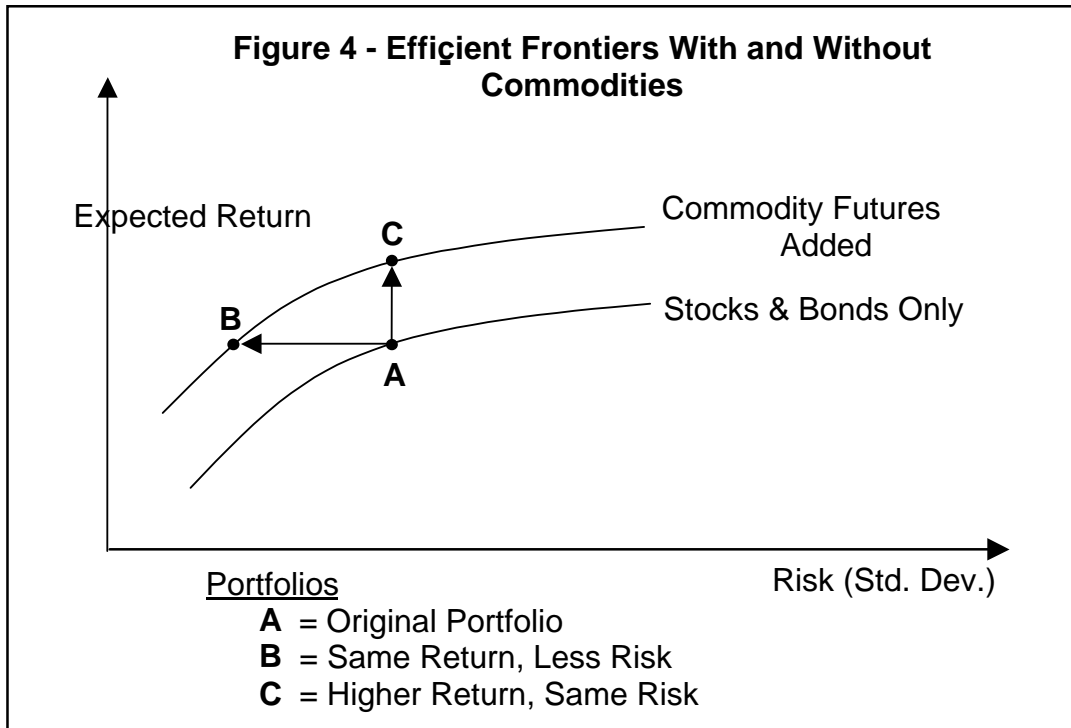
**Figure 3 – Comparing Historical Volatility of Commodity Futures and U.S. Stocks**



Still, the case for commodities does not require a picture anywhere near as rosy as the past according to Yale. The critical aspect of commodities futures insofar as portfolio design is concerned is their negative correlation to stock and bond returns. If a new investment truly has a negative correlation to the other elements of the portfolio, then adding it to the mix should decrease the volatility of the overall portfolio even if on a stand alone basis the new investment has very high volatility. I have seen studies showing that even if commodity futures returns were only half those of stocks, and even if their volatilities were half again greater than stocks, including them in our portfolio would still improve the portfolio’s risk-return profile<sup>3</sup>. This means we would be able to construct a portfolio with higher returns and no greater risk, or less risk with the same returns, or a combination of higher returns and lower risk.

For those of you familiar with the idea of an “efficient frontier” for an investment portfolio in the risk-return space, adding a negatively correlated, positive return investment like commodity futures would have the effect moving the efficient frontier upwards. This is illustrated conceptually in Figure 4. In this diagram, adding commodity futures to our portfolio’s choice set would enable us to move from original portfolio A to portfolio B or C, or anywhere along the line between B and C. All such portfolios are more “efficient” than portfolio A, because they have more return with the same risk (portfolio C), or the same return with less risk (portfolio B), or more return and less risk (all the points between B and C).

<sup>3</sup> See Asset Allocation – Balancing Financial Risk, by Roger Gibson, McGraw Hill, 2000



We have asserted that commodity futures have negative correlations with stocks and bonds. In the Yale study, the five year correlation with stocks was reported to be -0.42 and with bonds, -0.25. Different time periods and other studies have shown correlation values of similar or lower magnitudes, but the general negative to nil relationship is fairly clear.

Convincing as the data may be about the correlation of commodity futures with stocks and bonds, correlation is still only a statistical indicator of how the portfolio elements may interact. To improve our conviction that the diversification has actually worked as advertised in the real world, it is useful to look at the empirical history of up and down periods for each asset class.

Litman Gregory obtained the raw data underlying the Yale study and produced some very interesting analysis of their own along these lines. They calculated the returns for two hypothetical investments, a 60:40 stock and bond portfolio, and a commodity futures investment based on the Yale commodities index. They went through the 40-plus year time horizon month by month, computing the rolling past twelve months returns for each investment as of the end of each month. This produced 533 rolling 12 month periods for each investment. The point was to see how consistently commodity futures performed when stocks and bonds were doing poorly; i.e., “during the periods when you needed the diversification and non-correlation the most”.

Correlations between investment prices are not necessarily stationary, intrinsic properties in the real world. For example, we have seen that the correlations between large cap domestic stocks and large cap foreign stocks increased significantly in the past 10 years, so that when the U.S. market experienced three straight years of large cap stocks declining from 2000 to

2002, so did those in the major foreign markets. The diversification factor failed us just when we needed it most.

Litman Gregory’s analysis shows in contrast that commodity futures diversification benefits have shown up when they were needed most. The results are shown in Table 3. This breaks the 533 rolling 12 month periods into ten groups based on how well the 60:40 portfolio performed, ranging from those periods in which it earned less than -10% per year (row 1) to those where it earned over 30% per year (the last row).

**Table 3 – Do Commodity Futures Provide Diversification When You Need It Most?**

Rolling 1-Year Balanced Portfolio Returns (June-60 through Oct-04)	Average Return		Average Return Difference	# of periods
	Balanced Portfolio	Commodity Futures		
< -10%	-14.1%	17.4%	31.5%	12
-10% to -5%	-7.2%	22.6%	29.8%	32
-5% to 0%	-2.3%	8.3%	10.6%	52
0% to 5%	2.6%	13.9%	11.3%	54
5% to 10%	7.7%	10.1%	2.3%	86
10% to 15%	12.4%	10.1%	-2.4%	135
15% to 20%	17.2%	8.3%	-8.9%	80
20% to 25%	22.3%	8.1%	-14.3%	42
25% to 30%	27.2%	6.2%	-20.9%	22
> 30%	34.8%	7.6%	-27.2%	18

In Litman Gregory’s words, “The results were strong and consistent: During the periods when stocks and bonds declined, commodities have historically performed *very* well. For example, when a balanced portfolio returned between -5% and -10% over 12 months (or an average loss of -7.2%), commodity futures gained an average 22.6%. We did the same type of analysis looking at rolling 3-year returns and got similar results.” Don’t gloss over this table! It is the most impressive piece of evidence I have seen to date about the diversification value of commodities futures. Notice that in every negative or very low return period for stocks and bonds, the commodities futures index had strongly positive returns, and the magnitudes of those returns increase almost monotonically as the stock and bond returns get worse. Further, every relatively negative performance period for commodity futures is paired with a positive performance for stocks and bonds. And again, the worse the performance of one series, the better the performance of the other.

Now, to get even more practical, we will have a look at the particular mutual fund we are using to invest in commodity futures, PIMCO Commodities Real Return (PCRIX). We have been using this fund in some MAM accounts since 2003, and Table 4 below shows its performance since then, and how it stacks up against its benchmark, the Dow Jones AIG Commodities Futures Index:

**Table 4 – Total Returns of a Commodities Futures Mutual Fund and its Benchmark**

Year	PIMCO's PCRIX Fund	Dow Jones AIG Commodity Index	Outperformance Relative to Benchmark
2003	29.8%	23.9%	5.9%
2004	16.4%	9.2%	7.2%
2005 through 9/30/05	25.7%	25.2%	0.5%

Clearly the fund's returns have been remarkable so far, both on an absolute basis and relative to its benchmark. The fund has an expense ratio of 0.74%<sup>4</sup> that is not paid by the index it emulates, yet its performance thus far has been much better than that of the index. I believe this is primarily because TIPS have performed so much better than T-Bills over the past few years. Although I expect TIPS will easily outperform short term T-Bills in the long run, they will almost certainly not continue to perform as well as they have in the past few years. Still, even if we had only matched the performance of the AIG index, it would have been a happy outcome.

**Summary** – So where does this leave us? A fundamental principle of good portfolio design is to incorporate asset classes with positive expected returns and low correlations to other parts of the portfolio. Of course, these investments should also have reasonable investment costs, a substantial historical track record, understandable sources of investment return, liquid markets, observable investor returns and a practical method of investing. All of these criteria seem to be fulfilled when it comes to investing commodities futures.

Of course, there is no guarantee that future performance will be like past performance, and commodity futures do carry significant risks. Even using the mostly positive historical record as a guide, commodity futures investing will often have periods of substantial losses at least as large in magnitude and duration as equity investing.

But all things considered, I think commodities futures should have at least a modest place in our portfolios. Even if our expectations for their future returns were a bond-like 4% per year rather than the observed 11% annual return over the past 46 years, and even if their stand alone volatility were closer to 20% than the 15% or so observed in the Yale study, I would still come to this same conclusion. So we don't have certainty that this investment will work out well, but we do seem to have a comfortable margin of safety.

In fact, my intention to increase the fraction of assets in commodity futures in most of our portfolios up to 4% to 5% may seem somewhat timid to some of you. Maybe so, but I think it is prudent to move deliberately into new kinds of investments, and to take the time to make sure that we have not missed anything that could make us change our minds. We may want to increase the role of commodity futures even further in the future, but for now, I am not ready to move any further than noted. Also, I should reiterate that some MAM clients do not have any assets invested in alternative investments, whether by my choice or their own. I will not be adding any commodity futures for those clients unless we discuss and agree to it in advance.

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<sup>4</sup> We are lucky to have access to the institutional version of this fund which has no loads and which carries a lower expense ratio than any of the versions available to retail investors.