COMPARING COMMODITY INDICES: MULTIPLE APPROACHES TO RETURN

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COMMODITY INDEX COMPARISON

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COMMODITY INDEX COMPARISON

1. Introduction

Commodity-linked investment products offer sources of return and risk that cannot be easily replicated through other investment alternatives. Commodity investment can provide significant portfolio diversification benefits to traditional stock and bond portfolios, and can provide opportunities beyond those achievable from commodity-based stock and bond investment. Commodities are negatively correlated to many other asset classes, and perform well when the portfolio needs diversification most. Commodities have historically been positively correlated with inflation, and may provide a hedge against rising inflation.

Commodity indices are an effective and efficient means for gaining access to the benefits of commodities. A commodity index is a grouping of commodity futures contracts that are rolled. Commodity indices provide returns comparable to passive long positions in listed futures contracts. Commodity indices attempt to replicate the returns available to holding long positions in agricultural, metal, energy, or livestock investment, without the investor having to actively manage the positions.

The number of commodity indices available to investors has multiplied in the past few years. There are now more than ten publicly available commodity indices. All indices offer diversified exposure to commodity markets through the use of commodity futures contracts. The indices differ in terms of index composition, commodity selection criteria, rolling mechanism, rebalancing strategy, and weighting scheme.

Commodity index performance can be a function of the methodology of the index, combined with the impact of market factors on the index components. As a result, commodity index performance can vary across indices, and during different market environments. Depending on these factors as well, index performance can come with varying volatility. The methodology of the index can have an impact on volatility levels.

This review provides a summary of the features and methodologies of the major commodity indices available to investors as of February 2009. It also examines the return factors possible in a commodity index. Finally, the report describes and analyzes market conditions that will be favorable and adverse for the major commodity indices.

2. Commodity Index Methodology

Broadly speaking, commodity indices can be separated into two groups: first-generation and second-generation commodity indices. First-generation commodity indices were modeled on successful equity indices such as the S&P 500 stock index. In each of these indices the weight assigned to a given commodity is free to evolve over a year before being reset during the annual rebalancing window. Members of this first group include the S&P Goldman Sachs Commodity Index (SPGSCI), the Dow Jones-UBS Commodity Index (DJUBS), the Rogers International Commodity Index (RICI), and the Merrill Lynch Commodity Index eXtra (MLCX). Although based on the same basic structure and generally holding the same basket of commodities, there can be significant differences in their performance because of different weighting schemes and roll methodologies.

The second generation of commodity indices share many features with the first group, but each includes some unique features that truly distinguish it from the indices in the first group. Major second-generation indices are the Reuters/Jefferies CRB Commodity Index (CRB), the Deutsche Bank Liquid Commodity Index (DBLCI), the UBS Bloomberg Constant Maturity Commodity Index (CMCI), the Diapason Commodities Index (DCI), and the Bache Commodity Index (BCI).

The primary determinant of commodity index performance in recent years is the allocation to the energy sector. This single factor explains most of the differences in commodity index returns that are observed over short time horizons. However, over longer time horizons there are other differences in index methodology that influence performance. These components, which are listed below, define the indices in terms of composition, performance, and inflation and down-market hedge potential.

Selection and Weights:

Index Constituents: The number of commodity markets in major indices ranges from six to 24. Some commodity indices are designed to hold all liquid markets, while others exclude essentially similar commodity pairs such as Gold/Platinum and WTI Crude Oil/Brent Crude Oil, unless there is sufficient liquidity to support both commodities, as well as sufficient diversification benefit for doing so. Other indices avoid "double-counting" input commodities that are used in the production of other commodities. An example of this is holding Soybeans but not Soybean Oil, or Soybean Meal which is produced from soybeans.

Selection Criteria: Commodity indices use different component selection criteria. These can include importance to the global economy, liquidity and trading history, location of the commodity exchange, or the currency of the contracts. For many commodity indices, the final component selection is set by a committee.

Value-based vs. Quantity-based Weighting: A value-based index has fixed component weights. The number of futures contracts in the index changes dynamically to maintain constant weights. A quantity-based index holds a fixed quantity of each commodity, so that the index weights change each day. For example, the S&P 500 stock index is quantity-based since the number of shares of each company in the index only changes when the index constituents are changed. A benchmark that consists of 60% stocks and 40% bonds is value-based.

Asset Allocation:

Roll Schedule: The frequency and timing of rolls differ for each index. Across the major indices, and even within indices, commodity contracts can follow different roll schedules due to the liquidity or seasonality of the underlying commodity. The schedule used to roll commodity futures as they approach expiry can have a great impact on index performance. Larger roll windows can mean that contracts do not have to be rolled under negative trading circumstances. This flexibility can be an important source of performance.

Average Maturity: The weighted average maturity of the component contracts can also vary for each commodity index. This is also an important factor in fixed income indices. Equity indices, due to the infinite life of corporate stock, do not have an average maturity.

Energy Allocation: Since energy markets are highly volatile and highly correlated, energy is the dominant factor that drives the returns of commodity indices.

3. Factors of Return

Commodity indices can benefit from multiple sources of returns, many of which tend not to be correlated. These can include spot, roll, beta, momentum, rebalancing, and Treasury bill, or T-bill, returns. Additional factors like diversification, commodity component weighting, and roll schedule can also impact the index return.

Beta: Commodity beta for a given market can be defined as the return from holding the active contract until the contract roll date and then rolling to the next active contract. From the perspective of liquidity and transparency, this is the simplest way to hold commodities, and thus is the benchmark against which other methods of holding commodity futures is measured.

Roll Return: Positive or negative roll returns, which are the profits or losses generated from the rolling of futures contracts, also have a direct impact on index performance. A positive roll return may yield positive returns even if commodity prices are falling, whereas a negative roll return may result in negative commodity returns even if commodity prices are going up.

Spot Return: The difference between the excess return of an index and the roll return.

Dynamic Asset Allocation: Commodity markets exhibit short-term momentum. That momentum can be used to decide which positions to reduce and which to increase. By tactically reducing the risk of different commodities, an index that employs this methodology may hold less than a fully invested strategy, and have a lower volatility.

Diversification: A greater number of commodities can mean a more diverse index, which makes the index less sensitive to a particular commodity or a commodity sub-sector for price increases or decreases.

Commodity Weights: The greatest index returns result from higher weights in commodity futures that are increasing in value, and lower weights in those falling in value. However, risk and volatility can increase in an index that allocates a large weight to a small subset of commodities.

Maturity: Using longer maturity contracts tends to greatly increase roll returns, and consequently total returns, but does not significantly affect spot returns. Investing in longer maturity contracts can also effectively enhance risk-adjusted returns as measured by the Sharpe ratio. The downside is that liquidity is much more variable in less-traded commodities beyond the second month contract.

T-Bill: In total return indices, the amount invested in futures is set aside as collateral and earns interest, pegged for instance to the rate paid by 3-month US Treasury bills, or T-bills. Returns on the T-bill are then added to the index, creating an extra source of return.

4. Performance Variables

External market and macroeconomic factors can have a large impact on index performance.

Term Structure Factors:

> ***Backwardation:*** Roll returns, which are a separate source of returns than spot returns, are positively impacted by backwardation. When markets are in backwardation, roll returns are positive, because the contract nearing expiry will be more expensive than the nearby contracts that need to be purchased, or rolled.
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> ***Contango:*** The opposite phenomenon to backwardation is known as contango, which means contracts nearing expiry are cheaper than those farther out on the forward curve. Contango can lead to negative roll returns. Backwardation and contango are equivalent in the fixed income world to negatively and positively sloped yield curves. A negatively sloped (backwardated) yield curve favors shorter maturities, whereas a positively sloped (contango) yield curve generally favors longer dated bonds.
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> ***Seasonality:*** Some commodity markets exhibit strong seasonality due to a combination of peak supply (e.g., grains) or demand (e.g., natural gas), and expensive storage/transportation. Some commodity indices build seasonality factors into their commodity weights, but most indices ignore seasonality and hold the same weights in each commodity throughout the year.

Microstructure and Transaction Cost Factors:

> ***Liquidity:*** A very large portion of the liquidity in commodity futures is in the active and first deferred contracts. There are a few exceptions to this rule such as soybeans and corn, where there is ample liquidity in the expiration just following the northern hemisphere harvest. First-generation commodity

indices tended to hold just the active contract, but second-generation indices have introduced models that hold longer maturities. The benefits of extending the maturity of commodity contracts must be weighed against the potential loss of liquidity.

Bunching: The way indices are constructed has an impact on the performance of commodity futures markets. This effect has been documented in the equity index world, where the addition or removal from an index can have an impact on the performance of a particular stock. In the commodity markets, this effect is compounded by the need to replace expiring futures contracts as frequently as every month in some markets. First-generation indices tend to "bunch" their rolls in the second week of the month. Most second-generation indices have roll schedules that differ from the roll schedules of the earlier indices in order to avoid rolling at the same time as the older indices.

Macro Factors:

Inflation: Inflationary expectations are an important determinant of both the spot price of a commodity and the shape of the forward delivery curve. Fear of future inflation can drive up the price of storable commodities such as metals. Industrial users of a commodity will buy and store more of a commodity if there is concern about higher prices in the futures. For non-storable commodities, inflationary expectations will push up prices on the forward curve, as users of the commodity lock in prices for future delivery.

Interest Rates and Central Bank Policy: Interest rates have both a direct and an indirect impact on commodity index performance. The direct effect is through the collateral return, usually T-bills, that is added to the performance of investable commodity indices. The indirect exposure to central bank policy comes from changes in demand for commodities that result from stimulative or restrictive monetary policy. These two influences operate in contrary directions. An increase in interest rates adds to commodity index returns in the short term, but may reduce returns in the future.

Exchange Rates: Most commodity futures markets are denominated in US dollars (USD), but in many cases the marginal buyer of the commodity does not conduct business in USD, so foreign exchange becomes a component of the commodity transaction. When this occurs, the return to holding that commodity has a large currency exposure. A good example of this is Gold. Holdings of Gold in the US are much smaller compared to GDP than many other nations, so the US has a small impact on the global price of the commodity. Natural Gas has almost no currency effect because the delivery point for NYMEX Natural Gas futures is in the US and Natural Gas is very difficult to transport and store. A change in the value of the USD is unlikely to have much influence on the price of Natural Gas that is produced and delivered in the US. Commodity indices that have large allocations to non-USD commodities are likely to have larger currency exposure. Indices that have large allocations to local US commodities (Natural Gas, livestock, refined petroleum products) will have a smaller currency exposure.

Equities: The performance of the equity markets has only recently become a factor in commodity index performance. The inclusion of commodities in dynamic asset allocation models has resulted in aggressive selling of commodity indices during periods of rapid equity market declines. This could be a factor in commodity index performance if the index holds large positions in illiquid maturities or in the smaller commodity markets.

Sector Weights:

Energy: While the average exposure to energy among commodity indices is roughly 50%, energy contributes a much higher portion of the day-to-day volatility of indices. This is because energy markets are, on average, more volatile than other commodity markets and are highly correlated with each other.

Agriculture/Metals: The non-energy allocation averages 50% of commodity index exposure. Some indices are more heavily weighted towards agricultural products while others favor metals.

5. Major Commodity Indices

The current grouping of major commodity indices is listed below, along with an overview of the index, specific information on the index methodology, and factors of performance.

S&P Goldman Sachs Commodity Index (SPGSCI):

Overview: The SPGSCI is a quantity-based world production-weighted index that currently holds six energy products, eight agricultural products, five industrial metals, two precious metals, and three livestock products. The index has the flexibility to hold any number of contracts as long as the particular contract meets the liquidity criteria. Contracts are weighted by the average worldwide production in the last five years of available data. The SPGSCI is dominated by energy with around 68% of its weight allocated to the energy sector at the beginning of the year 2009.

There is a series of indices that use the same convention and hold the same components as the SPGSCI but vary allocation to the energy sector. The SPGSCI Reduced Energy Index uses one half of the SPGSCI contract production weights for the energy components, while the SPGSCI Light and SPGSCI UltraLight Energy index calculations use one quarter and one eighth of the contract production weights for the energy components, respectively.

The SPGSCI Enhanced Commodity Index is another variant of the SPGSCI. It holds the same basket of commodities as that of the SPGSCI but tries to address the issue of negative roll yield due to dominance of a contango market in recent years. Of the 24 commodities in the enhanced index, eight commodities have been selected to provide enhanced performance through modified roll methodology. Together these eight commodities had combined weight of just above 75% at the beginning of 2009. Roll frequency of these commodities has also been reduced to take advantage of seasonality factors. Commodities with enhanced roll methodology are WTI Crude Oil, Brent Crude, Heating Oil, Natural Gas, Chicago Wheat, Corn, Lean Hogs, and Live Cattle.

- *Launch Date:* November 1991

- *Roll:* The SPGSCI rolls from the front to the next contract between the 5th and 9th business day of the month prior to delivery. Rebalancing of the index takes place once a year after the weights are reviewed by the index committee. However, these weights change only slightly from year to year due to the five-year evaluation period.

- *Average Maturity:* The weighted average maturity of futures contracts in the SPGSCI is less than two months, which is the shortest average maturity of all commodity indices.

- *Energy Allocation:* Because the SPGSCI does not have sector-weight constraints, the index methodology generates the largest energy allocation of any commodity index.

- *Outperformance:* This index is expected to do well in times of rising energy prices. This index will also perform quite well when commodity markets are in backwardation.

Dow Jones-UBS Commodity Index (DJUBS):

Overview: The DJUBS is a quantity-based commodity index that predefines a set of criteria to prevent any sector from being dominant in the index. It limits the maximum weight of any commodity to 15% of the index, any sector to 33% of the index, and any commodity along with its downstream products to 25% of the index. This index currently holds 19 commodity futures of which four are energy products, seven are agricultural products, four are industrial metals, two are precious metals, and two are livestock products. A combination of liquidity and production measures is used to assign weights to individual commodities.

Liquidity has twice as much influence as production in deciding the overall weights. Use of the production data has the drawback of underweighting commodities like precious metals that are storable over a longer period and overweighting commodities like agricultural products that must be used over a shorter period.

In 2009, UBS Investment Bank purchased the commodity index business of AIG Financial Products Corp., including AIG's rights to the DJAIG Commodity Index. The index was rebranded as the DJUBS.

• *Launch Date:* July 1998

• *Roll:* The DJUBS follows a similar roll strategy as the roll strategy of the SPGSCI, and rolls from the 4th to 8th business day of the month, from the front to the next contract.

• *Average Maturity*: The DJUBS has the same average maturity for agriculture as the SPGSCI, but has a longer average energy and metals allocation because it skips every other expiration in commodity markets that trade on a monthly expiration schedule.

• *Energy Allocation:* The DJUBS methodology has a cap of 33% on energy, which is lower than almost all of the other commodity indices.

• *Outperformance*: The DJUBS will tend to outperform other indices when agriculture and metals prices rise more than energy. This index will also do better when agriculture and metals are more in backwardation than energy.

Bache Commodity Index (BCI):

Overview: The primary objective of the BCI is to provide broad-based exposure to global commodity markets, with low turnover and strong risk-adjusted returns resulting from multiple return factors. The BCI employs a dynamic asset allocation strategy based on the price momentum of individual commodity markets. This approach to index construction may help reduce transaction costs and turnover, and may increase the risk-adjusted return. This index also incorporates a relative roll strategy that is similar to a synthetic spread trade, which will be profitable if the price of the contract closest to expiration falls in price relative to the longer maturity contracts. With the addition of Gasoil in Feb 2008, the BCI comprises 19 commodities that are traded on seven major futures exchanges located in the US and the UK. Commodities in the index are chosen based on their importance to the global economy, and on the basis of liquidity measures. The BCI also focuses on commodity markets that have been determined to have potential as a hedge against inflation, and low correlation with traditional assets. The BCI is designed so that the index does not become dominated by a single commodity sector or by several commodities, through employing upper and lower bounds on the market and commodity weights, and by frequent rebalancing. BCI data prior to 2007 are pro forma.

• *Launch Date:* January 2007, pro forma returns available from January 1991.

• *Roll:* The index utilizes a continuous roll method.

• *Average Maturity*: Approximately three weeks more than the average maturity of the same commodity in the SPGSCI.

• *Energy Allocation:* The index can have as much as 50% allocated to energy, depending on the performance of the energy markets.

• *Outperformance*: When markets are in contango, the BCI will outperform most of the traditional indices. It will have a smaller drawdown compared to any other indices in declining markets as evidenced by the recent sharp decline in prices across all commodities in the second half of 2008. It will also tend to perform better in uptrending markets.

Rogers International Commodity Index (RICI):

Overview: The RICI is a quantity-based world production-weighted commodity index designed by investor Jim Rogers and launched in July 1998. The index is one of the most diverse commodity indices, consisting of 36 commodities from 10 exchanges in five countries. The RICI currently holds six energy products, 18 agricultural products, seven industrial metals, three precious metals, and two livestock products. The components are subject to change by the RICI committee. Inclusion of a commodity in the index is determined by its significance in worldwide consumption. Each commodity is rebalanced at the start of each month toward initial weights, determined annually by the RICI Committee. The index is rolled at the end of each month to contracts that are expected to be the most active during the next month. The index calculation methodology is reviewed annually by the index committee during its meeting in December and possibly amended thereafter. The initial value of the RCI was set to 1000 on July 31, 1998.

- *Launch Date:* July 1998

- *Roll:* The RICI usually rolls over three days, from the day prior to the last RICI business days of the month to the first RICI business day of the following month. During the roll period, the index is shifted from the first to the second nearby baskets at a rate of 33.33% per day. On the last roll day, the roll is completed unless the roll period is extended for a component as a result of a market disruption event such as a limit day.

- *Average Maturity*: Same as the average maturity of the SPGSCI prior to roll period for contracts that are common to both the RICI and the SPGSCI except for industrial metals. Between the RICI roll period and SPGSCI roll period, the average maturity of energy products in the RICI is about one month more than the average maturity of energy products in the SPGSCI. Industrial metals have an average maturity of three months. Forward contracts are used for calculating the contribution of industrial metals to the RICI.

- *Energy Allocation:* The target allocation for energy in the RICI is 44%.

- *Outperformance*: This index will perform better than the other indices when the agriculture sector performs better than the energy and metals sectors. With a very low allocation to Natural Gas compared to other major indices, The RICI will also perform better than other major indices when the price of Natural Gas futures declines. The RICI is one of the few commodity indices with direct exposure to exchange rate fluctuations. Decline in the value of the US dollar relative to Japanese Yen, Canadian Dollar, and Australian Dollar may boost the performance of the index.

Merrill Lynch Commodity Index eXtra (MLCX):

Overview: The MLCX is a quantity-based index introduced during the middle part of 2006. The main selling point of this index is the longer average maturity compared to the SPGSCI and DJUBS. Commodity contracts are selected based on liquidity and then weighted based on the importance of each commodity in the global economy with an emphasis on downstream commodities. Diversification of the index is ensured by setting maximum and minimum weights for any sectors in the index. Currently, the cap for any sector is set at 60% and the floor is set at 3%. Due to its allocation to the energy sector at 60%, this index will do well when energy prices are rising. The MLCX added Gasoil, Soybean Oil, and Cotton and removed Heating Oil and Soybean Meal from the Index in 2009.

- *Launch Date:* June 2006

- *Roll:* It rolls over a period of fifteen days from the 1st to the 15th business day of the rolling month and rolls from next to second next contract instead of the more conventional front to next contract.

- *Average Maturity*: Rolling one month ahead of the SPGSCI and DJUBS gives the MLCX an average maturity that is about one month longer than the DJUBS and six weeks longer than the SPGSCI.

- *Energy Allocation:* The index can have as much as 60% allocated to energy at the start of each year, which is larger than any other index except the SPGSCI.

• *Outperformance*: The MLCX is basically an average maturity bet. This index will do better when markets are in contango.

Deutsche Bank Liquid Commodity Index (DBLCI):

Overview: The key feature of the DBLCI is its low number of components compared to the other indices. It is a value-based index. This index consists of only six highly liquid contracts with each contract having large weights compared to other indices. Contracts included in this index are WTI Crude Oil, Heating Oil, Aluminum, Gold, Wheat, and Corn. The industrial and precious metal sectors are represented by single commodities.

Deutsche Bank also markets two other commodity indices as an enhanced version of the DBLCI index. The DBLCI Mean Reversion (DBLCI MR) index invests in the same six commodities as the DBLCI, but the weights of the commodities in the DBLCI MR index are systematically adjusted depending on the relative value, which is decided by the ratio of the one-year moving average price to the five-year moving average price. Another variant of the DBLCI is the Deutsche Bank Liquid Commodities Indices Optimum Yield (DBLCI-OY). The DBLCI-OY does not have any predetermined contract to roll to. Rather, it rolls into the new future contract that implies the maximum roll. Contracts maturing in the following thirteen months are considered for determining the maximum implied roll.

• *Launch Date:* February 2003

• *Roll:* This index has a dual rolling strategy with some contracts rolling once a year and the others rolling each month. Energy products are rolled each month while the others are rolled once a year during the annual rebalancing period which is between the 2nd and 6th business day of November. During this rebalancing period, energy products are rolled into contracts expiring in two months while the other contracts are rolled into contracts expiring in December of the next year.

• *Average Maturity*: The longest of any of the conventional commodity indices, the DBLCI has a considerable variation in maturity during the year. It is shorter in the fall, just before the annual rolls, and long in winter just after the rolls.

• *Energy Allocation*: Target weights in the index are 55% to the energy sector and 22.5% each to the agriculture and metals sector.

• *Outperformance*: Low diversification means that the DBLCI could perform very well if its subset of commodities does well. It has a heavy allocation to grains, no softs or livestock, and no Natural Gas. The DBLCI is also a contango play, as it holds long maturities and rolls ahead of the SPGSCI and DJUBS.

Reuters/Jefferies-CRB Index (CRB):

Overview: The CRB index is a value-based index, and has the longest history of all the commodity indices, with data beginning in 1957. However, the usefulness of the long track record has been reduced by the high number of revisions to the methodology. The CRB index was modified in 2005 to form the Reuters/Jefferies CRB index. Over the years, the number of commodities in the index has moved down to its current level of nineteen.

• *Launch Date*: Revised in 2005

• *Roll:* During the last revision, the index committee decided to move to monthly rebalancing and a traditional rolling mechanism. At present, the roll takes place over a four-day window between the 1st and 4th business days of the rolling month.

• *Average Maturity*: The CRB average maturity is about the same as SPGSCI.

• *Energy Allocation*: The index's energy allocation is relatively low, at 39% at the start of 2007.

• *Outperformance:* This index has the largest allocation to agriculture of any index, so can outperform when this sector does the best. Also, by trading a few days ahead of the SPGSCI and DJUBS, the CRB can benefit a little from markets that are in contango.

UBS Bloomberg Constant Maturity Commodity Index (CMCI):

Overview: UBS and Bloomberg L.P. have created a series of value-based commodity indices that seek to keep the weighted average maturity of any particular commodity in the index at a constant value ranging from three months up to five years. CMCI indices from four to five years are available only for a specific number of commodities. Constant maturity is attained by holding two contracts around the maturity in a proportion that makes the weighted average of the maturity a constant number. Holding two contracts around the maturity involves a continuous rolling mechanism which is expected to reduce the negative roll yield in adverse markets. The weight for each commodity is determined by a combination of economic factors like CPI, PPI, GDP, and liquidity factors. The three-month maturity holds 26 components of which seven are in the energy sector, ten are agricultural commodities, five are industrial metals, two are precious metals, and two are livestock products. The index holds two contracts of both Crude Oil and Sugar. The number of commodities in different CMCI indices declines as the maturity of the index increases. The index with a maturity of four years holds only five commodities whereas the one-year maturity index has 20 commodities.

UBS later introduced two other versions of the CMCI that essentially keeps the maturity of the components constant using the CMCI methodology, but varies the components and weights. The SPGSCI-Weighted UBS Bloomberg CMCI applies the CMCI methodology to the commodities in the SPGSCI in proportion to the SPGSCI weights. The CMCI Active Management Composite Index holds the same components as the CMCI but the weights are actively decided by an investment committee on a monthly basis.

• *Launch Date*: February 2007

• *Roll*: The index utilizes a constant-maturity roll method similar to the BCI. It slowly rolls forward in each of the target maturities to maintain a constant weighted average maturity. The shortest maturity, which is three months, rolls about a month ahead of the SPGSCI and DJUBS.

• *Average Maturity*: The main selling point in this index is its emphasis on average maturity. The design is much closer to a constant-duration bond index than an equity index. It remains to be seen if there is sufficient liquidity in the deferred contracts to support a significant level of tracking products.

• *Energy Allocation*: The CMCI energy allocation is low. For the first part of 2009, target allocation to the energy sector is 34.81%, which is close to the target allocation of energy sector of the DJUBS Commodity Index.

• *Outperformance*: The outperformance is difficult to measure since there are many versions of the CMCI. The three-month CMCI version has been used for recently announced index-tracking products, so it seems likely that this version will come to dominate. The three-month CMCI will outperform during periods when agriculture and metals do better than energy products due to the low CMCI energy allocation. All versions, including the three-month CMCI, have a longer average maturity than the SPGSCI and DJUBS. So, the index will outperform the SPGSCI and DJUBS during contango.

Diapason Commodities Index (DCI):

Overview: The DCI is a value-based index, and one of the broadest commodity indices available with 48 components in four major raw material sectors. Weights for individual components are determined by the significance of the commodity in world trade and liquidity of the commodity. The significance of the commodity contributes one third of the weight, and liquidity determines two thirds of the weight. Weights in the index are rebalanced monthly to the predetermined level set at the beginning of the year. Unlike most of the other indices, the DCI has some very thinly traded contracts like Coal, Electricity, Lumber, and Ethanol, which might prove to be an impediment to support large investment levels. At present, the index holds thirteen energy products, 20 agricultural products, seven industrial metals, four precious metals, and four

livestock products. ICE Natural Gas, TOCOM Crude Oil, and EURONEXT Rapeseed futures were added to the index at the beginning of 2008. The NYMEX PJM Electricity contract and the NYMEX Coal contract were replaced with the EEE Phelix Baseload Monthly contract and the ICE Rotterdam Coal contract due to liquidity concerns during the most recent revision of the index. While an interesting approach to indexing the commodity markets, the DCI is not really an investable index given that even a small investment (e.g., $100 million) would create liquidity problems for an index-tracking product.

• *Launch Date:* June 2006

• *Rolls:* The DCI rolls contracts from the front to the next during the last three business days of the month two months prior to expiration (about two weeks before the SPGSCI and the DJUBS). The index is rebalanced at the same time that rolls are executed.

• *Average Maturity*: Due to an accelerated roll, the average maturity of the DCI is a little longer than the SPGSCI and DJUBS. The index also holds a number of contracts with a small number of contract rolls per year.

• *Energy Allocation:* For the first part of 2009, the target allocation to the energy sector was set at 54.58%, which is roughly equal to the average allocation among commodity indices.

• *Outperformance:* The DCI is mostly a bet on small, illiquid markets. Significant weight is allocated to markets that appear in none of the other indices.

JPMorgan Commodity Curve Index (JPMCCI):

Overview: JPMCCI introduced a new concept in commodity index investing by holding the entire commodity curve as opposed to holding only the front contracts held by the more popular indices. This index holds exposure along the entire commodity curve in proportion to the open interest of each tenor. The index included 33 commodities when it went live in 2007. Two more commodities were added to the index at the beginning of 2008. The energy sector had the highest weight among the component sectors with an allocation of just around 46% at the beginning of 2009. The index contains some less liquid contracts like NYBOT Orange Juice, LIFFE White Sugar, and MGE Spring Wheat.

This index has a Light Energy version, which holds the same commodities as the main index but caps allocation to the energy sector at 33%.

• *Launch Date:* November 2007

• *Rolls:* The index rolls on the 1st to 10th business day. The major roll occurs from the expiring contract to the next contract, and other contracts rebalance during the roll period.

• *Average Maturity:* This varies among different groups of futures. The average maturity is close to six months for energy contracts, two to three months for precious metals, and around four months for industrial metals.

• *Energy Allocation:* Around 46% at the beginning of 2009.

• *Outperformance:* The JPMCCI will outperform when deferred contracts perform better than front contracts, and could also perform better than other indices in high negative roll periods.

Astmax Commodity Index (AMCI):

Overview: The AMCI is a Japanese yen-denominated commodity index that holds commodity futures traded on TOCOM. This makes the Index suitable for Japanese investors who do not want to have currency exposure in their commodities portfolio. The AMCI is comprised entirely of metals and energy sectors with very little representation in the agricultural sector. Such a skewed distribution of weights among different sectors of

commodities reduces the diversification benefit of holding commodity indices in a portfolio. The AMCI holds the longest available maturity contracts for all its component commodities as opposed to the near term contracts held by most of the major commodity indices. With an allocation of almost 50% to the precious metals group, this index is expected to perform better at times of economic uncertainty when prices of precious metals usually increase.

- *Rolls:* Contracts roll during the 2nd and the 6th trading day of listing of a new contract.

- *Average Maturity:* Crude Oil has an average maturity of around four months, while Gasoline and Kerosene have average maturities of around six months. Metals contracts have an average maturity of around 11 months and Rubber has an average maturity of around five months.

- *Energy Allocation:* Around 40% of the index weight.

- *Outperformance:* The AMCI will outperform other indices when precious metals sector perform better than energy sectors. This index will also outperform other indices in a declining market for Japanese yen.

6. Conclusion

Among the first-generation indices, including the SPGSCI, DJUBS, MLCX, and CRB, relative performance is almost entirely determined by the energy allocation. The SPGSCI is dominated by its energy allocation, and will be the top performing index in this group in periods of rising energy prices. The DJUBS, with the lowest energy allocation in this group, will be the worst performer in rising energy markets and the best performer in weak energy markets. The CRB has a high allocation to agriculture, so it will outperform in good years for grains. However, there is almost no diversification benefit from combining multiple first-generation indices in a portfolio. The right mixture of the SPGSCI and DJUBS indices will perform almost identically to the MLCX. Similarly, the CRB index can be largely replicated out of SPGSCI or DJUBS sector indices.

Second-generation indices have unique features that introduce different sources of risk and return that are not easily replicated using other indices. The CMCI combines a low energy allocation with a long average maturity. The longer maturity makes the CMCI potentially attractive as a way to diversify the contango risk inherent in the first-generation indices. The DCI holds a large number of non-US-dollar denominated contracts and many small markets. This makes for good potential diversification although it introduces both liquidity and currency risks that are greater than for other commodity indices. The JPMCCI holds the entire commodity curve as opposed to a few contracts held by the more popular indices. The BCI is differentiated by its dynamic asset allocation model based on momentum, and by its allocation to cash designed to cushion commodity price declines.

Appendix 1: Comparison of Major Commodity Indices

		SPGSCI	DJUBS	BCI	RICI	MLCX	DBLCI
Type		Quantity-based	Quantity-based	Value-based	Quantity-based	Quantity-based	Value-based
Components Selected By		Liquidity measures	Liquidity measures	Liquidity measures	Significance in worldwide consumption	Liquidity measures and value of global production	Liquidity measures
Weights Determined By		World production weighted over previous five years	Liquidity and production measures	Liquidity and production measures	Contract liquidity and worldwide consumption pattern	Importance of commodity in the global economy; emphasis on downstream commodities	Determined by the index committee
Number of Components		24	19	19	36	19	6
	Agriculture	8	7	6	18	8	2
	Industrial Metals	5	4	3	7	4	1
	Energy	6	4	6	6	4	2
	Livestock	3	2	2	2	1	0
	Precious Metals	2	2	2	3	2	1
Launch Date		Nov-1991	Jul-1998	Jan-2007	Jul-1998	Jun-2006	Feb-2003
Roll Period		5th to 9th	4th to 8th	Continuous roll	Over a three-day period from the day prior to the last business day of the month to the first business day of the following month	1st to 15th from next contract to second next contract	2nd to 6th. Rolls every month for the energy. Rolls once a year for the other commodities.
Reweighting *		Annual	Annual	Annual	Annual	Annual	Annual
Average Maturity		Less than two months	Same maturity as SPGSCI for agriculture, but longer average maturity for energy and metals as it holds every alternative month.	Around 3 weeks more than average maturity of SPGSCI contracts.	Same as the average maturity of the SPGSCI prior to the roll period for contracts that are common to both RICI and SPGSCI except industrial metals. Average maturity of industrial metals is three months.	About a month longer than DJUBS and six weeks longer than SPGSCI.	The longest of any of the conventional commodity indices. Considerable variation in maturity during the year. It is shortest in the fall, just before the annual rolls, and longest in winter just after the rolls.
Energy Allocation		Target allocation 74.59% for 2009	Capped at 33%	Maximum allocation is set at 50%	Target allocation is 44% for 2009	Can have maximum value of 60%	Target is 55% energy
Liquidity		Highly liquid	Slightly less liquid than SPGSCI due to alternating energy contracts.	Highly liquid	Most of the commodities are in the most liquid part of the curve. But some commodities in the index are illiquid with very low open interest.	Slightly less liquid than SPGSCI due to alternating energy contracts.	Only moderate liquidity due to long maturity of grain contracts.
Outperformance		During rising energy prices and when markets in backwardation.	Will outperform when the price of agriculture and metals rise more compared to energy prices. When agriculture and metals are more in backwardation then energy.	When markets are in contango, it will beat most of the traditional indices. It will have a smaller drawdown compared to any other indices in declining markets. Also will perform better in strong trending markets.	Will outperform when the agriculture sector performs better than the energy and metals sectors. Will outperform when natural gas declines.	Will do better when markets are in contango.	Low diversification means that DBLCI could perform very well if its subset of commodities does well. Also a contango player, as it holds long maturities and rolls ahead of SPGSCI/DJUBS.

* Reweighting is the frequency with which the components of the index are under consideration for change.

Appendix 1: Comparison of Major Commodity Indices

		CRB	CMCI	DCI	JPMCCI	AMCI
Type		Value-based	Value-based	Value-based	Value-based.	
Components Selected By		Liquidity and diversification	CPI, PPI, GDP, and liquidity factors	Significance in world trade and liquidity	Open interest	Determined by the investment committee.
Weights Determined By		Determined by the index committee	CPI, PPI, GDP, and liquidity factors	Significance in world trade and liquidity	Open interest	Liquidity, true investability, and sensitivity to the underlying commodity market.
Number of Components		19	26 for 3-month CMCI	48	35	9
	Agriculture	8	10	20	15	1
	Industrial Metals	3	5	7	7	1
	Energy	4	7	13	6	3
	Livestock	2	2	4	3	0
	Precious Metals	2	2	4	4	4
Launch Date		Launched in 1957 with major modification to methodology in 2005.	Feb-2007	Jun-2006	Nov 2007	
Roll Period		1st to 4th	Continuous roll. 3-month CMCI rolls about a month ahead of SPGSCI/DJUBS.	Last three business days of the month two months prior to expiration.	1st to 10th business day. Major roll occurs from the expiring contract to the next contract. Other contracts rebalance during roll period.	Contracts roll during the 2nd and the 6th trading day of listing of a new contract.
Reweighting *		Target Weights Constant Since 2005	Biannual	Annual	Biannual.	Annual.
Average Maturity		Almost the same as the SPGSCI.	Maturity is constant for different indices much like duration of a bond portfolio.	A little longer than SPGSCI/DJUBS due to accelerated roll. Also holds a number of contracts with a small number of contract rolls per year.	Varies among different groups of futures. Close to six months for energy contracts, two to three months for precious metals, and around four months for industrial metals.	Crude Oil has an average maturity of around four months, while Gasoline and Kerosene have average maturities of around six months. Metals contracts have an average maturity of around 11 months and Rubber has an average maturity of around 5 months.
Energy Allocation		39% of the index	34.81% for the composite index	Target weight is 54.58% for 2009	46% in at the beginning of 2009	40% of the Index.
Liquidity		Highly liquid	Low liquidity as entire holdings are in the illiquid portion of the forward curve.	Moderate liquidity due to accelerated rolls and alternating energy expirations.	Less liquid than some of the indices that invest solely in the front end of the curve.	Very low liquidity for the energy contracts.
Outperformance		When prices of agricultural commodities are rising compared to metals and energy. By trading a few days ahead of SPGSCI/DJUBS, it can benefit when markets are in contango.	The 3-mo CMCI will outperform during periods when agriculture and metals do better than energy. All versions have a longer average maturity than SPGSCI/DJUBS so will outperform during contango.	Has about 16% of index value allocated to markets that appear in none of the other indices. Will outperform when these markets do well. Large currency exposure.	When deferred contracts perform better than the front contracts. Has the potential to perform better than other indices during negative roll periods.	The AMCI will outperform other indices when precious metals sector perform better than energy sectors. This index will also outperform other indices in a declining market for Japanese yen.

* Reweighting is the frequency with which the components of the index are under consideration for change.