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DBIQ Index Guide

DBLCI Commodity Indices

Primer

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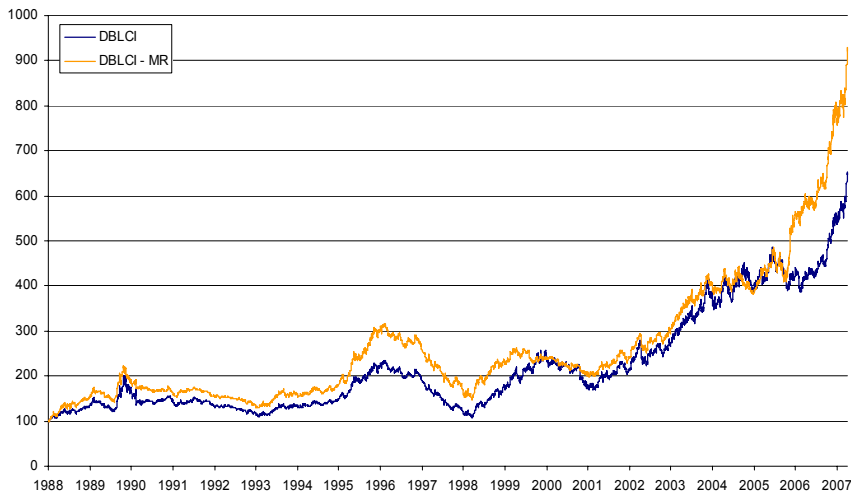
Deutsche Bank Liquid Commodities Indices (DBLCI) includes the benchmark DBLCI, systematic strategy DBLCI-MR and single commodity indices.

The DBLCI index tracks the performance of six commodity futures: Sweet Light Crude Oil (WTI), Heating Oil, Aluminium, Gold, Wheat and Corn.

All DBLCI indices are available in USD and hedged/un-hedged in EUR, JPY and GBP.

DBLCI MR index invests in the same six commodities as the DBLCI. The weights of the commodities in the DBLCI MR index are systematically adjusted depending on the relative richness or cheapness of the commodity.

Figure 1: DBLCI and DBLCI MR Excess Return Index Levels



Source: Deutsche Bank

Deutsche Bank AG/London

All prices are those current at the end of the previous trading session unless otherwise indicated. Prices are sourced from local exchanges via Reuters, Bloomberg and other vendors. Data is sourced from Deutsche Bank and subject companies.

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DISCLOSURES AND ANALYST CERTIFICATIONS ARE LOCATED IN APPENDIX 1

DBLCI Commodity Indices

Introduction

The Deutsche Bank suite of commodities indices includes the Deutsche Bank Liquid Commodities (DBLCI) benchmark index, the DBLCI MR Strategy index and individual DBLCI commodity indices. Both excess return (unfunded) and total return (funded) index levels based in USD are available. Further to this, hedged and un-hedged levels are available in EUR, GBP and JPY.

The DBLCI index tracks the performance of six commodity futures: Sweet Light Crude Oil (WTI), Heating Oil, Aluminium, Gold, Wheat and Corn. These cover the biggest commodity sectors and are held in fixed notional amounts which reflect world production and inventories in these sectors.

The DBLCI MR index invests in the same six commodities as the DBLCI. The weights of the commodities in the DBLCI MR index are systematically adjusted depending on the relative richness or cheapness of each commodity. The commodity weight is linked to the ratio between a one-year and five-year moving average price. Relatively expensive commodities have lower weights; conversely, relatively cheap commodities have higher weights.

DBLCI and DBLCI MR indices excluding Gold are also available. These follow a similar methodology to the standard indices except they do not include the Gold contract.

The six DBLCI individual commodity indices track the performance of the single commodities. The rules and procedures for these indices are the same as with the DBLCI except all the index holding is in a single commodity.

The commodity futures used in the indices are traded on some of the largest and most transparent exchanges in the world. The maturity of each instrument and the roll frequency have been chosen to enhance the returns of the index and to track the underlying cash commodities as closely as possible. Sweet Light Crude Oil (WTI) and Heating Oil are rolled on a monthly basis. Aluminium, Gold, Wheat and Corn are rolled on an annual basis over the same period as the annual rebalancing.

In the annual rebalancing all commodities have their future contracts rolled. For the DBLCI index the commodity weights are also reset to their rebalancing weights. Throughout the rest of the year the commodity weights for the DBLCI fluctuate as prices move. Since November 2004 the annual rebalancing occurs between the 2nd and 6th index business day of November. Prior to November 2004 the annual rebalancing occurred between the 2nd and 6th index business day of December. The DBLCI rebalancing weights are defined in Figure 2. These weights are used as reference rates for the DBLCI MR index. The Ex Gold indices' commodity weights are increased proportionally from the standard index weights.

Figure 2: DBLCI Commodity Membership List

Commodity	Symbol	Exchange	Rebalancing Weights	
			Standard	Ex Gold
Energy				
Sweet Light Crude Oil (WTI)	CL	NYMEX	35.00%	38.89%
Heating Oil	HO	NYMEX	20.00%	22.22%
Precious Metals				
Gold	GC	COMEX	10.00%	0.00%
Base Metals				
Aluminium	MAL	LME	12.50%	13.89%
Grains/Softs				
Corn	C	CBOT	11.25%	12.50%
Wheat	W	CBOT	11.25%	12.50%

Source: Deutsche Bank

The index is calculated on each index business day using the exchange closing prices. Index business days are weekdays when banks in NYC are open. If it is an exchange holiday but an index business day, the exchange close price from the previous index business day is used.

Historical Analysis

Historic daily index levels are available from 01-Dec-1988. From March 2003, closing price data for the underlying commodities have been captured from the exchanges. Prior to March 2003, the sources LIM, Bloomberg, and Reuters were used to obtain the closing price data. The index calculation methodology and commodity future selection are the same prior to and following March 2003.

Figure 3: DBLCI Excess Return Index Statistics

	Historical Return Summary			Monthly Return Analysis			Annualised Return Data			
	Annualised Return	Volatility	Sharpe Ratio	Avg. Monthly Return	No. +ve Months	% of +ve Months	15 Years	10 Years	5 Years	3 Years
DBLCI	10.13%	18.91%	0.54	0.96%	123	53.2%	11.00%	14.59%	18.84%	17.86%
DBLCI - MR	12.23%	16.38%	0.75	1.09%	121	52.4%	12.59%	15.03%	26.02%	30.02%
DBLCI Ex gold	10.82%	20.49%	0.53	1.04%	124	53.7%	11.35%	14.75%	18.76%	17.09%
DBLCI - MR Ex Gold	12.39%	17.80%	0.70	1.13%	125	54.1%	12.55%	14.52%	25.73%	29.34%
DBLCI CL	15.07%	31.26%	0.48	1.60%	134	58.0%	13.54%	18.86%	17.11%	6.94%
DBLCI HO	10.04%	31.16%	0.32	1.22%	128	55.4%	9.12%	15.83%	13.96%	7.58%
DBLCI MAL	-0.91%	17.35%	-0.05	0.06%	101	43.7%	4.92%	7.59%	20.45%	23.11%
DBLCI GC	0.13%	13.24%	0.01	0.09%	104	45.0%	3.64%	8.55%	18.27%	23.88%
DBLCI C	-3.79%	19.01%	-0.20	-0.15%	116	50.2%	-2.21%	-5.42%	6.35%	17.70%
DBLCI W	3.21%	20.85%	0.15	0.46%	122	52.8%	4.47%	2.84%	23.21%	40.59%

Source: Deutsche Bank, Returns between Index Dec 1988 and 29-Feb-2008. This data does not include transaction costs.

Index Calculation and Rules

Index Calculation

The excess return is equal to the percentage change of the underlying commodity futures market values. On a normal index calculation day there will be six commodity futures contracts in the DBLCI and DBLCI MR indices. During the annual rebalancing period both the old and new contracts are present for each commodity, resulting in twelve commodity futures contracts in the index. During the monthly roll periods of Sweet Light Crude Oil and Heating Oil, both new and old commodity contracts are present for these commodities. This results in eight commodity contracts being present in the DBLCI and DBLCI MR indices. The DBLCI single commodity indices have two contracts throughout roll periods and one contract on other days.

The excess return index level in USD is expressed as

$$ILer(t) = \frac{\sum_i PC(t,i) * N(t-1,i)}{\sum_i PC(t-1,i) * N(t-1,i)} * ILer(t-1)$$

Where:

ILer(t)	= Excess Return Index level on day t
ILer(t-1)	= Excess Return Index level on index calculation day t-1
PC(t,i)	= Close price of commodity future i on day t
PC(t-1,i)	= Close price of commodity future i on index calculation day t-1
N(t-1,i)	= Notional holding of commodity future i on index calculation day t-1

The total return index level in USD is expressed as

$$ILtr(t) = \left(\frac{ILer(t)}{ILer(t-1)} + Rt(t) \right) * (1 + Rt(t))^{d(t,t-1)} * ILtr(t-1)$$

$$Rt(t) = \left(1 - \frac{91}{360} y(t-1) \right)^{-\left(\frac{1}{91}\right)} - 1$$

Where:

ILtr(t)	= Total Return Index level on day t
ILtr(t-1)	= Total Return Index level on index calculation day t-1
Rt(t)	= T-bill return on day t
d(t,t-1)	= Number of calendar days between day t and index calculation day t-1 excluding day t
y(t-1)	= 3-month benchmark T-bill yield on index calculation day t-1

Hedged and Un-Hedged Index Levels

The total return hedged and un-hedged index levels are calculated based on WM FX data. The hedged and un-hedged indices are calculated on a month-to-date basis.

The return from the FX hedge is accrued over the month on an ACT/ACT basis. The hedged index is expressed as

$$ILh(t) = [1 + RetIL(t) + RetIL(t) * FXr(t) + FXhr(t)] * ILh(r)$$

The un-hedged index is expressed as

$$ILuh(t) = (1 + RetIL(t)) * (1 + FXr(t)) * ILuh(r)$$

Where:

ILh(t)	= Hedged total return index level on day t
ILh(r)	= Hedged total return index level on last calendar day of last month r
ILuh(t)	= Un-hedged total return index level on day t
ILuh(r)	= Un-hedged total return index level on last calendar day of last month r

$$RetIL(t) = \frac{ILl(t)}{ILl(r)} - 1$$

ILl(t)	= Local total return index level on day t
ILl(r)	= Local total return index level on last calendar day of last month r

$$FXr(t) = \frac{FX(t)}{FX(r)} - 1$$

FX(t) = FX rate on day t quoted Index Currency: Hedge Currency
 FX(r) = FX rate on last calendar day of last month r quoted Index Currency:
 Hedge Currency

$$FXhr(t) = \left(\frac{FXh(r)}{FX(r)} - 1 \right) * \frac{dy(t)}{TD}$$

FXh(r) = One-month FX forward rate on last calendar day of last month r quoted
 Index Currency: Hedge Currency

dy(t) = Number of calendar days between t and last calendar day of last month r
 TD = Number of calendar days in month

Excess return hedged index levels are calculated based on WM FX data. The excess return hedged index levels represent the returns of the USD excess returns converted into the target currency. Excess return un-hedged index levels are not calculated. The indices are calculated on a month-to-date basis. For all indices except DBLCI ER EUR Hedged prior to 11-Feb-2008 the excess return hedged levels were calculated using the same methodology as the total return indices. For DBLCI ER EUR Hedged prior to 01-Mar-2008 the excess return hedged levels were calculated using the same methodology as the total return indices.

The hedged index is expressed as

$$ILher(t) = (1 + RetIL(t) + RetILer(t) * FXr(t)) * ILher(r)$$

Where:

ILher(t) = Hedged excess return index level on day t
 ILher(r) = Hedged excess return index level on last calendar day of last month r

$$RetILer(t) = \frac{ILler(t)}{ILler(r)} - 1$$

ILler(t) = Local excess return index level on day t
 ILler(r) = Local excess return index level on last calendar day of last month r

$$FXr(t) = \frac{FX(t)}{FX(r)} - 1$$

FX(t) = FX rate on day t quoted Index Currency: Hedge Currency
 FX(r) = FX rate on last calendar day of last month r quoted Index Currency:
 Hedge Currency

DBLCI Benchmark Index Rebalancing and Rolls

Commodity future positions are adjusted during the annual index rebalancing period and the monthly index rolls. The rebalancing and rolls occur between the 2nd and 6th index business day of the month.

When neither an annual index rebalancing nor a monthly index roll is occurring, the notional holding of each commodity future remains constant.

$$N(t, i) = N(t - 1, i)$$

Annual Index Rebalancing Period

The annual index rebalancing takes place between the 2nd and 6th business day of the rebalancing month. From November 2004 the rebalancing month is November; prior to November 2004 it is December. The new Sweet Light Crude Oil (CL) and Heating Oil (HO) futures contracts are selected as the future contracts with an expiry month two months following the rebalancing month. The new Gold (GC), Aluminium (MAL), Corn (C) and Wheat (W) futures contracts are selected as the future contracts with an expiry in the December of the following year.

On each day during the rebalancing period the new notional holding of each commodity is calculated. The calculations for the old commodities that are leaving the index and the new commodities that are entering are different.

An equal amount of the notional holding of the old contract is sold each day over the five day roll period. The notional of the old commodities is expressed as:

$$N(t,i) = N(t-1,i) * \frac{6 - db(t)}{7 - db(t)}$$

The notional of the new commodities is expressed as:

$$N(t,j) = N(t-1,j) + \frac{MVo(t) * CW(j)}{PC(t,j) * (7 - db(t))}$$

$$MVo(t) = \sum_i PC(t,i) * N(t-1,i)$$

where

$N(t-1,i)$	= Notional holding of old commodity future i on index calculation day t-1
$N(t,i)$	= Notional holding of old commodity future i on index calculation day t
$N(t-1,j)$	= Notional holding of new commodity future j on index calculation day t-1
$N(t,j)$	= Notional holding of new commodity future j on index calculation day t
$db(t)$	= Number of index business days in the month up to and including day t
$MVo(t)$	= Total market value of all old commodities in index on day t
$CW(j)$	= Rebalancing weight for commodity j
$PC(t,i)$	= Close price of old commodity future i on day t
$PC(t,j)$	= Close price of new commodity future j on day t

Monthly Index Roll Period

On each month that is not an annual index rebalancing, the monthly index roll occurs. This takes place between the 2nd and 6th business day of the month. During the roll, the old commodity future contracts for Sweet Light Crude Oil and Heating Oil are substituted with new contracts. The new Sweet Light Crude Oil and Heating Oil contracts are selected as the contracts that expire in two months.

On each day during the roll period the new notional holdings of the Sweet Light Crude Oil and Heating Oil contracts are calculated. The calculations for the old commodities that are leaving the index and the new commodities that are entering are different.

The notional of the old commodities is expressed as:

$$N(t,i,c) = N(t-1,i,c) * \frac{6 - db(t)}{7 - db(t)}$$

The notional of the new commodities is expressed as:

$$N(t,j,c) = N(t-1,j,c) + \frac{PC(t,i,c) * N(t-1,i,c)}{PC(t,j,c) * (7 - db(t))}$$

where

$N(t-1,i,c)$	= Notional holding of old commodity future i of commodity type c on index calculation day t-1
$N(t,i,c)$	= Notional holding of old commodity future i of commodity type c on index calculation day t
$N(t-1,j,c)$	= Notional holding of new commodity future j of commodity type c on index calculation day t-1

$N(t,j,c)$	= Notional holding of new commodity future j of commodity type c on index calculation day t
$db(t)$	= Number of index business days in the month up to and including day t
$PC(t,i,c)$	= Close price of old commodity future i of commodity type c on day t
$PC(t,j,c)$	= Close price of new commodity future j of commodity type c on day t

For all other commodity future contracts the notional holding of the commodity future remains constant.

$$N(t,i) = N(t-1,i)$$

Initial Index Notional

The index inception date is 01-Dec-1988. On this date the initial commodity notionals were calculated using:

$$N(t,i) = \frac{100 * CW(i)}{PC(t,i)}$$

where

$N(t,i)$	= Notional holding of commodity future i on index calculation day t
$CW(i)$	= Rebalancing weight for commodity i
$PC(t,i)$	= Close price of commodity future i on day t

DBLCI MR Index Rebalancing and Rolls

The DBLCI MR index has a systematic weight strategy based on the commodities' moving averages. The systematic weight changes occur when a divergence tick for one of the commodities changes. As with the DBLCI benchmark index, commodity future positions are adjusted during the annual index rebalancing period and the monthly index rolls. The rebalancing and rolls occur between the 2nd and 6th index business day of the month. Systematic weight changes cannot occur during the rebalancing or roll periods.

When neither an annual index rebalancing nor a monthly index roll nor a systematic weight change is occurring, the notional holding of each commodity future remains constant.

$$N(t,i) = N(t-1,i)$$

Annual Index Rebalancing and Monthly Index Roll Periods

The commodity weights are maintained throughout the annual rebalancing and monthly roll periods. The calculation of the notional holding for each commodity contract is the same for the annual rebalancing and monthly roll.

The annual index rebalancing takes place between the 2nd and 6th business day of the rebalancing month. From November 2004 the rebalancing month is November; prior to November 2004 it is December. The new Sweet Light Crude Oil (CL) and Heating Oil (HO) futures contracts are selected as the future contracts with an expiry month two months following the rebalancing month. The new Gold (GC), Aluminium (MAL), Corn (C) and Wheat (W) futures contracts are selected as the future contracts with an expiry in the December of the following year.

On each month that is not an annual index rebalancing, the monthly index roll occurs. This takes place between the 2nd and 6th business day of the month. During the roll, the old commodity future contracts for Sweet Light Crude Oil and Heating Oil are substituted with new contracts. The new Sweet Light Crude Oil and Heating Oil contracts are selected as the contracts that expire in two months.

On each day during the rebalancing/roll period the new notional holding of each commodity that is being rebalanced/rolled is calculated. The calculations for the old commodities that are leaving the index and the new commodities that are entering are different.

The notional of the old commodities is expressed as:

$$N(t, i, c) = N(t-1, i, c) * \frac{6 - db(t)}{7 - db(t)}$$

The notional of the new commodities is expressed as:

$$N(t, j, c) = N(t-1, j, c) + \frac{PC(t, i, c) * N(t-1, i, c)}{PC(t, j, c) * (7 - db(t))}$$

where

$N(t-1, i, c)$	= Notional holding of old commodity future i of commodity type c on index calculation day t-1
$N(t, i, c)$	= Notional holding of old commodity future i of commodity type c on index calculation day t
$N(t-1, j, c)$	= Notional holding of new commodity future j of commodity type c on index calculation day t-1
$N(t, j, c)$	= Notional holding of new commodity future j of commodity type c on index calculation day t
$db(t)$	= Number of index business days in the month up to and including day t
$PC(t, i, c)$	= Close price of old commodity future i of commodity type c on day t
$PC(t, j, c)$	= Close price of new commodity future j of commodity type c on day t

During the monthly roll, for all other commodity future contracts apart from Sweet Light Crude Oil and Heating Oil the notional holding of the commodity future remains constant.

$$N(t, i) = N(t-1, i)$$

Systematic Weight Strategy

The systematic weight strategy is based on the commodity divergence ticks. The divergence tick is a measure of the ratio of the 5yr and 1yr commodity moving average. The divergence tick is expressed as:

$$dk(t, i) = trunc\left(\frac{MA1(t, i) / MA5(t, i) - 1}{f}\right)$$

where:

$dk(t, i)$	= Divergence tick of commodity i on day t
$MA1(t, i)$	= One-year moving average of commodity i on day t
$MA5(t, i)$	= Five-year moving average of commodity i on day t
f	= 0.05

The one-year moving average uses the new commodity price from the first business day in the rebalancing/roll month. Prior to December 1988 the one-year average was based off a DB approximation. This average was proportionally weighted in the moving average calculation until December 1989.

The five-year moving average uses the new commodity price from the first of either the day after the old contract's expiry or the first business day in the month following the rebalancing/roll. Prior to December 1988 the five-year average was based off a DB approximation. This average was proportionally weighted in the moving average calculation until December 1993.

When a divergence tick for a commodity changes between t-1 and t, the new target weight is calculated. The target weight is expressed as:

$$W(t, i) = \frac{CW(i) * e^{-dk(t, i) * k}}{\sum_j CW(j) * e^{-dk(t, j) * k}}$$

where:

$$\begin{aligned} W(t,i) &= \text{Target weight of commodity } i \text{ on day } t \\ k &= 0.3 \end{aligned}$$

The DBLCI MR commodities weights will rebalance on the next business day, provided this is not a rebalancing/roll date. The new notional is expressed as:

$$N(t+1,i) = \frac{100 * W(t,i)}{PC(t+1,i)}$$

Initial Index Notional

The index inception date is 01-Dec-1988. On this date the initial commodity notionals were calculated using:

$$N(t,i) = \frac{100 * CW(i)}{PC(t,i)}$$

where

$$\begin{aligned} N(t,i) &= \text{Notional holding of commodity future } i \text{ on index calculation day } t \\ CW(i) &= \text{Rebalancing weight for commodity } i \\ PC(t,i) &= \text{Close price of commodity future } i \text{ on day } t \end{aligned}$$

DBLCI Single Commodity Index Rebalancing and Rolls

As with the DBLCI benchmark index, commodity future positions are adjusted during the annual index rebalancing period. Monthly rolls only occur for the Sweet Light Crude Oil (CL) and Heating Oil (HO) indices. The rebalancing and rolls occur between the 2nd and 6th index business day of the month.

When neither an annual index rebalancing nor a monthly index roll nor a systematic weight change is occurring, the notional holding of each commodity future remains constant.

$$N(t,i) = N(t-1,i)$$

Annual Index Rebalancing and Monthly Index Roll Periods

The annual index rebalancing takes place between the 2nd and 6th business day of the rebalancing month. From November 2004 the rebalancing month is November; prior to November 2004 it is December. The new Sweet Light Crude Oil (CL) and Heating Oil (HO) futures contracts are selected as the future contracts with an expiry month two months following the rebalancing month. The new Gold (GC), Aluminium (MAL), Corn (C) and Wheat (W) futures contracts are selected as the future contracts with an expiry in the December of the following year.

On each month that is not an annual index rebalancing, the monthly index roll occurs for the Sweet Light Crude Oil (CL) and Heating Oil (HO) indices. This takes place between the 2nd and 6th business day of the month. During the roll, the old commodity future contracts for Sweet Light Crude Oil and Heating Oil are substituted with new contracts. The new Sweet

Light Crude Oil and Heating Oil contracts are selected as the contracts that expire in two months.

On each day during the rebalancing/roll period the new notional holding of each commodity that is being rebalanced/rolled is calculated. The calculations for the old commodities that are leaving the index and the new commodities that are entering are different.

The notional of the old commodities is expressed as:

$$N(t,i,c) = N(t-1,i,c) * \frac{6 - db(t)}{7 - db(t)}$$

The notional of the new commodities is expressed as:

$$N(t, j, c) = N(t-1, j, c) + \frac{PC(t, i, c) * N(t-1, i, c)}{PC(t, j, c) * (7 - db(t))}$$

where

$N(t-1, i, c)$	= Notional holding of old commodity future i of commodity type c on index calculation day t-1
$N(t, i, c)$	= Notional holding of old commodity future i of commodity type c on index calculation day t
$N(t-1, j, c)$	= Notional holding of new commodity future j of commodity type c on index calculation day t-1
$N(t, j, c)$	= Notional holding of new commodity future j of commodity type c on index calculation day t
$db(t)$	= Number of index business days in the month up to and including day t
$PC(t, i, c)$	= Close price of old commodity future i of commodity type c on day t
$PC(t, j, c)$	= Close price of new commodity future j of commodity type c on day t

Initial Index Notional

The index inception date is 01-Dec-1988. On this date the initial commodity notionals were calculated using:

$$N(t, i) = \frac{100}{PC(t, i)}$$

where

$N(t, i)$	= Notional holding of commodity future i on index calculation day t
$PC(t, i)$	= Close price of commodity future i on day t

Appendix 1

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