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# **CYD<sup>®</sup> Commodity Index Guide 2018**

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# 1 Amendments of the Index Rules

This Section shows all changes of the index rules in a chronological order.

## **December 2006**

Amendment of the CYD MarketNeutral Plus Commodity Index and the CYD MarketNeutral Plus 5 Commodity Index: Before December 2006, the two indices were only invested in a commodity if both the Nearby and the 2<sup>nd</sup> Nearby Contract Expiration were Investable Expirations. They were *not* invested in a Commodity Contract if only the Nearby and the 3<sup>rd</sup> Nearby Contract Expirations were Investable Expirations, i.e. if the 2<sup>nd</sup> Nearby Contract did not meet the Minimum Liquidity Requirement. Beginning in December 2006, the two indices enter a position in the Nearby and 3<sup>rd</sup> Nearby Contract Expiration even if the 2<sup>nd</sup> Nearby Contract does not meet the Minimum Liquidity Requirement.

## **February 2007**

Inclusion of 3 new Commodity Contracts in the CYD Commodity Index Universe: Nickel (London Metal Exchange), Zinc (London Metal Exchange), Aluminium (London Metal Exchange).

## **October 2007 and February 2008**

On two Roll Days, October 8, 2007, and February 8, 2008, trading for CBOT Wheat futures contracts was halted after the futures prices increased by the daily price limit. On these two days, the future settlement prices did not represent a tradable market price. Instead of these settlement prices, the indices are calculated based on synthetic futures prices derived from the CBOT futures options (October 8 2007) and from OTC prices from 3 independent brokers (February 8 2008).

## **May 2008**

Extension of the Roll Period for all indices to 5 days - from the 5<sup>th</sup> Business Day of the month to the 9<sup>th</sup> Business Day of the month. The positions are determined based on the roll return on the 4<sup>th</sup> Business Day and the Minimum Trading Volume on the 4 Business Days before that Business Day (the last Business Day of the previous month until the 3<sup>rd</sup> Business Day of the current month). Before May 2008, all indices were rolled on a single Roll Day, the 6<sup>th</sup> Business Day of the month based on the observed Roll Return of the 5<sup>th</sup> Business Day and the Minimum Trading Volumes from the 1<sup>st</sup> to the 4<sup>th</sup> Business Day.

**May 2008**

Adjustment of the CYD MarketNeutral Plus and Plus 5 Commodity Index target weights as follows:

Commodity	Ticker	Weight until May 2008	Weight since May 2008
Corn	C	5.00%	7.00%
Soybeans	S	5.00%	7.00%
Soybean Oil	BO	0.00%	3.00%
Wheat	W	5.00%	8.00%
Live Cattle	LC	6.00%	8.00%
Lean Hogs	LH	4.00%	8.00%
Arabica Coffee	KC	3.00%	3.00%
Cotton No. 2	CT	3.00%	8.00%
Sugar No. 11	SB	3.00%	8.00%
Copper	HG	5.00%	8.00%
Brent Crude Oil	LCO	12.00%	0.00%
WTI Crude Oil	CL	25.00%	9.00%
Heating Oil No. 2	HO	8.00%	8.00%
Gasoline	XB	6.00%	6.00%
Natural Gas	NG	10.00%	9.00%

**May 2008**

Before May 2008, a commodity position was continuously included in the CYD LongShort and CYD LongOnly Commodity Index even if it was the only Investable Expiration on the first Roll Day and no Roll Return was observable for that commodity. This rule typically applied to commodities with only a few actively traded expirations such as Palladium or Platinum. Starting in May 2008, this rule was dropped.

**June 2009**

Adjustment of the CYD MarketNeutral Plus and Plus 5 Commodity Index target weights as follows:

Commodity	Ticker	Weight until May 2008	Weight since May 2008	Weight since June 2009
Corn	C	5.00%	7.00%	7.00%
Soybeans	S	5.00%	7.00%	7.00%
Soybean Oil	BO	0.00%	3.00%	3.00%
Wheat	W	5.00%	8.00%	8.00%
Live Cattle	LC	6.00%	8.00%	8.00%
Lean Hogs	LH	4.00%	8.00%	8.00%
Cocoa	CC	0.00%	0.00%	3.00%
Arabica Coffee	KC	3.00%	3.00%	3.00%
Cotton No. 2	CT	3.00%	8.00%	5.00%
Sugar No. 11	SB	3.00%	8.00%	8.00%
Copper	HG	5.00%	8.00%	8.00%
Brent Crude Oil	LCO	12.00%	0.00%	0.00%
WTI Crude Oil	CL	25.00%	9.00%	9.00%
Heating Oil No. 2	HO	8.00%	8.00%	8.00%
Gasoline	XB	6.00%	6.00%	6.00%
Natural Gas	NG	10.00%	9.00%	9.00%

**2010**

Prof. Dr. Heinz Zimmermann, member of the CYD Index Committee from 2006 to 2010, has resigned from the CYD Commodity Index Committee.

**2012**

CYD Research GmbH does no longer provide any versions of the currency hedged CYD Indices. Last publication date on Bloomberg was 30.12.2011.

Dr. Viola Markert and Matthias van Randenborgh, members of the CYD Index Committee from 2006 to 2011, have resigned from the CYD Commodity Index Committee. They are replaced by Daniel Schild, Head of Investment Office CYD Research GmbH and Dr. Daniel Seiler, CIO Vescore Solutions AG.

Nicholas Wogan, member of the CYD Index Committee from 2006 to 2012 has resigned from the CYD Commodity Index Committee. He is replaced with "An appointed member of the RBS Index Committee".

**2014**

CYD Research GmbH resumed the publication of the currency hedged CYD Indices LongOnly, LongShort, MarketNeutral Plus and MarketNeutral Plus 5 in CHF and EUR.

**2015**

CYD Research GmbH was renamed to Vescore Research GmbH.

**2017**

Vescore Research GmbH was merged into Vontobel Asset Management AG.

**2018**

"An appointed member of the RBS Index Committee" is replaced by Stephan Schneider, Head of Portfolio.

## 2 Overview

### 2.1 The CYD Commodity Index Concept

The CYD Commodity Index family was developed to capture time-varying returns in commodity futures markets in a mechanically applied active investment strategy conditioned on the term structure. The aim of the CYD Commodity Indices is to account for the different nature of commodities as consumption and production goods in the index construction. Commodities differ from financial assets in several ways, and the concept of a passive, long-only equity index reflecting an efficient market portfolio cannot be directly applied to commodities.

Since commodities are difficult (or even impossible) to store, financial investors can only gain a direct commodity exposure using futures markets. This implies that returns to investors are affected by the slope of the futures term structure, the so called roll return. Moreover, there is more than one way to invest into a specific commodity as there is typically more than one futures expiration with a sufficient liquidity. The CYD Commodity Indices are not only focused on the nearby futures expiration but rather take into account all investable futures expirations with a sufficient trading volume and (directly or indirectly) consider the term structure and roll returns.

In contrast to the equity risk premium, it is unlikely that the risk premium on commodity futures is strictly positive. Rather it depends on the changing overall market exposure to commodity price risk. Depending on the storability and the scarcity of a commodity, its production-, processing- and transportation infrastructure or the hedging activity of producers and consumers, the risk premium can be on the long position of the futures contract or the short position. CYD Commodity Indices assume long and short positions in commodity futures, or selective long positions based on the notion that the risk premium in commodity futures can be positive or negative.

A good indicator for the characteristic of a specific commodity – its scarcity, storability and the hedging activity of its producers and consumers – and the expected commodity futures return is the slope of the futures term structure. Therefore, the positions of the CYD Commodity Index components (long, short, no investment) are (directly or indirectly) conditioned on the slope of the commodity futures term structure and the roll return.

Finally, there is no observable market portfolio for commodities or commodity futures, i.e. it is not possible to use a market-cap based weighting scheme similar to equity indices. CYD Commodity Indices do not make the attempt to derive a weighting scheme from production or consumption patterns. Rather, they use equal weights as the simplest weighing scheme and the weighting scheme with the highest diversification potential. To ensure the tradability of the index under this weighting scheme, the index components are required to meet strict liquidity criteria.

Summing up, the rules of this guide aim at constructing an investable and broadly diversified index family that assumes the perspective of an investor who is positioned on the side of the commodity futures market where the risk premium is earned.

The CYD Commodity Index Family was developed and is calculated by Vescore, a boutique of Vontobel Asset Management (Vescore), former CYD Research GmbH, based on the rules of this guide. Vescore calculates and publishes an official daily settlement price for each of the CYD Commodity Indices continuously on each business day.

## 2.2 The CYD Commodity Index Family

The CYD Commodity Index Family is comprised of three indices representing different applications of the CYD Commodity Index Concept. The indices were developed to reflect the different needs, risk aversions and regulatory requirements of commodity-futures investors. They exhibit a different commodity spot-price exposure, different volatility levels and long-only positions or long-short positions.

### 2.2.1 CYD LongShort Commodity Index

The CYD LongShort Commodity Index is based on an equally weighted basket of 26 commodity futures (the *CYD Commodity Index Universe*). The index is monthly rebalanced and the futures positions are determined based on the current term structure of the each commodity. The index holds a long position in commodities with a backwardated term structure (positive roll returns) and a short position in commodities with a term structure in contango (negative roll returns). The index has a long- or backwardation bias, i.e. it assumes a long position whenever an actively traded expiration of the term structure is in backwardation. The index only assumes a short position for commodities with a contango situation throughout the whole (actively traded) term structure. The CYD LongShort Commodity Index is an unleveraged index, i.e. returns are calculated on a fully-collateralized basis with full reinvestment. For the short positions of the index, however, the size of the collateral is limited to the observed futures price, i.e. leverage cannot be completely ruled out as the futures price can rise by more than 100% between two *Roll Periods*.

The index is suited for investors who are willing to take also short positions in commodity futures and who believe that returns on commodity futures are strongly driven by the term structure and roll returns. The overall commodity spot-price exposure of this index is reduced by the short position in some of the commodities. The overall spot-price exposure varies over time, however, as the number of short positions depends on the observed term structure of the futures contracts. If all commodities are in backwardation the index holds only long positions. The risk of this index is that the commodity spot-price development outweighs the roll returns, i.e. the spot prices of backwardated commodities decrease by more than the roll return and/or the spot prices of contango commodities increase by more than the roll return.

### 2.2.2 CYD LongOnly Commodity Index

The CYD LongOnly Commodity Index is a long-only unleveraged, equally weighted and monthly rebalanced index investing in all commodities of the *CYD Commodity Index Universe* with a backwardation in any actively traded part of the futures term structure. The composition of the CYD LongOnly Commodity Index changes along with the number and type of commodities with a backwardated part of the term structure. The maximum weight per commodity is defined along three liquidity categories (high (15%), medium (10%) or low (5%)), and also a maximum weight of 50% per commodity group applies. If the maximum weight is attained, the index holds the remaining proportion in cash (*Excess Return Index*) or the U.S. money market (*Total Return Index*). The CYD LongOnly Commodity Index is an unleveraged index, i.e. returns are calculated on a fully-collateralized basis with full reinvestment.

The index is developed for investors who are restricted or not willing to take short positions in commodity futures and who believe that returns on commodity futures are strongly driven by backwardation, convenience yields, positive roll returns and the scarcity of a commodity. Through its long-only investment, the index has always a full commodity spot-price exposure (although with a different commodity composition), the spot-price exposure is only reduced in times when most commodities are in contango, the maximum weight applies and the index is not fully invested in commodities. As for

the CYD LongShort Commodity Index, the risk of this index is that the commodity spot-price development outweighs the roll returns, i.e. the spot prices of backwardated commodities decrease by more than the roll return and the spot prices of contango commodities increase by more than the roll return.

### **2.2.3 CYD MarketNeutral Plus and Plus 5 Commodity Index**

The CYD MarketNeutral Plus Commodity Index and the CYD MarketNeutral Plus 5 Commodity Index hold two to three positions per commodity. They assume a short position in the nearby expiration of each commodity and a ½ long position in the 2nd- and 3rd-nearby expiration. The indices are currently based on a subset of 15 commodities of the CYD Commodity Index Universe. In contrast to the other CYD Commodity Indices, the CYD MarketNeutral Commodity Indices have fixed target weights shown in Section 5.2.4).

The CYD MarketNeutral Plus Commodity Index is a 2 times leveraged index, i.e. for every dollar invested in the index, the index enters futures positions with a total notional of 2 dollars, a long futures position with a notional value of 1 dollar and a simultaneous short position with a notional value of 1 dollar.

The CYD MarketNeutral Plus 5 Commodity Index is a 5 times leveraged Index, i.e. for every dollar invested in the index, the index enters futures positions with a total notional of 5 dollars, a long futures position with a notional value of 2.5 dollars and a simultaneous short position with a notional value of 2.5 dollars. Returns on the CYD MarketNeutral Commodity Indices are calculated on a collateralized basis with full reinvestment.

The two CYD MarketNeutral Commodity Indices aim at investors who seek a source of return which is independent from commodity spot market moves and who are willing to take short positions in commodity futures: The indices hold a simultaneous long- and short position for each commodity and, therefore, have no spot price exposure. Rather, the CYD MarketNeutral Commodity Indices are exposed to twists in the term structure over the course of the month. As the CYD MarketNeutral Commodity Indices always take short positions at the short end of the term structure and long positions at the longer end of the term structure, the risk of the indices is that the slope of the term structure at the very short end becomes steeper in times of backwardation or more flat in times of contango. The source of return for the two CYD MarketNeutral Commodity Indices rests on the assumption that backwardation (contango) typically tends to be less (more) pronounced for the nearby expiration than for the 2nd- or 3rd-nearby expiration, i.e. the slope flattens at the very short end of the term structure.

## 2.3 The CYD Commodity Index Committee

The CYD Commodity Index Family is maintained by the CYD Commodity Index Committee which meets on an annual basis to monitor and change the index composition and calculation based on the rules of this guide.

CYD Commodity Index Committee may also meet at other times during the year in order to review the index composition and calculation under exceptional circumstances (such as trading volume collapses or other severe trading restrictions for a single commodity).

At present, the CYD Commodity Index Committee at Vescore consists of the following members:

Daniel Schild	Head Computation, Executive Director
Dr. Daniel Seiler	Head Vescore, Managing Director
Stephan Schneider	Head Portfoliomangement, Executive Director

The members of the CYD Commodity Index Committee are proposed by Vescore and have to be accepted by two thirds of the existing members of the CYD Commodity Index Committee.

Decisions of the CYD Commodity Index Committee about modifications of the index composition or the index calculation are reached by unanimous consent of the Committee and will be listed in the first chapter of the CYD Commodity Index Guide which will be published after the annual meeting of the Index Committee.

## 3 Definitions

The following list defines the terms which are used throughout this Index Guide.

### **Business Day**

The Business Day is defined as a day on which the CME (Chicago Mercantile Exchange) is scheduled to be open for trading for at least three hours, and a daily Settlement Price for the CME commodities in the CYD Commodity Index Universe is published by the exchange.

### **Calculated Forward Rates**

The FX Forward Rate with Duration between the published FX Forward Rates must be calculated by a linear interpolation between the FX Forward Rates with a shorter and a longer Duration as the Calculated Forward Rate.

### **Commodity Constant**

The Commodity Constant is the factor for each commodity of the CYD Commodity Index Universe which is used to convert the Settlement Price of the commodity into the U.S. Dollar notional value of the Commodity Contract. It is equal to the price quote of the Settlement Price as published in Thomson/Datastream - 1 for U.S. dollar quotes and 0.01 for U.S. cents quotes - times the contract size of the Commodity Contract. The Commodity Constant is included in the index calculation to reduce rounding effects caused by the different price quotes and contract sizes of the different Commodity Contracts. A table of the Commodity Constants for all commodities of the CYD Commodity Index Universe is given in Section 6.1.2.

### **Commodity Contract**

Commodity Contract refers to any contract traded on one of the Recognized Exchanges based on the price of a commodity, e.g. NYMEX WTI Crude Oil represents one Commodity Contract and ICE Brent Crude Oil another Commodity Contract

### **Contract Expiration**

Contract Expiration refers to a specific date or term specified by the exchange during or after which a contract will expire, or delivery or settlement will occur. The Contract Expiration is typically a specific contract month.

### **Contract Number**

The Contract Number is the number of futures contracts in a specific Contract Expiration of a commodity which is needed to replicate the USD value of the CYD Excess Return Indices. It equals the Excess Return Index Value times the index weight of the specific Contract Expiration and the Leverage Factor and Long/Short Indicator divided by the current Settlement Price of the Contract Expiration and the Commodity Constant of the commodity.

### **Currency Hedged Index**

This Index represents the currency hedged return of an investment in the CYD Commodity Total Return Indices in another currency than USD. The Currency Hedged Index incorporates the returns on CYD Total Return Index in a foreign currency and the Hedge Return, which results from a monthly bought FX Forward Contract. The Hedge Ratio will be adjusted to 100% once a month at the Hedge Day. The currency hedge does not incorporate the profits and losses which were realised between the Hedge Days.

### **CYD Commodity Index Committee**

The CYD Commodity Index Committee monitors and reviews the index composition and calculation based on the rules of this guide. The CYD Commodity Index Committee meets regularly on an annual basis.

**CYD Commodity Index Concept**

The CYD Commodity Index Concept is the economic background of the CYD Commodity Index family as described in Section 2.1.

**CYD Commodity Index Universe**

The CYD Commodity Index Universe refers to the basket of Commodity Contracts that are allowed to be considered for the inclusion in the CYD Commodity Indices. The CYD Commodity Index Universe includes all contracts which are traded on one of the Recognized Exchanges and meet the selection requirements as described in Section 4. The CYD Commodity Indices do not always comprise the complete CYD Commodity Index Universe, as the indices are based on active index rules, which select the index components based on the selection requirements as described in Section 5.3.

**Daily Treasury Bill Rate**

On any Business Day, the Daily Treasury Bill Rate refers to the 91-day auction high rate for U.S. Treasury Bills on the most recent weekly auction date prior to the most recent Roll Period.

**Duration**

The Duration of an FX Forward Contract is the difference between the value day of the FX Forward Contract and the value day of the current spot rate.

**Excess Return Index**

The Excess Return Index reflects the cumulative price change of the commodity futures contracts underlying a CYD commodity Index, indexed to a normalized value of 100 on December 31, 1979. Since futures contracts do not bind capital, the Excess Return Index reflects the returns on fully-levered futures positions, i.e. excess returns.

**Futures Position**

The Futures Position in a specific commodity Contract Expiration can be a long position, a short position or no investment based on the investment rules of this Index Guide.

**FX Forward Contract**

The FX Forward Contract is an agreement between two parties to buy or sell a particular currency at an agreed date in the future, at a rate agreed now.

**FX Spot- and Forward Rate**

The CYD Currency Hedged Indices use the New York fixing rate of the FX Spot- and Forward Contracts, which were published on Reuters and Bloomberg

**Hedge Day**

The Hedge Day will be determined to roll the FX Forward Contract once a month. It is the business day in the month on which the FX Spot value day is the last business day in this month.

**Hedge Return**

The Hedge Return is the cumulative realised return from the monthly bought FX Forward Contract (currency hedge) since the last Hedge Day.

**Investable Contract Expiration**

The CYD Commodity Indices are not only focused on the Nearby Contract Expiration but consider a larger number of Contract Expirations for the inclusion in the index. The Investable Contract Expirations are defined on the first Roll Day of a Roll Period. A Contract Expiration is an Investable Contract Expiration if its delivery period does not begin before the end of the next Roll Period in the following month and if it meets the Minimum Liquidity Requirement.

**Leverage Factor**

The Leverage Factor equals the USD *notional* of all New Index Positions opened on each Roll Day divided by the USD *value* of the Old Index Positions closed on that Roll Day. The CYD LongOnly Commodity Index and the CYD LongShort Commodity Index have a Leverage Factor of 1, i.e. on each Roll Day, the *notional* of the New Index Positions to be opened equals the *value* of the Old Index Positions which are rolled and rebalanced. For the CYD MarketNeutral Plus Commodity Index, the Leverage Factor equals 2, i.e. on each Roll Day, the index opens futures positions with a total notional of 2 dollars for every dollar value of the Old Index Positions which are closed. For the CYD MarketNeutral Plus 5 Commodity Index, the Leverage Factor equals 5.

**Long/Short Indicator**

The Long/Short Indicator equals 1 for a long Futures Position, (-1) for a Short Futures Position and 0 for no Futures Position.

**Liquidity Category**

All Commodities are be categorised in accordance to their futures liquidity. These categories are be high, medium and low. High means that this commodity can make up to 15% of an index, medium means 10% and low 5%.

**Minimum Liquidity Requirement**

Based on the Minimum Liquidity Requirement a Contract Expiration has to exhibit a minimum USD Trading Volume of 20mn. on the four Business Days starting from the last Business Day of the previous month to the 3<sup>rd</sup> Business Day of the current month to be considered as an Investable Contract Expiration. The calculation of the minimum USD Trading Volume only includes days on which the Recognized Exchange is open for trading for at least three hours.

**New Index Position**

The CYD Commodity Indices roll over a Roll Period of 5 days. During this time the indices gradually shift the index positions from the Old Index Positions to the New Index Positions. The New Index Position for a commodity is the Futures Position in the Selected Expiration of the current Roll Period.

**New Single Commodity Value**

The CYD Indices roll over a Roll Period of 5 days. During this time the indices gradually shift the index positions from the Old Index Positions to the New Index Positions. The New Single Commodity Value is the value of the New Index Position for a commodity based on the current Reference Price.

**Nearby Contract Expiration**

The futures expiration with the shortest time to expiration and a delivery period which does not begin before the end of the next Roll Period, is called the Nearby Contract Expiration. A table of all Nearby Contracts is given in Section 5.3.1.

**Old Index Position**

The CYD Indices roll over a Roll Period of 5 days. During this time the indices gradually shift the index positions from the Old Index Positions to the New Index Positions. The Old Index Position for a commodity is the Futures Position and the Selected Expiration which were opened in the previous Roll Period and are closed in the current Roll Period.

**Old Single Commodity Value**

The CYD Indices roll over a Roll Period of 5 days. During this time the indices gradually shift the index positions from the Old Index Positions to the New Index Positions. The Old Single Commodity Value is the value of the Old Index Position in a specific commodity based on the current Reference Price.

**Recognized Exchange**

All Contracts of the CYD Commodity Index Universe must be publicly traded at one of the Recognized Exchanges. The Recognized Exchanges are determined by the CYD Commodity Index Committee. To qualify as a Recognized Exchange, an exchange or trading facility must at least publish daily closing prices, trading volumes and open interest data for all traded Commodity Contracts and Contract Expirations.

**Reference Price**

The Reference Price equals the futures Settlement Price expressed in USD. For futures which are not denominated in USD, the Settlement Price in local currency has to be multiplied by the USD FX Rate.

**Roll Day**

The CYD Indices roll over a Roll Period of 5 Roll Days from the 5<sup>th</sup> Business Day of the month to the 9<sup>th</sup> Business Day of the month. Each Business Day in this Roll Period is a Roll Day.

**Roll Period**

Roll Period means a period of 5 Business Days, the first day of such period being the 5<sup>th</sup> Business Day of the month, and the last day being the 9<sup>th</sup> Business Day of the month.

**Roll Return**

The Roll Return equals the annualised slope of the term structure for a specific Contract Expiration. It is positive if the term structure is in backwardation (downward sloping) and negative if the term structure is in contango (upward sloping) for a specific Contract Expiration. The detailed calculation of the Roll Return is described in Section 5.4.

**Selected Contract Expiration**

The Selected Contract Expiration refers to the Contract Expiration which is chosen from all Investable Contract Expirations for the inclusion in a specific CYD Commodity Index based on the rules of the indices as outlined in Section 5.4.

**Selected Forward Rates**

The Selected Forward Rate is the Rate of the FX Forward Contract, which will be determined on each Hedge Day. The value day of this FX Forward Contract is the last business day of the next month.

**Single Commodity Value**

The Single Commodity Value is the building block for the calculation of the Excess Return Index. It represents the USD value of the Excess Return Index which is invested in the Selected Contract Expiration of a commodity.

**Settlement Price**

The futures Settlement Price equals the official daily closing price as published by the Recognised Exchange on any Business Day.

**Total Annual USD Trading Volume**

The Total Annual USD Trading Volume equals the total annual trading volume of a Commodity Contract (aggregated over all listed Contract Expirations) expressed in number of contracts traded over the annual reference period multiplied by the Commodity Constant and the average spot price over the annual reference period.

**Treasury Bill Return**

The Treasury Bill Return is a daily rate of return derived from the Treasury Bill Rate based on a year of 360 days and a period of 91 days.

**Total Return Index**

The Total Return Index incorporates the returns on the Excess Return Index and the Treasury Bill Return, indexed to a normalized value of 100 on December 31, 1979. It represents the returns of fully-collateralized futures positions in the commodities underlying the CYD Commodity Indices. Please note that for indices with short positions, the size of the collateral invested in Treasury Bills is limited to the Reference Price at each Roll Day, i.e. leverage cannot be completely ruled out as the Reference Price can rise by more than 100%.

**Unhedged Return**

The Unhedged Return is in the foreign currency exchanged return of the in USD noted CYD Total Return Index.

**USD FX Rate**

The USD FX Rate is used to calculate the USD Reference Price for futures Contracts which are not denominated in USD. The reference for the USD FX Rate of the different currencies is the closing value of the respective currency as published by Datastream around 5:00 PM, New York Time.

## 4 The Selection of the CYD Commodity Index Universe

In order to optimize the diversification within the CYD Commodity Index, the basket of commodity futures contracts that constitute the CYD Commodity Indices – the CYD Commodity Universe – is defined as broad as possible. To facilitate the calculation, replication and tradability of the indices and to comply with the CYD Commodity Index Concept, however, the commodity futures contracts must meet some general requirements.

### 4.1 Non-Financial Futures Contracts

The CYD Commodity Indices only include futures contracts on commodities which mainly serve as consumption or production goods. Futures on precious metals such as gold and silver are not included in the CYD Commodity Index Universe as their term structure is always in contango and merely reflects the risk free rate and storage costs rather than the market conditions for the underlying commodity. The CYD LongOnly and CYD LongShort Commodity Index are directly conditioned on the term structure based on the notion that the term structure contains information on the underlying commodity market, e.g. the hedging-, production- or consumption activity, and the expected futures return.

### 4.2 Recognized Exchanges

To facilitate the calculation, replication and tradability of the index all Commodity Contracts of the CYD Commodity Index Universe must be publicly traded at one of the Recognized Exchanges which publish the Settlement Prices, trading volumes and open interest on a daily basis. At present, the six Recognized Exchanges are

Exchange	Abbreviation	Country
1. Chicago Board of Trade	CBOT	US
2. Chicago Mercantile Exchange	CME	US
3. New York Board of Trade	NYBOT	US
4. New York Mercantile Exchange	NYMEX	US
5. The Intercontinental Exchange	ICE	UK, US
6. The London Metal Exchange	LME	UK

### 4.3 Liquidity Requirement

The CYD Commodity Indices are limited to those contracts that are actively traded in order to assure that the prices generated by the markets for such contracts represent reliable, competitive prices. A new Commodity Contract must have a Total Annual USD Trading Volume of 5bn. for at least two years before it can be included in the indices

The estimate for the Total Annual USD Trading Volume is based on the number of contracts traded per year as published in Datastream. This number is then multiplied by the Commodity Constant and the average spot price per year and the average USD FX Rate (if the contract is not denominated in USD).

## **4.4 Further Requirements**

### **4.4.1 Denomination and Geographical Requirements**

There is no geographical requirement with respect to the listing of the commodity Contract or the Recognized Exchange. Neither is there a requirement for the Commodity Contracts to be listed in USD. The FX risk of the CYD Commodity Indices is not hedged, i.e. the Settlement Prices for Commodity Contracts which are not listed in USD are translated in USD using the USD FX Rate as published in Datastream at market closing around 5:00 PM, New York Time.

### **4.4.2 Double Listing**

The CYD Commodity Indices can also include commodities which are traded on more than one exchange as long as they meet all other requirements, specifically the liquidity requirement. The fact that a commodity trades on more than one exchange with a sufficient liquidity is taken as an indication that is a regional in terms of production, consumption and pricing.

### **4.4.3 Availability of Daily Prices and Volume Data**

For a contract to be included in the CYD Commodity Index Universe, the Recognized Exchange must publish daily closing prices for such contract on the same Business Day and daily trading volumes for the contract with a maximum time lag of one Business Day.

## 4.5 Current CYD Commodity Index Universe

Based on the above rules the current CYD Commodity Index Universe is comprised of the following 26 Commodity Contracts:

Commodity Group	Commodity Contract	Ticker	Recognized Exchange	Currency	Liquidity Category
<b>Grains</b>					
	Corn	C	CBOT	USD	High
	Soybean Meal	SM	CBOT	USD	Medium
	Soybean Oil	BO	CBOT	USD	Medium
	Soybeans	S	CBOT	USD	High
	Wheat	W	CBOT	USD	High
<b>Livestock and Meat</b>					
	Feeder Cattle	FC	CME	USD	Medium
	Live Cattle	LC	CME	USD	Medium
	Lean Hogs	LH	CME	USD	Medium
<b>Exotics</b>					
	Cocoa	CC	NYBOT	USD	High
	Arabica Coffee	KC	NYBOT	USD	High
	Cotton No. 2	CT	NYBOT	USD	Medium
	Sugar No. 11	SB	NYBOT	USD	High
	Lumber	LB	CME	USD	Low
	Orange Juice	JO	NYBOT	USD	Low
<b>Metals</b>					
	Copper	HG	NYMEX	USD	High
	Nickel	LN	LME	USD	Low
	Aluminium	LA	LME	USD	Low
	Zinc	LX	LME	USD	Low
	Palladium	PA	NYMEX	USD	Low
	Platinum	PL	NYMEX	USD	Low
<b>Energy</b>					
	Brent Crude Oil	CO	ICE	USD	High
	WTI Crude Oil	CL	NYMEX	USD	High
	Gas Oil	QS	ICE	USD	High
	Heating Oil No. 2	HO	NYMEX	USD	High
	Gasoline	HU	NYMEX	USD	High
	Natural Gas	NG	NYMEX	USD	High

The constituents of the CYD Commodity Index Universe and the Recognized Exchanges are reviewed and potentially changed annually by the CYD Commodity Index Committee. Changes are published in the CYD Commodity Index Guide.

## **5 Roll Period, Weights and Expirations**

### **5.1 Roll Period**

All Futures Positions are rolled over a period of five Business Days. The first Roll Day is the 5<sup>th</sup> Business Day, the last Roll Day is the 9<sup>th</sup> Business Day of each calendar month. The Futures Positions are determined based on the closing prices of the 4<sup>th</sup> Business Day. The Business Day is defined as a day on which NYMEX and CME are scheduled to be open for trading for at least three hours.

To ensure the tradability and replication of the CYD Commodity Index, the CYD Commodity Index Committee can decide to extend the Roll Period further. This adjustment of the Index calculation will be published immediately on the web page and in the first chapter of the updated CYD Commodity Index Guide.

### **5.2 Weights and Rebalancing**

#### **5.2.1 General Rule**

In order to exploit the low correlations among different commodities and their diversification benefit, the CYD Commodity Indices are generally equally weighted across all commodities. The index weights are rebalanced once a month on the Roll Day when the Futures Positions are determined.

#### **5.2.2 CYD LongShort Commodity Index**

The CYD LongShort Commodity Index includes all Commodity Contracts with a least one Investable Contract Expiration (as defined in Section 5.3). Therefore, in general, the Index holds long- or short Futures Positions in all 26 Commodity Contracts each weighted equally. For the unlikely event that there are very few Commodity Contracts with Investable Contract Expirations, the maximum weight per Commodity Contract is restricted according to their Liquidity Category and the maximum weight for the Grains, Livestock and Meat, Metals and Energy commodity group is restricted to be 50%. The maximum weight is not applied to the Exotics commodity group as this commodity group is very heterogeneous and its constituents exhibit a low correlation. If less than 100% are invested, the index invests the remaining proportion in cash (Excess Return Index) or 3-month U.S. treasury bills (Total Return Index).

#### **5.2.3 CYD LongOnly Commodity Index**

The CYD LongOnly Commodity Index invests only in backwardated Commodity Contracts, whereby all commodities are equally weighted. In order to avoid a concentration of the index in times when most commodities are in contango, the maximum weight per Commodity Contract is restricted according to their Liquidity Category. If less than 100% are invested, the index invests the remaining proportion in cash (Excess Return Index) or 3-month U.S. treasury bills. Moreover, the total weight per commodity group is restricted to be 50% for Grains, Livestock, Metals and Energy. The maximum weight is not applied to the Exotics commodity group as this commodity group is very heterogeneous and its constituents exhibit a low correlation.

### 5.2.4 CYD MarketNeutral Plus and Plus 5 Commodity Index

The indicative weights for the spread positions of the CYD MarketNeutral Plus Commodity Index and the CYD MarketNeutral Plus 5 Commodity Index are as follows:

Commodity Group	Commodity Contract	Ticker	Exchange	Weight
<b>Grains</b>				
	Corn	C	CBOT	7.00%
	Soybeans	S	CBOT	7.00%
	Soybean Oil	BO	CME	3.00%
	Wheat	W	CBOT	8.00%
<b>Livestock and Meat</b>				
	Live Cattle	LC	CME	8.00%
	Lean Hogs	LH	CME	8.00%
<b>Exotics</b>				
	Cocoa	CC	NYBOT	3.00%
	Arabica Coffee	KC	NYBOT	3.00%
	Cotton No. 2	CT	NYBOT	5.00%
	Sugar No. 11	SB	NYBOT	8.00%
<b>Metals</b>				
	Copper	HG	NYMEX	8.00%
<b>Energy</b>				
	WTI Crude Oil	CL	CME	9.00%
	Heating Oil No. 2	HO	CME	8.00%
	Gasoline	XB	CME	6.00%
	Natural Gas	NG	CME	9.00%

The remaining commodities of the CYD Commodity Index Universe are not included in the CYD MarketNeutral Commodity Indices and have a weight of 0.0%. The CYD MarketNeutral Plus Commodity Index and the CYD MarketNeutral Plus 5 Commodity Index are only invested in a Commodity Contract if its Nearby and 2<sup>nd</sup> or 3<sup>rd</sup> Nearby Contract are Investable Expirations (as defined in Section 5.3). Otherwise, the indicative weight of this Commodity Contract in the table above is reallocated to the remaining Commodity Contracts in proportion to their indicative weights. Moreover, the total weight per commodity group is restricted to be 50% for Grains and Energy, 20% for Livestock and 15% for Metals. The maximum weight is not applied to the Exotics commodity group as this commodity group is very heterogeneous and its constituents exhibit a low correlation. If the maximum weights attained and less than 100% are invested, the indices invest the remaining proportion in cash (Excess Return Index) or US 3 month treasury bills (Total Return Index).

### 5.3 Investable Contract Expirations

In contrast to most other commodity indices, the CYD Commodity Indices are not only focused on the Nearby Contract Expiration but consider a larger number of expirations for the inclusion in the index. This inbuilt flexibility allows them to enter a Futures Position in the expiration with the highest expected futures return and the lowest roll cost as indicated by the rules of this Index Guide.

To determine the “Investable Expirations” of a commodity futures contract, the CYD Commodity Indices uses an expiration criterion and a Minimum Liquidity Requirement

### 5.3.1 Expiration Longer or Equal to Nearby Contract Expiration

To be included in the CYD Commodity Indices, the delivery period of a futures contract must not begin before the end of the next Roll Period. The futures expiration with the shortest time to expiration which is actively traded and meets this requirement is called the Nearby Expiration.<sup>1</sup> The following table shows the Nearby Contract Expiration on the first Roll Day of each calendar month for the different Commodity Contracts of the CYD Commodity Index Universe.

Commodity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Grains													
C	Corn	Mar	May	May	Jul	Jul	Sep	Sep	Dec	Dec	Dec	Mar	Mar
SM	Soybean Meal	Mar	May	May	Jul	Jul	Aug	Sep	Dec	Dec	Dec	Jan	Mar
BO	Soybean Oil	Mar	May	May	Jul	Jul	Aug	Sep	Dec	Dec	Dec	Jan	Mar
S	Soybeans	Mar	May	May	Jul	Jul	Nov	Nov	Nov	Nov	Jan	Jan	Mar
W	Wheat	Mar	May	May	Jul	Jul	Sep	Sep	Dec	Dec	Dec	Mar	Mar
Livestock													
FC	Feeder Cattle	Mar	Apr	May	Aug	Aug	Aug	Sep	Oct	Nov	Jan	Jan	Mar
LC	Live Cattle	Apr	Apr	Jun	Jun	Aug	Aug	Oct	Oct	Dec	Dec	Feb	Feb
LH	Lean Hogs	Apr	Apr	Jun	Jun	Jul	Aug	Oct	Oct	Dec	Dec	Feb	Feb
Exotics													
CC	Cocoa	Mar	May	May	Jul	Jul	Sep	Sep	Dec	Dec	Dec	Mar	Mar
KC	Arabica Coffee	Mar	May	May	Jul	Jul	Sep	Sep	Dec	Dec	Dec	Mar	Mar
CT	Cotton No. 2	Mar	May	May	Jul	Jul	Dec	Dec	Dec	Dec	Dec	Mar	Mar
SB	Sugar No. 11	Mar	May	May	Jul	Jul	Oct	Oct	Oct	Mar	Mar	Mar	Mar
LB	Lumber	Mar	May	May	Jul	Jul	Sep	Sep	Nov	Nov	Jan	Jan	Mar
JO	Orange Juice	Mar	May	May	Jul	Jul	Sep	Sep	Nov	Nov	Jan	Jan	Mar
Metals													
HG	Copper	Mar	May	May	Jul	Jul	Sep	Sep	Dec	Dec	Dec	Mar	Mar
LN	Nicke	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
LA	Aluminium	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
LX	Zinc	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
PA	Palladium	Mar	Jun	Jun	Jun	Sep	Sep	Sep	Dec	Dec	Dec	Mar	Mar
PL	Platinum	Apr	Apr	Jul	Jul	Jul	Oct	Oct	Oct	Jan	Jan	Jan	Apr
Energy													
CO	Brent Crude	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
CL	WTI Crude Oil	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
QS	Gas Oil	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
HO	Heating Oil	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
XB	Gasoline	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
NG	Natural Gas	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb

### 5.3.2 Minimum Liquidity

In a second step, the Investable Contract Expirations are derived from a Minimum Liquidity Requirement: In order to qualify for an Investable Contract Expiration, the Contract Expiration must exhibit a minimum daily trading volume of USD 20mn. for the period of four Business Days starting from the last Business Day of the previous month until the 3<sup>rd</sup> Business Day of the current month.<sup>2</sup> The calculation of the minimum USD Trading Volume only includes days on which the Recognized Exchange is open for trading for at least three hours.

The USD trading volume is calculated based on the Trading Volumes, Settlement Prices and the USD FX Rate (for contracts which are not denominated in USD).

<sup>1</sup> The LME contracts are an exception of this rule: For these commodities, the contracts expiring on the 3<sup>rd</sup> Wednesday in four months time are defined as the Nearby Contract Expiration.

<sup>2</sup> This rule is not applied to the LME contracts. Trading volumes of LME contracts are difficult to define as the standard LME contracts have daily expiration dates rather than monthly expiration dates.

To ensure the tradability and replication of the CYD Commodity Index, the CYD Commodity Index Committee can change this threshold for the coming year on its annual meeting. This amendment of the Index calculation is then published in the first chapter of the updated CYD Commodity Index Guide.

### 5.3.3 Example

The following table illustrates the rule to determine the Investable Contract Expirations for Corn in January 2008: March 2008, May 2008, July 2008, September 2008 and December 2008.

4 Business Days for the Corn Contract before Jan. 2008 Roll Period					
Expiration Dates	12.31.07	01.02.08	01.03.08	01.04.08	01.07.08
Trading Volume (Number of Contracts)					
Mar-08	54'377	98'452	83'995	84'152	
May-08	8'341	15'101	15'642	19'015	
Jul-08	6'082	11'548	14'697	18'140	
Sep-08	1'108	1'888	1'303	1'711	
Dec-08	9'611	19'754	16'688	20'086	
Mar-09	204	650	835	2'230	
May-09	24	186	62	168	
Jul-09	97	267	197	188	
Dec-09	355	1'865	1'151	1'253	
Mar-10	0	15	12	11	
Jul-10	0	8	18	37	
Dec-10	179	313	197	253	
Settlement Price (in Cents / Bushel)					
Mar-08	455.5	462.5	466	466.75	466.25
May-08	466.75	473.5	476.75	478	477.5
Jul-08	476.5	483	486.5	487.75	487
Sep-08	474.25	479.75	484	486.25	485.75
Dec-08	473.5	480.25	485.75	486.75	485.75
Mar-09	478.75	484.75	491	491.75	491.75
May-09	482.5	489.5	494	494.25	495
Jul-09	485	492.5	497.5	499	499
Dec-09	462	469.75	476	479.25	479.25
Mar-10	466.5	474.5	481	484.25	484.5
Jul-10	472	480	486	489.25	490
Dec-10	459	466	471.5	474.5	475
Trading Volume (Value, in mn. USD)					
= Number of Contracts * Settlement Price (in USD / Bushel) * 5000 Bushels					
Mar-08	<b>1'238</b>	<b>2'277</b>	<b>1'957</b>	<b>1'964</b>	
May-08	<b>195</b>	<b>358</b>	<b>373</b>	<b>454</b>	
Jul-08	<b>145</b>	<b>279</b>	<b>358</b>	<b>442</b>	
Sep-08	<b>26</b>	<b>45</b>	<b>32</b>	<b>42</b>	
Dec-08	<b>228</b>	<b>474</b>	<b>405</b>	<b>489</b>	
Mar-09	5	16	20	55	
May-09	1	5	2	4	
Jul-09	2	7	5	5	
Dec-09	8	<b>44</b>	<b>27</b>	<b>30</b>	
Mar-10	0	0	0	0	
Jul-10	0	0	0	1	
Dec-10	4	7	5	6	

## 5.4 Selected Contract Expiration

The CYD LongShort and the CYD LongOnly Commodity Indices are invested in only one and the CYD MarketNeutral Plus and Plus 5 Commodity Indices only in two or three expirations of the Investable Contract Expirations for each Commodity Contract. The expiration, which enters the index calculation, is called the Selected Contract Expiration.

For the CYD LongShort Commodity Index and the CYD LongOnly Commodity Index, the Selected Contract Expiration is determined on the first Roll Day, the 5<sup>th</sup> Business Day of the month, based on the Annualised Roll Return of the previous Business Day, the 4<sup>th</sup> Business Day of the month.

The Annualised Roll Return, Roll, for commodity i and expiration j, Exp<sub>j</sub>, is defined as follows:

$$Rroll_{i,t=rd1-1}^{Exp_j} = \left( \frac{P_{i,t=rd1-1}^{Exp_{j-1}}}{P_{i,t=rd1-1}^{Exp_j}} \right)^{\frac{365}{(Exp_j - Exp_{j-1})}} - 1,$$

where t=rd1 is the first Roll Day of the Roll Period and t= rd1-1 is the Business Day prior to the first Roll Day. For the expiration j, the Annualised Roll Return equals the Settlement Price for the futures contract with the expiration prior to expiration j, Exp<sub>j-1</sub>, divided by the Settlement Price for the futures with expiration j, Exp<sub>j</sub>. Exp<sub>j</sub> can only be an Investable Contract Expiration. Exp<sub>j-1</sub> can be any expiration and does not have to be an Investable Contract Expiration, since the Settlement Price for Exp<sub>j-1</sub> is only used for the calculation of the Annualised Roll Return.

The ratio of the Settlement Prices is expressed as a simple annualised rate of return, where (Exp<sub>j</sub>-Exp<sub>j-1</sub>) is the number of calendar days from the beginning of expiration month Exp<sub>j-1</sub> to the beginning of expiration month Exp<sub>j</sub>.

For the different expirations of Corn in January 2008, the Annualised Roll Return is calculated as follows – the highlighted roll returns are the roll returns for the Investable Contract Expirations:

Expiration	Exp <sub>j</sub> -Exp <sub>j-1</sub>		Settlement Prices 01.07.08	p <sup>Exp<sub>j-1</sub></sup> /p <sup>Exp<sub>j</sub></sup>	Roll
	in Days	in Years			
Mar-08			466.25		
May-08	61	0.17	477.5	0.976	<b>-13.53%</b>
Jul-08	61	0.17	487	0.980	<b>-11.39%</b>
Sep-08	62	0.17	485.75	1.003	<b>1.78%</b>
Dec-08	91	0.25	485.75	1.000	<b>0.00%</b>
Mar-09	90	0.25	491.75	0.988	-4.78%
May-09	61	0.17	495	0.993	-4.12%
Jul-09	61	0.17	499	0.992	-4.69%
Dec-09	153	0.42	479.25	1.041	10.06%
Mar-10	90	0.25	484.5	0.989	-4.39%
Jul-10	122	0.33	490	0.989	-3.26%
Dec-10	153	0.42	475	1.032	7.80%

At the London Metal Exchange margins have to be carried until the expiration of a futures contract even if the position is closed out before expiration, i.e. margins would accumulate over time if the index switched between different expirations. Therefore, for the LME contracts (Nickel, Zinc and Aluminium), the index does not switch between different expirations and the Selected Expiration is equal to the Nearby Contract as defined in Section 5.3.1.

#### 5.4.1 CYD LongShort Commodity Index

The CYD LongShort Commodity Index holds a long position in all Commodity Contracts which exhibit a positive Annualised Roll Return for *at least one* of the Investable Contract Expirations. For these commodities the Selected Contract Expiration is the expiration with the maximum Annualised Roll Return. If there is more than one Investable Contract Expiration with a maximum Annualised Roll Return, the Selected Contract Expiration is determined as the expiration with the maximum Annualised Roll Return and the nearest expiration.

For commodities which exhibit a negative Annualised Roll Return for *all* Investable Contract Expirations, the CYD LongShort Commodity Index enters a short position. Then, the Selected Contract Expiration for the CYD LongShort Commodity Index is the expiration with the minimum Annualised Roll Return. If there is more than one Investable Contract Expiration with a minimum Annualised Roll Return, the Selected Contract Expiration is determined as the expiration with the minimum Annualised Roll Return and the nearest expiration.

Rule to determine the Futures Position and Selected Contract Expiration of CYD LongShort Commodity Index based on the Annualised Roll Returns for the Investable Contract Expirations,  $Rroll^{Exp_j}$ :

$$\max_j (Rroll_{i,t=rd1-1}^{Exp_j}) \begin{cases} \geq 0 \Rightarrow Select = \operatorname{argmax}_j (Rroll_{i,t=rd1-1}^{Exp_j}), LongPositioninExp_{i,Select} \\ < 0 \Rightarrow Select = \operatorname{argmin}_j (Rroll_{i,t=rd1-1}^{Exp_j}), ShortPositioninExp_{i,Select} \end{cases}$$

Based on this rule, in January 2008, the CYD LongShort Commodity Index holds a long position in the September 2008 contract for Corn. Even if the negative Roll Return for the May 2008 contract is larger in absolute terms than the positive Roll Return for the September 2008 contract (-13.53% vs. 1.78%), the CYD LongShort Commodity Index opens a long position in the September 2008 contract ("long bias" of the index).

If there is no Investable Contract Expiration for a commodity, the CYD LongShort Commodity Index makes no investment in this Commodity Contract for the current month.

#### 5.4.2 CYD LongOnly Commodity Index

The CYD LongOnly Commodity Index invests only in Commodity Contracts in backwardation, i.e. commodities which exhibit a positive Annualised Roll Return for one of the Investable Contract Expirations. Commodity Contracts which exhibit a negative Annualised Roll Return for all Investable Contract Expirations are not included in the Index. The Selected Contract Expiration for the CYD LongOnly Commodity Index is the expiration with the maximum Annualised Roll Return. If there is more than one Investable Contract Expiration with the maximum Annualised Roll Return, the Selected Contract Expiration is determined as the expiration with the maximum Annualised Roll Return and the nearest expiration.

Rule to determine the Futures Position and Selected Expiration of the CYD LongOnly Commodity Index based on the Annualised Roll Returns for the Investable Contract Expirations,  $Rroll^{Exp_j}$ :

$$\max_j (Rroll_{i,t=rd1-1}^{Exp_j}) \begin{cases} \geq 0 \Rightarrow & \text{Select} = \operatorname{argmax}_j (Rroll_{i,t=rd1-1}^{Exp_j}), \text{LongPositioninExp}_{i,\text{Select}} \\ < 0 \Rightarrow & \text{no investment} \end{cases}$$

Based on this rule, in January 2008, the CYD LongOnly Commodity Index holds a long position in the September 2008 contract for Corn. The CYD LongOnly Commodity Index has a “long bias”, i.e. it opens a long position in the September 2008 expiration even if the negative Roll Return for the May 2008 contract is larger in absolute terms than the positive Roll Return for the September 2008 contract (-13.53% vs. 1.78%).

If there is no Investable Contract Expiration for a commodity, or if all Investable Contract Expirations exhibit a negative Roll Return, the CYD LongOnly Commodity Index makes no investment in this Commodity Contract for the current month.

### 5.4.3 CYD MarketNeutral Plus and Plus 5 Commodity Index

The CYD MarketNeutral Plus Commodity Index and the CYD MarketNeutral Plus 5 Commodity Index only differ in their Leverage Factor: While the CYD MarketNeutral Plus Commodity Index is 2 times leveraged, the CYD MarketNeutral Plus 5 Commodity Index is 5 times leveraged. Both indices enter a simultaneous long and short position in the commodities which are listed in Section 5.2.4. They enter a long position in the 2<sup>nd</sup> and/or 3<sup>rd</sup> Nearby Contract and a short position in the Nearby Contract.

If the Nearby Contract, the 2<sup>nd</sup> Nearby Contract and the 3<sup>rd</sup> Nearby Contract are an Investable Expiration, i.e. they meet the Minimum Liquidity Requirement, then for each dollar invested the CYD MarketNeutral Plus (5) Commodity Index, the index invests one (2.5) dollar(s) in the short position in the Nearby Contract and 0.5 (1.25) dollar(s) in long positions in the 2<sup>nd</sup> and 3<sup>rd</sup> Nearby Contracts respectively. Please note that the CYD MarketNeutral Plus Commodity Index is 2 times leveraged, i.e. for every dollar invested the index holds futures positions with a notional of 2 dollars, and the CYD MarketNeutral Plus 5 Commodity Index is 5 times leveraged, i.e. for every dollar invested the index holds futures positions with a notional of 5 dollars

If only the Nearby and 2<sup>nd</sup> Nearby Contract Expiration are Investable Expirations, for every dollar invested, the MarketNeutral Plus (5) Commodity Index invests one (2.5) dollar(s) in the short futures position of the Nearby Contract and one (2.5) dollar(s) in a long position in the 2<sup>nd</sup> Nearby Contract. Again, for every dollar invested, the CYD Market Neutral Plus Commodity Index holds futures positions with a notional of 2 dollars and the CYD Market Neutral Plus 5 Commodity Index holds futures positions with a notional of 5 dollars.

If only the Nearby and 3<sup>rd</sup> Nearby Contract Expiration are Investable Expirations, for every dollar invested, the MarketNeutral Plus (5) Commodity Index invests one (2.5) dollar(s) in the short futures position of the Nearby Contract and one (2.5) dollar(s) in a long position in the 3<sup>rd</sup> Nearby Contract. Again, for every dollar invested, the CYD Market Neutral Plus Index holds futures positions with a notional of 2 dollars and the CYD Market Neutral Plus 5 Index holds futures positions with a notional of 5 dollars.

If either the Nearby Contract Expiration or both, the 3<sup>rd</sup> Nearby and 2<sup>nd</sup> Nearby Contract Expiration are not an Investable Expiration, i.e. they do not meet the Minimum Liquidity Requirement in a particular month, then the MarketNeutral Plus (5) Commodity Index is not invested in this Commodity Contract and its indicative weight is allocated to the remaining Commodity Contracts (see Section 5.2.4).

Based on this rule, for Corn in June 2006 (weight 5.0%), the CYD MarketNeutral Plus Commodity Index would allocate  $\frac{1}{2}$  of its Corn exposure to a short position in the March 2008 (2.5%) contract and  $\frac{1}{4}$  of its Corn exposure to a long position in the May 2008 (1.25%) and July 2008 (1.25%) contracts respectively.

## 6 Excess Return Index Calculation

### 6.1 General Calculation

The CYD Excess Return Indices are calculated on a daily basis based on the futures Settlement Prices published by the Recognised Exchanges. The indices are indexed to a normalized value of 100 on December 31, 1979. At later dates (with the exception of the five Roll Days), the value of the Excess Return Indices is equal to the sum of the Single Commodity Values for each commodity  $i$ ,  $V_i$ , plus a cash position in months when the index is not fully invested in commodities:

$$V_{Index,t} = \sum_i V_{i,t} + \text{cash} \quad , i = 1 \dots \text{number of commodities included in index}, t = \text{time index}$$

The Single Commodity Values,  $V_i$ , are the building blocks of the CYD Excess Return Indices. They represent the USD value of the different Futures Positions in the index.

In the index calculation, all results of the different steps in the index calculation are rounded to fifteen decimal places of precision.

#### 6.1.1 Example Calculation for One Roll Day

For simplicity, in this section it is assumed that all index positions are rolled on a single Roll Day,  $t=rd$ , and the index is rebalanced on that day. Then, the Single Commodity Value for each futures position  $i$  is calculated as the dollar value of this position at time  $t$ :

$$V_{i,t} = \underbrace{w_i * V_{Index,t=rd}}_{\text{Exposure opened on previous Roll Day}} + \underbrace{\left( \frac{w_i * V_{Index,t=rd} * I_{Lev} * I_{i,L/S}}{C_i * P_{i,t=rd}^{ExpSelect}} \right) * C_i * (P_{i,t}^{ExpSelect} - P_{i,t=rd}^{ExpSelect})}_{\substack{Q_{i,t=rd} \\ \text{P\&L since previous Roll Day}}}$$

$V_{i,t}$ : Single Commodity Value of commodity position  $i$  on day  $t$

$w_i$ : Index weight of commodity position  $i$  (defined on previous Roll Day)

$V_{Index,t=rd}$ : Value of the Excess Return Index on previous Roll Day,  $t = rd$

$Q_{i,t=rd}$ : Contract Number for commodity position  $i$  (opened on previous Roll Day,  $t = rd$ )

$C_i$ : Commodity Constant of commodity position  $i$  (contract size \* price quote)

$P_{i,t}^{ExpSelect}$ : Reference Price of commodity position  $i$  on day  $t$  for the Selected Contract Expiration

$I_{Lev}$ : Leverage Factor of the index, 1 = no leverage, 2 = 2 – times leverage, 5 = 5 – times leverage

$I_{i,L/S}$ : Long/Short Indicator variable defined on Roll Day, 1 = long position, (-1) = short position

The first part of the above expression shows the USD index value which is reallocated to commodity position  $i$  on the Roll Day<sup>3</sup>. It equals the weight of the commodity position times the value of the Excess Return Index on the Roll Day,  $w_i * V_{Index,t=rd}$ .

Generally, the index weight of the commodity,  $w_i$ , equals one divided by the number of commodities which are included in the index over a specific month. For the CYD LongShort Commodity Index this number is typically 1 divided by the number of constituents of the CYD Commodity Index Universe. For the CYD LongOnly Commodity

<sup>3</sup> The CYD LongShort and CYD LongOnly Commodity Index enter one Futures Position per commodity and the CYD MarketNeutral Commodity Indices enter two or three Futures Positions per commodity.

Index the weight varies along with the number of index constituents and the application of the maximum weight rules. For the CYD MarketNeutral Commodity Index, weights are given in the Table in Section 5.2.4.

The second part of the above expression shows the profit and loss on the commodity position  $i$  since the last Roll Day. It equals the Contract Number entered on the last Roll Day,  $Q_i$ , times the Commodity Constant (contract size and price quote),  $C_i$ , times the price change since the last Roll Day. The Contract Number,  $Q_i$ , is derived from the index value allocated to the commodity position on the Roll Day,  $w_i * V_{Index,t=rd}$ , times the Leverage Factor,  $I_{Lev}$ , and the Long/Short Indicator divided by the futures Reference Price on the Roll Day and the Commodity Constant.

For example:

Assume that on Jan 8, 2008 (the Roll Day) the Excess Return Index Value,  $V_{Index,t=rd}$ , equals 1'000, and  $w_i=100\%$  of this value is invested in a 2-times leveraged long position in the Sep 2008 Corn future.

Expirations	01.08.08	01.09.08	01.10.08	01.11.08
Settlement Prices (Cents / Bushel)				
Mar-08	478.75	477.25	475	495
May-08	490	489	486.25	506.25
Jul-08	499.5	498.75	496	516
Sep-08	496.75	496	494	514

The Single Commodity Value for the 2-times leveraged long position in Corn for Jan. 8 to Jan. 11 2008 is calculated as follows:

$$V_{Index,01.08.08} = 1'000$$

$$w_{Corn} = 100\%$$

$$C_{Corn} = 5'000bushels * \frac{1USD}{100UScents} = 50$$

$$I_{Corn,\frac{L}{S}} = 1$$

$$I_{Lev} = 2$$

$$Exp_{Corn}^{Select} = Sep08$$

$$V_{Corn,01.08.08} = w_{Corn} * V_{Index,01.08.08} = 100\% * 1'000 = 1'000$$

$$Q_{Corn} = \frac{V_{Corn,01.08.08} * I_{Lev} * I_{Corn,L/S}}{C_{Corn} * P_{Corn,01.08.08}^{Sep08}} = \frac{1'000 * 2 * 1}{50 * 496.75} = 0.08052340$$

In this example, results are rounded to eight decimal places of precision.<sup>4</sup> The following days, the Single Commodity Value for Corn equals:

$$V_{Corn,01.09.08} = \underbrace{w_{Corn} * V_{Index,01.08.08}}_{\text{Exposure on 01.08.08}} + \underbrace{Q_{Corn} * C_{Corn} * (P_{Corn,01.09.08}^{Sep08} - P_{Corn,01.08.08}^{Sep08})}_{\text{P\&L 01.08.08 to 01.09.08}}$$

$$= 1'000 - 0.08052340 * 50 * (496 - 496.75)$$

$$= 1'000 - 3.0196275$$

<sup>4</sup> For the index calculation, the results of all steps in the calculation are rounded to ten decimal places of precision.

$$\begin{aligned}
V_{Corn,01.10.08} &= \underbrace{w_{Corn} * V_{Index,01.08.08}}_{\text{Exposure on 01.08.08}} + \underbrace{Q_{Corn} * C_{Corn} * (P_{Corn,01.10.08}^{Sep08} - P_{Corn,01.08.08}^{Sep08})}_{\text{P\&L 01.08.08 to 01.10.08}} \\
&= 1'000 + 0.08052340 * 50 * (494 - 496.75) \\
&= 1'000 - 11.07196750
\end{aligned}$$

$$\begin{aligned}
V_{Corn,01.11.08} &= \underbrace{w_{Corn} * V_{Index,01.08.08}}_{\text{Exposure on 01.08.08}} + \underbrace{Q_{Corn} * C_{Corn} * (P_{Corn,01.11.08}^{Sep08} - P_{Corn,01.08.08}^{Sep08})}_{\text{P\&L 01.08.08 to 01.11.08}} \\
&= 1'000 + 0.08052340 * 50 * (514 - 496.75) \\
&= 1'000 - 69.45143250
\end{aligned}$$

Please note that for an unleveraged long position,  $I_{L/S} = I_{Lev} = 1$ , the formula for the Single Commodity Value reduces to

$$\begin{aligned}
V_{i,t} &= w_i * V_{Index,t=rd} + \underbrace{\left( \frac{w_i * V_{Index,t=rd} * I_{Lev} * I_{i,L/S}}{C_i * P_{i,t=rd}^{ExpSelect}} \right)}_{Q_{i,t=rd}} * C_i * (P_{i,t}^{ExpSelect} - P_{i,t=rd}^{ExpSelect}) \\
&= w_i * V_{Index,t=rd} + \underbrace{\left( \frac{w_i * V_{Index,t=rd} * I_{Lev} * I_{i,L/S}}{C_i * P_{i,t=rd}^{ExpSelect}} \right)}_{Q_{i,t=rd}} * C_i * P_{i,t}^{ExpSelect} \\
&\quad - \underbrace{\left( \frac{w_i * V_{Index,t=rd} * I_{Lev} * I_{i,L/S}}{C_i * P_{i,t=rd}^{ExpSelect}} \right)}_{Q_{i,t=rd}} * C_i * P_{i,t=rd}^{ExpSelect} \\
&= Q_{i,t=rd} * C_i * P_{i,t}^{ExpSelect}
\end{aligned}$$

Only for this case, the commodity price on the Roll Day,  $P_{i,t=rd}$ , cancels out and the Single Commodity Value becomes independent from the price on the Roll Day. For any leveraged position and/or short position, the Single Commodity Value is a function of the price on the last Roll Day,  $P_{i,t=rd}$ .

## 6.1.2 Commodity Constant

The Commodity Constant is the factor for each commodity of the CYD Commodity Index Universe which is used to convert the Settlement Price of the commodity into the U.S. Dollar notional value of the Commodity Contract. It is equal to the Settlement Price as published in Thomson/Datastream - 1 for U.S. dollar quotes and 0.01 for U.S. cents quotes - times the contract size of the Commodity Contract. The Commodity Constant is included in the index calculation to reduce rounding effects caused by the differences of the price quotes and contract sizes of the various Commodity Contracts.

The table below shows the Commodity Constants for all commodities of the CYD Commodity Index Universe. The Commodity Constant only changes if the contract specification of the exchanges changes.

Commodity Contract	Ticker	Contract Size		Price Quote	Commodity Constant
<b>Grains</b>					
Corn	C	5'000	bushels	0.01	50
Soybean Meal	SM	100	tons	1.00	100
Soybean Oil	BO	60'00	pounds	0.01	600
Soybeans	S	5'000	bushels	0.01	50
Wheat	W	5'000	bushels	0.01	50
<b>Livestock and Meat</b>					
Feeder Cattle	FC	50'00	pounds	0.01	500
Live Cattle	LC	40'00	pounds	0.01	400
Lean Hogs	LH	40'00	pounds	0.01	400
<b>Exotics</b>					
Cocoa	CC	10	metric tons	1.00	10
Arabica Coffee	KC	37'50	pounds	0.01	375
Cotton No. 2	CT	50'00	pounds	0.01	500
Sugar No. 11	SB	112'0	pounds	0.01	1'120
Lumber	LB	10'00	Board feet	0.001	110
Orange Juice	JO	15'00	pounds	0.01	150
<b>Metals</b>					
Copper	HG	25'00	pounds	0.01	250
Nickel	LN	6	tons	1.00	6
Aluminium	LA	25	tons	1.00	25
Zinc	LX	25	tons	1.00	25
Palladium	PA	100	troy ounces	1.00	100
Platinum	PL	50	troy ounces	1.00	50
<b>Energy</b>					
Brent Crude Oil	CO	1'000	barrels	1.00	1'000
WTI Crude Oil	CL	1'000	barrels	1.00	1'000
Gas Oil	QS	100	tons	1.00	100
Heating Oil No. 2	HO	42'00	gallons	1.00	42'000
Gasoline	XB	42'00	gallons	1.00	42'000
Natural Gas	NG	10'00	mmBtu	1.00	10'000

### 6.1.3 Calculation during the Roll Period

The CYD Indices roll over a Roll Period of 5 days. During this time the indices gradually shift the index positions from the Old Index Positions,  $V^{Old}$  to the New Index Positions,  $V^{New}$ .

For the five Roll Days, the Excess Return Indices are calculated as:

$$V_{Index,t=rd1}^{New} = V_{Index,t=rd1}^{New} + 80\% * V_{Index,t=rd1}^{Old}$$

$$V_{Index,t=rd2}^{New} = V_{Index,t=rd2}^{New} + 60\% * V_{Index,t=rd2}^{Old}$$

$$V_{Index,t=rd3}^{New} = V_{Index,t=rd3}^{New} + 40\% * V_{Index,t=rd3}^{Old}$$

$$V_{Index,t=rd4}^{New} = V_{Index,t=rd4}^{New} + 20\% * V_{Index,t=rd4}^{Old}$$

$$V_{Index,t=rd5}^{New} = V_{Index,t=rd5}^{New}$$

$V^{Old}$  is the value of the Excess Return Index for the Old Index Positions to be closed in the Roll Period. It equals the sum of the Old Single Commodity Values for the Selected Contract Expirations in the previous Roll Period plus the cash position from the previous Roll Period.  $V^{New}$  is the value of the Excess Return Index for the New Index Positions. It is the sum of the New Single Commodity Values for the Selected Contract Expirations and positions plus any cash position for the current Roll Period.

$$V_{Index,t}^{Old} = \sum_i V_{i,t}^{Old} + cash^{Old}$$

$$V_{Index,t}^{New} = \sum_i V_{i,t}^{New} + cash^{New}$$

The Old Single Commodity Value for commodity position  $i$ ,  $V^{Old}$ , is always given by

$$V_{i,t}^{Old} = A_i^{Old} + B_i^{Old} * C_i * P_{i,t}^{Exp_{Select}^{Old}},$$

$A_i$  and  $B_i$  are constants which are adjusted on the Business Day after the last Roll Day (see Sections below). The calculation of the New Single Commodity Value for commodity  $i$  is different for the different Roll Days, Roll Day 1 to Roll Day 5.

#### Roll Day 1

On the first Roll Day,  $t=rd1$ , 20% of the Old Index Positions is reallocated to the New Index Positions, and the New Single Commodity Value for the New Index Position in commodity  $i$  is given by:

$$V_{i,t=rd1}^{New} = \frac{w_i * V_{Index,t=rd1}^{Old} * 20\%}{\text{Exposure on } t=rd1}$$

If the index is not fully invested the remaining proportion of the Excess Return Index is invested in cash:

$$cash_{t=rd1}^{New} = \left(1 - \sum_i w_i\right) * V_{Index,t=rd1}^{Old} * 20\%$$

**Roll Day 2**

On the second Roll Day, t=rd2, another 20% of the Old Index Positions is reallocated to the New Index Positions, and the New Single Commodity Value for the New Index Position i is given by:

$$V_{i,t=rd2}^{New} = \underbrace{w_i * V_{Index,t=rd1}^{Old} * 20\%}_{\text{Exposure on t=rd1}} + \left( \frac{w_i * V_{Index,t=rd1}^{Old} * 20\% * I_{Lev} * I_{i,\frac{L}{S}}^{New}}{C_i * P_{i,t=rd1}^{ExpNew}} \right) * C_i * \left( P_{i,t=rd2}^{ExpNew} - P_{i,t=rd1}^{ExpNew} \right) + \underbrace{w_i * V_{Index,t=rd2}^{Old} * 20\%}_{\text{Additional Exposure on t=rd2}}$$

Please note that  $w_i$  is constant during one Roll Period. It is the weight of commodity position i for the part of the Excess Return Index which is rebalanced. Because commodity prices are changing over the course of the 5 day Roll Period, however, the actual weight of commodity position i in the overall index will generally be different from  $w_i$  even after the rebalancing of the index on the last Roll Day.

The above expression can be rearranged as follows:

$$V_{i,t=rd2}^{New} = \underbrace{(V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old}) * w_i * 20\% * \left( 1 - I_{Lev} * I_{i,\frac{L}{S}}^{New} \right)}_{A_{i,t=rd2}^{New}} + \underbrace{\left( \frac{w_i * V_{Index,t=rd1}^{Old} * 20\% * I_{Lev} * I_{i,\frac{L}{S}}^{New}}{C_i * P_{i,t=rd1}^{ExpNew}} + \frac{w_i * V_{Index,t=rd2}^{Old} * 20\% * I_{Lev} * I_{i,\frac{L}{S}}^{New}}{C_i * P_{i,t=rd2}^{ExpNew}} \right)}_{B_{i,t=rd2}^{New}} * C_i * P_{i,t=rd2}^{ExpNew}$$

$$= A_{i,t=rd2}^{New} + B_{i,t=rd2}^{New} * C_i * P_{i,t=rd2}^{ExpNew}$$

The first component of this sum,  $A_i$ , is independent from the current Settlement Price of the New Index Position. It measures the value which has been reallocated to the new commodity position on the previous two Roll Days multiplied by a factor accounting for the leverage and long- or short position:

$$A_{i,t=rd2}^{New} = \underbrace{(V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old}) * w_i * 20\%}_{\text{Value allocated to commodity i}} * \underbrace{\left( 1 - I_{Lev} * I_{i,\frac{L}{S}}^{New} \right)}_{\text{Leverage and Long/Short Factor}}$$

The second component of this sum is time-varying with the Settlement Price,  $P_{i,t}$ , and equals the notional value of the cumulated futures position in commodity i.  $B_i$  equals the cumulative Contract Number opened during the first two Roll Days:

$$B_{i,t=rd2}^{New} = Q_{i,t=rd1} + Q_{i,t=rd2}$$

Any cash position – if the index is not fully invested in the current month – is given by:

$$cash_{t=rd2}^{New} = \left( 1 - \sum_i w_i \right) * (V_{i,t=rd1}^{Old} + V_{i,t=rd2}^{Old}) * 20\%$$

**Roll Day 3**

For the third Roll Day,  $t=rd3$ , the New Single Commodity Value for commodity position  $i$  is given by:

$$V_{i,t=rd3}^{New} = A_{i,t=rd3}^{New} + B_{i,t=rd3}^{New} * C_i * P_{i,t=rd3}^{ExpSelectNew}$$

$$A_{i,t=rd3}^{New} = (V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old} + V_{Index,t=rd3}^{Old}) * w_i * 20\% * \left(1 - I_{Lev} * I_{i,\frac{L}{S}}^{New}\right)$$

$$B_{i,t=rd3}^{New} = Q_{i,t=rd1} + Q_{i,t=rd2} + Q_{i,t=rd3}$$

$$cash_{t=rd3}^{New} = \left(1 - \sum_i w_i\right) * (V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old} + V_{Index,t=rd3}^{Old}) * 20\%$$

**Roll Day 4**

For the fourth Roll Day,  $t=rd4$ , the New Single Commodity Value for commodity position  $i$  is given by:

$$V_{i,t=rd4}^{New} = A_{i,t=rd4}^{New} + B_{i,t=rd4}^{New} * C_i * P_{i,t=rd4}^{ExpSelectNew}$$

$$A_{i,t=rd4}^{New} = (V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old} + V_{Index,t=rd3}^{Old} + V_{Index,t=rd4}^{Old}) * w_i * 20\% * \left(1 - I_{Lev} * I_{i,\frac{L}{S}}^{New}\right)$$

$$B_{i,t=rd4}^{New} = Q_{i,t=rd1} + Q_{i,t=rd2} + Q_{i,t=rd3} + Q_{i,t=rd4}$$

$$cash_{t=rd4}^{New} = \left(1 - \sum_i w_i\right) * (V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old} + V_{Index,t=rd3}^{Old} + V_{Index,t=rd4}^{Old}) * 20\%$$

**Roll Day 5**

For the fifth and last Roll Day,  $t=rd5$ , the New Single Commodity Value for commodity  $i$  is given by:

$$V_{i,t=rd5}^{New} = A_{i,t=rd5}^{New} + B_{i,t=rd5}^{New} * C_i * P_{i,t=rd5}^{ExpSelectNew}$$

$$A_{i,t=rd5}^{New} = (V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old} + V_{Index,t=rd3}^{Old} + V_{Index,t=rd4}^{Old} + V_{Index,t=rd5}^{Old}) * w_i * 20\% * \left(1 - I_{Lev} * I_{i,\frac{L}{S}}^{New}\right)$$

$$B_{i,t=rd5}^{New} = Q_{i,t=rd1} + Q_{i,t=rd2} + Q_{i,t=rd3} + Q_{i,t=rd4} + Q_{i,t=rd5}$$

$$cash_{t=rd5}^{New} = \left(1 - \sum_i w_i\right) * (V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old} + V_{Index,t=rd3}^{Old} + V_{Index,t=rd4}^{Old} + V_{Index,t=rd5}^{Old}) * 20\%$$

$Q$  is the Contract Number opened on each of the five Roll Days,  $rd=1,...5$ . It is given by

$$Q_{i,t=rd} = \frac{w_i * V_{Index,t=rd}^{Old} * 20\% * I_{Lev} * I_{i,\frac{L}{S}}^{New}}{C_i * P_{i,t=rd}^{ExpSelectNew}}$$

Because both the Old Index Value,  $V^{Old}$ , and the Settlement Price of the Selected Contract Expiration vary from one Roll Day to another, the Contract Number is also varying.

### 6.1.4 Calculation after the Roll Period

After the last Roll Day on  $t=rd5+1$ , the Selected Expiration for the New Index Position  $i$  becomes the Selected Expiration for the Old Index Position:

$$Exp_{Select}^{Old} = Exp_{Select}^{New}$$

Similarly,  $A^{Old}$ ,  $B^{Old}$  and  $cash^{Old}$  are set equal to  $A^{New}$ ,  $B^{New}$  and  $cash^{New}$ :

$$\begin{aligned} A_i^{Old} &= A_{i,t=rd5}^{New} \\ B_i^{Old} &= B_{i,t=rd5}^{New} \\ cash &= cash_{t=rd5}^{New} \end{aligned}$$

The Old Single Commodity Values are then calculated as follows:

$$V_{i,t}^{Old} = A_i^{Old} + B_i^{Old} * C_i * P_{i,t}^{Exp_{Select}^{Old}},$$

$A^{Old}$ ,  $B^{Old}$  and  $C_i$  are constant, only  $P_{i,t}$  changes on a daily basis.

All components of the New Single Commodity Values are set equal to zero until the next Roll Period:

$$\left. \begin{aligned} A_{i,t}^{New} &= 0 \\ B_i^{New} & \\ cash_{t=rd5}^{New} &= 0 \\ V_{i,t}^{New} &= 0 \end{aligned} \right\} \text{ for } t > t = rd5$$

The index value is given by

$$V_{Index,t} = \sum_i V_{i,t}^{Old} + cash^{Old}$$

### 6.1.5 Example Calculation for five Roll Days

The following table illustrates the calculation of the Excess Return Index for an index with a long position in Corn Sep 2008 which is shifted to a Short Position in Corn Mar 2008. The Leverage Factor is assumed to be 1, the Commodity Constant for Corn is 50 (see Section 6.1.2).

The first and second columns indicate the Business Day of the current calendar month and the date. Columns 3 to 10 show the calculation for the Old Single Commodity Value, columns 11 to 16 the calculation for the New Single Commodity Value, and columns 17 to 20 the calculation for the "index".

The first Roll Day is Jan. 8, 2008. Before that date, the "index" in this example only holds an unleveraged long position in the Sep 2008 expiration for Corn. For an unleveraged Long Position,  $A=0$  (see also Section 6.3 below).  $B$  in column 7 equals the Contract Number in the Old Index Position, and  $V$  in column 8 equals the value of this position ( $B \cdot P \cdot \text{CommodityConstant}$ ).

From Jan 8 to Jan 14, the long position is rolled into a short position in Mar 08 Corn. Columns 9 and 10 show the index percentage and index value of the Old Index Position which is rolled into the New Index Position. Columns 11 to 13 show the new Selected Contract Expiration for Corn, the Settlement Price of that expiration and the New Futures Position (a short position). Column 14 shows  $A_{\text{New}}$ .  $A_{\text{New}}$  for an unleveraged short position equals two times the cumulative value of the Old Index Position which has been rolled into the New Index Position

$$\begin{aligned} A_{\text{Corn},t=1.8.08}^{\text{New}} &= V_{\text{Index},t=1.8.08}^{\text{Old}} * w_{\text{Corn}} * 20\% * \left(1 - I_{\text{Lev}} * I_{\text{Corn},\frac{L}{S}}^{\text{New}}\right) \\ &= 104.74445563 * 100\% * 20\% * (1 - 1 * (-1)) \\ &= 104.74445563 * 20\% * 2 = 41.89778266 \end{aligned}$$

$B_{\text{New}}$  in column 15 equals the cumulative Contract Number needed for the New Index Position. On January 8, this value equals

$$\begin{aligned} B_{\text{Corn},t=1.8.08}^{\text{New}} &= Q_{\text{Corn},t=1.8.08}^{\text{New}} = \frac{V_{\text{Index},t=1.8.08}^{\text{Old}} * 20\% * w_{\text{Corn}} * I_{\text{Corn},\frac{L}{S}}^{\text{New}} * I_{\text{Lev}}}{C_{\text{Corn}} * P_{\text{Corn},t=1.8.08}^{\text{Mar08}}} \\ &= \frac{104.74445563 * 20\% * 100\% * (-1) * 1}{50 * 478.75} = -0.00087515 \end{aligned}$$

The overall value of the New Index Position in Corn,  $V_{\text{New}}$ , in column 16 is calculated as:

$$\begin{aligned} V_{\text{Corn},t=1.8.08}^{\text{New}} &= A_{\text{Corn},t=1.8.08}^{\text{New}} + B_{\text{Corn},t=1.8.08}^{\text{New}} * C_{\text{Corn}} * P_{\text{Corn},t=1.8.08}^{\text{Mar08}} \\ &= 41.89778266 - 0.0087515 * 50 * 478.75 = 20.94887954 \end{aligned}$$

Because Jan. 8 2008 is the first Roll Day, this value is equal to the value of the Old Index Position to be sold (see column 10), Small differences arise because of rounding differences.<sup>5</sup> (For simplicity, the table below only shows the first two or five decimal places). On the 2<sup>nd</sup> to the 5<sup>th</sup> Roll Day, however, the values in columns 10 and 16 will differ because the return on the New Index Position differs from the return on the Old Index Position.

<sup>5</sup> In this example, all results are rounded to 8 decimal places of precision.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BD	Date	Old Single Commodity Value								New Single Commodity Value						Index Value			
		Exp <sub>SelectOld</sub>	RP <sub>Exp</sub>	I <sub>L/SOld</sub>	A <sub>Old</sub>	B <sub>Old</sub>	V <sub>Old</sub>	Exp <sub>SelectNew</sub>	RP <sub>Exp</sub>	I <sub>L/SNew</sub>	A <sub>New</sub>	B <sub>New</sub>	V <sub>New</sub>	weighted V <sub>Old</sub>	V <sub>New</sub>	V <sub>Index</sub>			
0	1.1.08	Sep-08	474.25	1	0.00	0.00422	100.00									100%	100.00	0.00	100.00
1	1.2.08	Sep-08	479.75	1	0.00	0.00422	101.16									100%	101.16	0.00	101.16
2	1.3.08	Sep-08	484	1	0.00	0.00422	102.06									100%	102.06	0.00	102.06
3	1.4.08	Sep-08	486.25	1	0.00	0.00422	102.53									100%	102.53	0.00	102.53
4	1.7.08	Sep-08	485.75	1	0.00	0.00422	102.43									100%	102.43	0.00	102.43
5	1.8.08	Sep-08	496.75	1	0.00	0.00422	<b>104.74</b>	20%	20.95	<b>Mar-08</b>	<b>478.75</b>	<b>-1</b>	<b>41.90</b>	<b>-0.00088</b>	<b>20.95</b>	<b>80%</b>	<b>83.80</b>	<b>20.95</b>	<b>104.74</b>
6	1.9.08	Sep-08	496	1	0.00	0.00422	104.59	20%	20.92	Mar-08	477.25	-1	83.73	-0.00175	41.93	60%	62.75	41.93	104.68
7	1.10.08	Sep-08	494	1	0.00	0.00422	104.16	20%	20.83	Mar-08	475	-1	125.40	-0.00263	62.96	40%	41.67	62.96	104.63
8	1.11.08	Sep-08	514	1	0.00	0.00422	108.38	20%	21.68	Mar-08	495	-1	168.75	-0.00350	82.01	20%	21.68	82.01	103.69
9	1.14.08	Sep-08	531.25	1	0.00	0.00422	112.02	20%	22.40	<b>Mar-08</b>	<b>512</b>	<b>-1</b>	<b>213.56</b>	<b>-0.00438</b>	<b>101.43</b>	<b>0%</b>	<b>0.00</b>	<b>101.43</b>	<b>101.43</b>
<b>10</b>	<b>1.15.08</b>	<b>Mar-08</b>	<b>509</b>	<b>-1</b>	<b>213.56</b>	<b>-0.00438</b>	<b>102.09</b>									100%	102.09	0.00	<b>102.09</b>
11	1.16.08	Mar-08	502.5	-1	213.56	-0.00438	103.51									100%	103.51	0.00	103.51
12	1.17.08	Mar-08	502	-1	213.56	-0.00438	103.62									100%	103.62	0.00	103.62
13	1.18.08	Mar-08	498.25	-1	213.56	-0.00438	104.45									100%	104.45	0.00	104.45
13	1.21.08	Mar-08	498.25	-1	213.56	-0.00438	104.45									100%	104.45	0.00	104.45
14	1.22.08	Mar-08	489	-1	213.56	-0.00438	106.47									100%	106.47	0.00	106.47
15	1.23.08	Mar-08	469.25	-1	213.56	-0.00438	110.80									100%	110.80	0.00	110.80
16	1.24.08	Mar-08	489.25	-1	213.56	-0.00438	106.42									100%	106.42	0.00	106.42
17	1.25.08	Mar-08	498.25	-1	213.56	-0.00438	104.45									100%	104.45	0.00	104.45
18	1.28.08	Mar-08	502.25	-1	213.56	-0.00438	103.57									100%	103.57	0.00	103.57
19	1.29.08	Mar-08	501	-1	213.56	-0.00438	103.84									100%	103.84	0.00	103.84
20	1.30.08	Mar-08	498.5	-1	213.56	-0.00438	104.39									100%	104.39	0.00	104.39
21	1.31.08	Mar-08	501.25	-1	213.56	-0.00438	103.79									100%	103.79	0.00	103.79

BD= Business Day, Exp=Expiration, RP=Reference Price, IL/S=LongShort Indicator Variable, Commodity Constant Corn: 5000\*0.01=50; Leverage Factor Ilev=1

Columns 17 to 20, finally, show the calculation for the overall index where the Old Index Position and the New Index Position are added.

Column 17 shows the weight of the Old Index Position. Since 20% of the old positions are rolled into the new positions, the Old Index Position only enters the calculation with a weight of 80% (column 18):

$$V_{Corn,t=1.8.08}^{Old} * 80\% = 104.74445563 * 80\% = 83.79556530.$$

Column 19 repeats the overall value of the New Index Position from column 16, and column 20 shows the overall index value as the sum of the Old Index Positions and the New Index Positions:

$$\begin{aligned} V_{Index,t=1.8.08} &= V_{Corn,t=1.8.08}^{Old} * 80\% + V_{Corn,t=1.8.08}^{New} \\ &= 83.79556530 + 20.94887954 = 104.74444844 \end{aligned}$$

Because Jan. 8, 2008 is the first Roll Day, this value (column 20) is equal to column 8 apart from rounding differences. After that day, however, the new index value in column 20 differs from the old index value in column 8 because the return on the New Index Position differs from the return on the Old Index Position.

After the Roll Period on the tenth Business Day of the month, Jan. 15, 2008 (columns 1 and 2) until the next Roll Day, the Selected Expiration for the New Index Position becomes the Selected Expiration for the Old Index Position (column 3 on the tenth Business Day equals column 11 on the ninth Business Day), the New Index Position becomes the Old Index Position (columns 5 and 13),  $A_{New}$  becomes  $A_{Old}$  (columns 6 and 14) and  $B_{New}$  becomes  $B_{Old}$  (columns 7 and 15).

Then, all values for the New Index Position are set to zero (columns 11 to 16) until the next Roll Day, and the value of the overall index equals the sum of the Old Single Commodity Positions (only Corn in this example):

$$\begin{aligned} A_{Corn}^{Old} &= A_{Corn,t=rd5}^{New} = 213.55850162 \\ B_{Corn}^{Old} &= B_{Corn,t=rd5}^{New} = -0.00437986 \\ V_{Index,1.15.08} &= V_{Corn,1.15.08}^{Old} = A_{Corn}^{Old} + B_{Corn}^{Old} * C_{corn} * P_{Corn,1.15.08}^{Mar08} \\ &= 213.55850162 - 0.00437986 * 50 * 509 = 102.09106462 \end{aligned}$$

## 6.2 CYD LongShort Commodity Index

The CYD LongShort Commodity Index is an unleveraged index, i.e. the Leverage Factor  $I_{Lev}=1$ . The Selected Expirations and the Positions,  $I_{L/S}=1$  for a Long Position or  $I_{L/S}=-1$  for a Short Position, are determined on the first Roll Day based on the procedure explained in Section 5.4.1. The weights,  $w_i$ , are also determined on this day based on the number of futures contracts to be included in the index for the current month (see Section 5.2.2). The index calculation is then based on the rules of the previous two sections.

## 6.3 CYD LongOnly Commodity Index

The CYD LongOnly Commodity Index is an unleveraged index, i.e. the Leverage Factor  $I_{Lev}=1$ . The Selected Expirations are determined on the first Roll Day based on the procedure explained in Section 5.4.2. The index only enters long positions, i.e.  $I_{L/S}=1$  for all commodities. The weights,  $w_i$ , are also determined on the first Roll Day based on the number of futures contracts to be included in the index for the current month (see Section 5.2.3).

For the CYD LongOnly Commodity Index, the index calculation is simpler than the general calculation in sections 6.1.3 and 6.1.4 because leverage and short positions are not permitted. For unleveraged, long-only positions,

$$I_{Lev} = I_{L/S} = 1 \Rightarrow A = 0.$$

Therefore, "A" can be omitted from the index calculations. The index calculation on Roll Days is given by:

$$V_{Index,t=rd1} = \left( \sum_i V_{i,t=rd1}^{New} + cash_{t=rd1}^{New} \right) + 80\% * \left( \sum_i V_{i,t=rd1}^{Old} + cash^{Old} \right)$$

$$V_{Index,t=rd2} = \left( \sum_i V_{i,t=rd2}^{New} + cash_{t=rd2}^{New} \right) + 60\% * \left( \sum_i V_{i,t=rd2}^{Old} + cash^{Old} \right)$$

$$V_{Index,t=rd3} = \left( \sum_i V_{i,t=rd3}^{New} + cash_{t=rd3}^{New} \right) + 40\% * \left( \sum_i V_{i,t=rd3}^{Old} + cash^{Old} \right)$$

$$V_{Index,t=rd4} = \left( \sum_i V_{i,t=rd4}^{New} + cash_{t=rd4}^{New} \right) + 20\% * \left( \sum_i V_{i,t=rd4}^{Old} + cash^{Old} \right)$$

$$V_{Index,t=rd5} = \sum_i V_{i,t=rd5}^{New} + cash_{t=rd5}^{New}$$

$$V_{i,t=rd}^{Old} = B_i^{Old} * C_i * P_{i,t=rd}^{ExpSelect}^{Old}$$

$$V_{i,t=rd}^{New} = B_{i,t=rd}^{New} * C_i * P_{i,t=rd}^{ExpSelect}^{New}$$

$$B_{i,t=rd}^{New} = Q_{i,t=rd1} + \dots + Q_{i,t=rd}$$

$$Q_{i,t=rd} = \frac{w_i * V_{Index,t=rd}^{Old} * 20\%}{C_i * P_{i,t=rd}^{ExpSelect}^{New}}$$

$$Cash_{t=rd}^{New} = (1 - \sum_i w_i) * (V_{Index,t=rd1}^{Old} + \dots + V_{Index,t=rd}^{Old}) * 20\%$$

After the Roll Period the index is calculated as

$$Exp_{Select}^{Old} = Exp_{Select}^{New}$$

$$B_i^{Old} = B_{i,t=rd5}^{New}$$

$$V_{i,t}^{Old} = B_i^{Old} * C_i * P_{i,t}^{Exp_{Select}^{Old}}$$

$$cash^{Old} = cash_{t=rd5}^{New}$$

$$V_{Index,t} = \sum_i V_{i,t}^{Old} + cash^{Old}.$$

## 6.4 CYD MarketNeutral Plus and Plus 5 Commodity Index

The two CYD MarketNeutral Commodity Indices enter up to three positions per commodity in the Nearby, 2<sup>nd</sup> Nearby and/or 3<sup>rd</sup> Nearby Contract. The index weight per commodity  $i$ ,  $w_i$ , based on Section 5.2.4 is allocated to these positions and the index weight of each of these positions is given by

$$w_i * w_i^{Nearby}, w_i * w_i^{2ndNearby} \text{ and } w_i * w_i^{3rdNearby}$$

$w_{Nearby}$ ,  $w_{2ndNearby}$  and  $w_{3rdNearby}$  can assume values of 0.5, 0.25 or 0 depending on the rules outlined in Section 5.4.3. The weights of the three positions sum to 1:

$$w_i^{Nearby} + w_i^{2ndNearby} + w_i^{3rdNearby} = 1$$

The Long/Short Indicator Variable is (-1) for the Nearby Contract, and 1 for the 2<sup>nd</sup> Nearby and/or 3<sup>rd</sup> Nearby Contract or 0 for all contracts if the commodity does not meet the Minimum Liquidity Criterion). Because the index is market neutral per commodity the weighted Long/Short Indicator Variables sum to 0:

$$I_{L/S}^{Nearby} * w_i^{Nearby} + I_{L/S}^{2ndNearby} * w_i^{2ndNearby} + I_{L/S}^{3rdNearby} * w_i^{3rdNearby} = 0$$

If, for example, the CYD MarketNeutral Commodity Index holds a short position in the Nearby Contract of commodity  $i$  and a long position in the 2<sup>nd</sup> and 3<sup>rd</sup> Nearby Contracts, the equation equals:

$$(-1) * 0.5 + 1 * 0.25 + 1 * 0.25 = 0.$$

Because of this relation, the index calculation simplifies.  $A_{New}$  on Roll Day one is given by:

$$\begin{aligned} A_{i,t=rd1}^{New} &= V_{Index,t=rd1}^{Old} * w_i * \left( \underbrace{w_i^{Nearby} + w_i^{2ndNearby} + w_i^{3rdNearby}}_{=1} \right) * 20\% \\ &\quad - V_{Index,t=rd1}^{Old} * 20\% * I_{L/S} * w_i * \left( \underbrace{I_{L/S}^{Nearby} * w_i^{Nearby} + I_{L/S}^{2ndNearby} * w_i^{2ndNearby} + I_{L/S}^{3rdNearby} * w_i^{3rdNearby}}_{=0} \right) \\ &= V_{Index,t=rd1}^{Old} * w_i * 20\% \end{aligned}$$

The same applies to  $A$  on Roll Day two to five.

For the first Roll Day, the New Single Commodity Value for commodity  $i$  is given by:

$$V_{i,t=rd1}^{New} = V_{Index,t=rd1}^{Old} * w_i * 20\%$$

For the second Roll Day, the New Single Commodity Value for commodity i is given by:

$$V_{i,t=rd2}^{New} = (V_{Index,t=rd1}^{Old} + V_{Index,t=rd2}^{Old}) * w_i * 20\% + C_i * (B_{i,t=rd2}^{NewNearby} * P_{i,t=rd2}^{NewNearby} + B_{i,t=rd2}^{New2ndNearby} * P_{i,t=rd2}^{New2ndNearby} + B_{i,t=rd2}^{New3rdNearby} * P_{i,t=rd2}^{New3rdNearby})$$

$$B_{i,t=rd2}^{NearbyNew} = \frac{w_i * w_i^{Nearby} * V_{Index,t=rd1}^{Old} * 20\% * I_{Lev} * (-1)}{C_i * P_{i,t=rd1}^{NewNearby} \underbrace{Q_{i,t=rd1}^{Nearby}}_{Nearby}} + \frac{w_i * w_i^{Nearby} * V_{Index,t=rd2}^{Old} * 20\% * I_{Lev} * (-1)}{C_i * P_{i,t=rd2}^{NewNearby} \underbrace{Q_{i,t=rd2}^{Nearby}}_{Nearby}}$$

$$B_{i,t=rd2}^{2ndNearbyNew} = \frac{w_i * w_i^{2ndNearby} * V_{Index,t=rd1}^{Old} * 20\% * I_{Lev}}{C_i * P_{i,t=rd1}^{New2ndNearby} \underbrace{Q_{i,t=rd1}^{2ndNearby}}_{2ndNearby}} + \frac{w_i * w_i^{2ndNearby} * V_{Index,t=rd2}^{Old} * 20\% * I_{Lev}}{C_i * P_{i,t=rd2}^{New2ndNearby} \underbrace{Q_{i,t=rd2}^{2ndNearby}}_{2ndNearby}}$$

$$B_{i,t=rd2}^{3rdNearbyNew} = \frac{w_i * w_i^{3rdNearby} * V_{Index,t=rd1}^{Old} * 20\% * I_{Lev}}{C_i * P_{i,t=rd1}^{New3rdNearby} \underbrace{Q_{i,t=rd1}^{3rdNearby}}_{3rdNearby}} + \frac{w_i * w_i^{3rdNearby} * V_{Index,t=rd2}^{Old} * 20\% * I_{Lev}}{C_i * P_{i,t=rd2}^{New3rdNearby} \underbrace{Q_{i,t=rd2}^{3rdNearby}}_{3rdNearby}}$$

The New Single Commodity Values for the remaining Business Days are calculated accordingly. The Leverage Factor for the CYD MarketNeutral Plus Commodity Index is two,  $I_{Lev}=2$ , and for the CYD MarketNeutral Plus 5 Commodity Index five,  $I_{Lev}=5$ .

The index calculation on Roll Days is given by:

$$V_{Index,t=rd1} = \left( \sum_i V_{i,t=rd1}^{New} + cash_{t=rd1}^{New} \right) + 80\% * \left( \sum_i V_{i,t=rd1}^{Old} + cash^{Old} \right)$$

$$V_{Index,t=rd2} = \left( \sum_i V_{i,t=rd2}^{New} + cash_{t=rd2}^{New} \right) + 60\% * \left( \sum_i V_{i,t=rd2}^{Old} + cash^{Old} \right)$$

$$V_{Index,t=rd3} = \left( \sum_i V_{i,t=rd3}^{New} + cash_{t=rd3}^{New} \right) + 40\% * \left( \sum_i V_{i,t=rd3}^{Old} + cash^{Old} \right)$$

$$V_{Index,t=rd4} = \left( \sum_i V_{i,t=rd4}^{New} + cash_{t=rd4}^{New} \right) + 20\% * \left( \sum_i V_{i,t=rd4}^{Old} + cash^{Old} \right)$$

$$V_{Index,t=rd5} = \sum_i V_{i,t=rd5}^{New} + cash_{t=rd5}^{New}$$

$$V_{i,t=rd}^{Old} = A_{i,t=rd}^{Old} + C_i * \left( B_{i,t=rd}^{OldNearby} * P_{i,t=rd}^{Exp_{Select}^{OldNearby}} + B_{i,t=rd}^{Old2ndNearby} * P_{i,t=rd}^{Exp_{Select}^{Old,2ndNearby}} + B_{i,t=rd}^{Old3rdNearby} * P_{i,t=rd}^{Exp_{Select}^{Old,3rdNearby}} \right)$$

$$V_{i,t=rd}^{New} = A_{i,t=rd}^{New}$$

$$+ C_i * \left( B_{i,t=rd}^{NewNearby} * P_{i,t=rd}^{Exp_{Select}^{NewNearby}} + B_{i,t=rd}^{New2ndNearby} * P_{i,t=rd}^{Exp_{Select}^{New,2ndNearby}} + B_{i,t=rd}^{New3rdNearby} * P_{i,t=rd}^{Exp_{Select}^{New,3rdNearby}} \right)$$

$$B_{i,t=rd}^{NewNearby} = Q_{i,t=rd1}^{NewNearby} + \dots + Q_{i,t=rd}^{NewNearby}$$

$$Q_{i,t=rd}^{NewNearby} = (-1) * \frac{w_i * w_i^{Nearby} * I_{Lev} * V_{Index,t=rd}^{Old} * 20\%}{C_i * P_{i,t=rd}^{Exp_{Select}^{NewNearby}}}$$

$$B_{i,t=rd}^{New2ndNearby} = Q_{i,t=rd1}^{New2ndNearby} + \dots + Q_{i,t=rd}^{New2ndNearby}$$

$$Q_{i,t=rd}^{New2ndNearby} = \frac{w_i * w_i^{2ndNearby} * I_{Lev} * V_{Index,t=rd}^{Old} * 20\%}{C_i * P_{i,t=rd}^{Exp_{Select}^{New2ndNearby}}}$$

$$B_{i,t=rd}^{New3rdNearby} = Q_{i,t=rd1}^{New3rdNearby} + \dots + Q_{i,t=rd}^{New3rdNearby}$$

$$Q_{i,t=rd}^{New3rdNearby} = \frac{w_i * w_i^{3rdNearby} * I_{Lev} * V_{Index,t=rd}^{Old} * 20\%}{C_i * P_{i,t=rd}^{Exp_{Select}^{New3rdNearby}}}$$

$$cash_{t=rd}^{New} = \left( 1 - \sum_i w_i \right) * (V_{Index,t=rd1}^{Old} + \dots + V_{Index,t=rd}^{Old}) * 20\%$$

After the Roll Period the index is calculated as:

$$\begin{aligned} Exp_{Select}^{Old,Nearby} &= Exp_{Select}^{New,Nearby}, Exp_{Select}^{Old,2ndNearby} \\ &= Exp_{Select}^{New,2ndNearby}, Exp_{Select}^{Old,3rdNearby} \\ &= Exp_{Select}^{New,3rdNearby} \end{aligned}$$

$$B_i^{Old,Nearby} = B_{i,t=rd5}^{New,Nearby}, B_i^{Old,2ndNearby} = B_{i,t=rd5}^{New,2ndNearby}, B_i^{Old,3rdNearby} = B_{i,t=rd5}^{New,3rdNearby}$$

$$A_i^{Old} = A_{i,t=rd5}^{New}$$

$$V_{i,t}^{Old} = A_{i,t}^{Old} + C_i * \left( B_i^{Old,Nearby} * P_{i,t}^{Exp_{Select}^{Old,Nearby}} + B_i^{Old,2ndNearby} * P_{i,t}^{Exp_{Select}^{Old,2ndNearby}} + B_i^{Old,3rdNearby} * P_{i,t}^{Exp_{Select}^{Old,3rdNearby}} \right)$$

$$V_{Index,t} = \sum_i V_{i,t}^{Old} + cash^{Old}$$

.

## 6.5 Trading Halts during the Roll Period

If there is a trading halt for a Commodity Contract during the Roll Period, or if one of the Recognized Exchanges (other than the CME) on which the Commodity Contracts is traded is closed for trading, then the position of this commodity is rolled on the next Business Day of the Roll Period on which the exchange is open for trading.

If there is a trading halt for a commodity position to be opened, i.e. for one of the New Commodity Positions, then the Index amount which should be allocated to this commodity is redistributed to all other traded commodities during that day in proportion to their respective weights. If trading for the commodity is opened again during one of the following Roll Days, the target weight for this commodity is multiplied by the number of Roll Days on which the commodity was not traded and the target weights of all commodities are then rescaled to 100%. In the event a contract is locked on the last day of the roll, this position is rolled on the next available trading day with all the weights for other contracts rescaled to zero.

If there is a trading halt for a commodity position to be closed, i.e. for one of the Old Commodity Positions, only the Old Index Positions for all traded commodities are closed and reallocated to the New Index Positions. If trading for this commodity is started again within the Roll Period, then the accumulated position is closed and reallocated to the New Index Position. If trading is halted until the end of the Roll Period, then the position is closed as soon as trading begins and the amount is held in cash until the next Roll Period.

If there is a trading halt for only one expiration of a commodity (to be opened or to be closed), the rules above apply to all expirations of that commodity including the Old Positions to be closed and the New Positions to be opened. If, for example, there is a trading halt for the Nearby Contract to be closed out in Corn, then the Nearby, 2<sup>nd</sup> Nearby and 3<sup>rd</sup> Nearby Contracts are not closed out until trading is started for all expirations again.

## 7 Total Return Index Calculation

The CYD Total Return Indices are indexed to a normalized value of 100 on December 31, 1979. At later dates, the value of the CYD Total Return Indices on any Business Day is equal to the sum of a futures component,  $V^{Fut}$ , and an interest rate component,  $INT$ :

$$V_{Index,t}^{TR} = V_{Index,t}^{Fut} + INT_{Index,t}$$

The interest rate component is reallocated to the futures positions on the monthly basis at the close of the last Roll Day, the 9<sup>th</sup> Business Day of the month,  $t=rd5$ . Then, the futures component is given by

$$V_{Index,t=rd5}^{Fut} = V_{Index,t=rd5}^{TR}$$

where  $t=rd5$  is the last Roll Day of the Roll Period.

On any other time, the futures component is given by

$$V_{Index,t}^{Fut} = V_{Index,t=rd5}^{Fut} \left[ 1 + \frac{V_{Index,t} - V_{Index,t=rd5}}{V_{Index,t=rd5}} \right],$$

where  $t=rd5$  is the last Roll Day of the previous Roll Period and  $V_{Index}$  is the Value of the Excess Return Index.

On any day  $t$ , the interest rate component is calculated as

$$INT_{Index,t} = V_{Index,t=rd5}^{TR} * \left[ (1 + R_{t=rd5}^{Tbill})^{days} - 1 \right],$$

where  $t=rd5$  is the last Roll Day of the previous Roll Period and “days” is the number of calendar days from that day to the current day (which may be the last Roll Day of the next Roll Period).

Again, the results of the all calculations are rounded to fifteen decimal places of precision.

The Daily Treasury Bill Return,  $R^{Tbill}$ , is derived from the Treasury Bill Rate auction high rate on the most recent weekly auction date prior to the most recent Roll Day.

It is calculated based on a year of 360 days and a period of 91 days:

$$R_{t=rd}^{Tbill} = \left( \frac{1}{1 - \frac{91}{360} \cdot TbillRate_{t=rd}} \right)^{\frac{1}{91}} - 1.$$

## 8 Currency Hedged Indices

For all CYD Total Return Indices, CYD provides a Currency Hedged Index. The daily hedged Index is a fully replicable Index representing the returns that a non USD investor can achieve by hedging the currency exposure of the CYD Total Return Indices using a FX Forward Contract, which matures on the last business day of the month.

The following approach describes the daily hedged methodology of the Total Return Indices.

The Currency Hedged Index uses the FX Spot Rate and the 1 Day-, 1-week, 2-weeks, 3-weeks and 1-month FX Forward Rates published at the New York fixing. The Index will be hedged once a month on the Business Day on which the spot value day is the last Business Day of the current month (Hedge Day) using a FX Forward Contract with spot value day on the last Business Day of the next month.

The hedge will not be adjusted during the month; hence the profits and losses arising over the course of the month are not hedged. The Currency Hedged Index will be calculated and published every business day on which the underlying Index is calculated and published and FX Spot- and Forward Rates are available.

### 8.1 Calculation of the Forward Rates

The Forward Rates for the hedge are calculated as follows:

#### 1. Determine the Hedge Day

Find the Business Day of the month for which the spot value day is the last Business Day of the month. Example: In May 2009, the Hedge Day would be 27.05.2009 because on this day the spot value day is the last Business Day in May, 29.05.2009.

#### 2. Determine the Selected FX Forward Contract

The Selected FX Forward Contract is the 1-month Forward Contract on the Hedge Day. The value day used for this contract is the last Business Day of the coming month. I.e. on the Hedge Day in May 2009, the value day of the Selected FX Forward Contract is 30.06.2009

#### 3. Determine the Duration of the Selected FX Forward Contract

The Duration of the Selected FX Forward Contract is the difference between the value day of the Selected FX Forward Contract and the value day of the current spot rate. From the example above, the Duration of the one month Selected FX Forward Contract on the 08.06.2009, bought on the 27.05.2009, is then:

$$\begin{aligned} \text{Duration} &= \text{value day forward}_{\text{Select}} - \text{value day spot} = 20 \text{ days} \\ &= 30.06.2009 - 10.06.2009 = 20 \text{ days} \end{aligned}$$

#### 4. Calculate the FX Forward Rate

Forward rates are only published for selected (“tenor”) durations (1-day, 1-week, 2-weeks, 3-weeks and 1-month). For a daily valuation, the forward rates between these durations must be calculated by linear interpolation. The CYD Currency Hedged Index uses a linear interpolation between the tenors with exact value days and is calculated as follows:

Select the two **published** FX Forward or FX Spot Rates with a longer and shorter duration than the Selected Forward Rate, so that the duration of the Selected Forward Rate lies between the two published FX Forward Rates.

$$DFFR_{short_t} \leq DFFR_{Select_t} \geq DFFR_{long_t}$$

Where:

- $SFFR_{Select}$  is the duration of the Selected Forward Rate
- $SFFR_{short}$  is the duration of the published forward rate with a shorter duration
- $SFFR_{long}$  is the duration of the published forward rate with a longer duration

From the example above, on 08.06.2009 the following forward rates are published:

Published Forward Rates on 08.06.2009	Spot Rate	2-weeks Rate	3 weeks Rate
Value day	10.06.2009	24.06.2009	01.07.2009
Duration in days	0	14	21
Rate	1.3900	1.3898	1.3897

On 08.06.2009, the value day of the Selected Forward Rate – used for the hedge of the CYD TR Commodity Indices – is 30.6.2009. The two neighbouring published forward rates are the 3-week Rate (value day 01.07.2009, 21 days duration), and the 2-week Rate (value day 24.06.09, duration of 14 days).

The general formula for the Calculated Forward Rate is:

$$FFR_{Select_t} = FFR_{short_t} + \frac{(FFR_{long_t} - FFR_{short_t})}{(DFFR_{long_t} - DFFR_{short_t})} * (DFFR_{Select_t} - DFFR_{short_t})$$

Where:

- $FFR_{Select}$  is the calculated selected forward rate
- $FFR_{short}$  is the published forward rate with a shorter duration
- $FFR_{long}$  is the published forward rate with a longer duration

The interpolated value of the Selected Forward Rate from the example above is:

$$\begin{aligned}
 &= 1.3898 + \frac{(1.3897 - 1.3898)}{(21 - 14)} * (20 - 14) \\
 &= 1.38971
 \end{aligned}$$

## 8.2 Calculation of the Currency Hedged Index

The daily return of the CYD Currency Hedged Indices consists of the daily Unhedged Return of the underlying CYD Commodity Total Return Index, the interest rate difference between the hedged currency and the domestic currency (cost of forward rates) and the gain or loss on the spot exchange rate of the hedged amount. The last two components are the Hedge Return.

The cumulative Hedge Return since the last Hedged Day at time t is:

$$HR_t = \underbrace{\left( \frac{FXR_{t_0}}{FFR_{t_0}} \right)}_{\text{interest rate difference}} - \underbrace{\left( \frac{FXR_{t_0}}{FFR_t} \right)}_{\text{profit or loss by market to market close}}$$

Where:

- $FXR_{t_0}$  is the Spot FX Rate at the close of the Hedge Day
- $FFR_{t_0}$  is the selected FX Forward Rate at the close of the Hedge Day
- $FFR_t$  is the Calculated Forward Rate at time t

The exchange rates are denominated in currency/USD.

The cumulative Unhedged Return of the underlying CYD Commodity Index at time t is:

$$IR_t = \underbrace{\left( \frac{\frac{VTR_{Index,t}}{FXR_t}}{\frac{VTR_{Index,t_0}}{FXR_{t_0}}} \right)}_{\text{unhedged return in domestic currency}} - 1$$

The return of the Currency Hedged Index at time t is the sum of the Unhedged Return of the underlying CYD Commodity Index in the domestic currency (IR) and the Hedge Return (HR).

$$HIR_t = IR_t + HR_t$$

The Currency Hedged Index value at time t is:

$$Hedged\ Index_t = Hedged\ Index_{t_0} * (1 + HIR_t)$$

### Calculation Example

The following example shows the calculation of the Currency Hedged Index for the CYD LongOnly Total Return Index on 08.06.2009. The previous Hedge Day was 27.05.09 (see example above), i.e. selected  $t_0$  equals 27.05.2009. The observation date t equals 08.06.2009.

The calculation is based on the following parameters:

$$FXR_{t_0} = 1.3922 \text{ EUR/USD}$$

$$FFR_{t_0} = 1.3918 \text{ EUR/USD}$$

$$FXR_t = 1.3900 \text{ EUR/USD}$$

$$FFR_t = 1.38971 \text{ EUR/USD}$$

$$V_{Index,t_0}^{TR} = 3395.64 \text{ USD}$$

$$V_{Index,t}^{TR} = 3471.22 \text{ USD}$$

The cumulative Hedge Return ( $HR_t$ ) is:

$$HR_t = \left( \frac{1.3922 \text{ EUR/USD}}{1.3918 \text{ EUR/USD}} \right) - \left( \frac{1.3922 \text{ EUR/USD}}{1.38971 \text{ EUR/USD}} \right)$$

$$HR_t = -0.150\%$$

The cumulative Unhedged Index Return in domestic currency (EUR) is:

$$IR_t = \left( \frac{\frac{3471.22 \text{ USD}}{1.3900 \text{ EUR/USD}}}{\frac{3395.64 \text{ USD}}{1.3922 \text{ EUR/USD}}} \right) - 1$$

$$IR_t = \left( \frac{2497.281 \text{ EUR}}{2439.046 \text{ EUR}} \right) - 1$$

$$IR = 2.388\%$$

The cumulative Hedged Index Return in domestic currency (EUR) is:

$$HIR_t = 2.388\% - 0.150\%$$

$$HIR_t = 2.2375\%$$

Supposed that the value of the CYD LongOnly Euro Hedged Index was 418.2316 on the 27.05.2009 (Hedge Day), the CYD LongOnly Euro Hedged Index will be calculated on the 08.06.2009<sup>6</sup>:

$$\text{Hedged Index}_t = 418.2316 \text{ EUR} * (1 + 2.2375\%)$$

$$\text{Hedged Index}_t = 427.589$$

<sup>6</sup> A small difference in the results arises from rounding.