I. Commodity Markets – An Overview

II. Introduction to Commodity Futures

   – Case Study: Crude Oil

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### Introduction to Commodity Markets

#### Overview

#### Commodities

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>Crude Oil (WTI, Brent, WCS, LLS), Heating Oil, Gasoline, US Natural Gas, Coal, Uranium, …</td>
</tr>
<tr>
<td><strong>Base Metals</strong></td>
<td>Copper, Aluminium, Zinc, Nickel, Lead, Tin, …</td>
</tr>
<tr>
<td><strong>Precious Metals</strong></td>
<td>Gold, Silver, Platin, Palladium, …</td>
</tr>
<tr>
<td><strong>Agriculture and Livestock</strong></td>
<td>Wheat, Corn, Soybeans, Sugar, Cotton, Coffee, Cocoa, Palmoil, Lean Hogs, Live Cattle, …</td>
</tr>
<tr>
<td><strong>Other (‘Exotics‘)</strong></td>
<td>Water, Electricity, CO2, Minor Metals* / Rare Earths, …</td>
</tr>
</tbody>
</table>

*Minor Metals (inc. REE) are metals not traded at LME, CME, SHFE or other public exchanges: Antimony (Sb), Arsenic (As), Beryllium (Be), Bismuth (Bi), Cadmium (Cd), Cerium (Ce), Chromium (Cr), Cobalt (Co), Gadolinium (Gd), Gallium (Ga), Germanium (Ge), Hafnium (Hf), Indium (In), Lithium (Li), Magnesium (Mg), Manganese (Mn), Mercury (Hg), Molybdenum (Mo), Neodymium (Nd), Niobium (Nb), Iridium (Ir), Osmium (Os), Praseodymium (Pr), Rhenium (Re), Rhodium (Rh), Ruthenium (Ru), Samarium (Sm), Selenium (Se), Silicon (Si), Tantalum (Ta), Tellurium (Te), Titanium (Ti), Tungsten (W), Vanadium (V), Zirconium (Zr). Characteristic: small production volume and often mined together with other metals (byproduct).
Commodities versus Commodity Futures

Comparison of Spot und Total Return (S&P GSCI), 1980 to 2015

Components:

- Spot Return
- Roll Return
- Collateral Return

Total Return

Returns of fully collateralized commodity futures outperform commodity prices in the medium to long term.

Data: Bloomberg 2015
Commodities versus Commodity Futures

Future Pricing:
\[ F = Se^{(r+y-q-u)T} \]
\[ F = Se^{rT} \]

Backwardation:
- Future Price < Spot Price
- Positive roll-yields for long-only investors

Contango:
- Future Price > Spot Price
- Negative roll-yields for long-only investors

Depending on the structure of the future curve, returns from rolling positions can be positive or negative.


Symbols: Spot Price (S), Future Price (F), Interest Rate (r), Storage Costs (y), Dividends (q), Convenience Yield (u), Time Horizon (T)
Commodities versus Commodity Futures

Roll Returns of the BCOM-Subindices (one-year rolling)

Roll-Yields can be positive or negative, and differ between the sectors

Data: Bloomberg 2015
Crude. What is it all about? – North America

Global benchmark is WTI (West Texas Intermediate, USA) and Brent (Europe). Criteria for crude valuation are gravity/viscosity (°API) and sulfur content.
**Future Contract – Example US Crude (WTI)**

1 lot WTI (100,000 USD) equals 1,000 barrel crude (each 159l) Liter.

During the past 10 years crude traded between USD 35 and USD 145 per barrel.

Data: Bloomberg 2014
Changes in price and structure of future curve are the two most important factors in commodity investing. 

*Example:* crude spot trades at USD 102 while Dec-2015 crude is at USD 89 (-13%).

But: structure and steepness of future term structure can change very fast.
Term Structure Dynamics – Example #1

Shift in US Crude (WTI) in 2013/2014

Data: Bloomberg 2014
Introduction to Commodity Markets
Commodity Futures

Term Structure Dynamics – Example #2

Different dynamics in WTI and Brent in 2014

Data: Bloomberg 2014
Term Structure Dynamics – Example #3


Data: Bloomberg 2014
Term Structure Dynamics – Example #4

Seasonality of US Natural Gas

Data: Bloomberg 2014
Case Study – Crude Oil

Three dominant topics: OPEC, USA and China. Break-Even Prices*.

Case Study – Crude Oil

Market Balance Crude Oil

Data: Bloomberg, IEA
Case Study – Crude Oil

USA. Crude Production and Imports.
Case Study – Crude Oil

Competition for Production. OPEC, USA and Russia.

Data: Bloomberg 2015
Case Study – Crude Oil

Structure of OPEC Crude Production.

Data: Bloomberg 2015
Case Study – Crude Oil

Iran. High Potential after lift of Sanctions.
Defining an asset class: a) returns are independent from other asset classes, b) significant excess return to money market, c) returns not dependent on positive alpha of a manager, d) positive contribution to portfolio diversification

Commodities as an Asset Class

- Expected **return and risk** comparable to equities
- Low to negative **correlation** to equities and bonds
- Positive higher moments of return distribution (**skewness/kurtosis**)
- Partly positive correlation to **geopolitical risks**
- Party positive correlation to **inflation** (inflation hedge)
- Commodity prices follow a **mean reversion** process

An asset class can be replicated by an index/ETF. Managers can add active alpha if market efficiency is low (emerging markets and commodities).
For commodities two reference indices are recognised by investors:

- **Bloomberg Commodity Index (BCOM)**, and
- **S&P Goldman Sachs Commodity Index (S&P GSCI)**

### Commodities as an Asset Class. Correlation Statistics.

<table>
<thead>
<tr>
<th></th>
<th>10 Years</th>
<th>MSCI W</th>
<th>S&amp;P 500</th>
<th>Bonds</th>
<th>BCOM</th>
<th>Rohöl</th>
<th>Gold</th>
<th>USD</th>
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<tr>
<td>MSCI World</td>
<td>1</td>
<td>0.95</td>
<td>0.12</td>
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<tr>
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<tr>
<td>Anleihen</td>
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<td>0.43</td>
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<td>0.37</td>
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<tr>
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<tr>
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</table>

Data: Bloomberg 2015
Investable Commodity Indices

Commodity indices differ in terms of a) number of components, and b) weighting scheme.
Efficient Frontier: Challenges in the New World Order or what we call it...

THE REAL WORLD

- Punishment of holding Cash (-0.2%)
- Bond-Returns are not safe (eg Greece, Venezuela)
- Current Return of 10 Year Bonds
  - USA: 2.3%
  - Germany: 0.6%
  - Switzerland: -0.3%
- QE drove equity prices up
- What about gold & commodity prices

Source: Dennin 2009
Efficient Frontier: Minimum-Variance-Portfolio und Tangential Portfolio

Efficient Frontier improves by adding commodities to investment opportunity set

Source: Dennin 2009
An allocation to commodities results for every portfolio model in reduction of volatility, increase of return, and increase of Sharpe-Ratio. Maximum Sharpe-Ratio has been achieved at a commodity allocation of 22% („Substanz“), 33% („Balance“), and 54% („Dynamic“).
## Investment Strategies and Instruments

### Indices
- **Example:**
  - S&P GSCI
  - DJUBS/BCOM
  - R/J CRB
  - RICI
  - DBLCI
- Differentiation: number of components, weighting scheme

### Enhanced Indices
- **Example:**
  - DBLCI Optimum Yield
  - UBS CMCI, RICI Enhanced
- Differentiation: methodology of roll optimization

### Quantitative Strategies
- **Rule Based Strategies**
  - Example:
    - DBLCI Mean Reversion
    - DB Platinum Commodity Euro
    - DB Commodity Harvest
    - Commodity IGAR (JPM)
    - ComBATS, Corals (Barclays)
    - GAINS (CS)
    - LBBW Rohstoffe 1/2
  - Different trading strategies; Criteria: long only; long/short, cash

### Discretionary
- **Active Management**
  - Example:
    - DWS Invest Commodity Plus
    - Lupus Alpha Commodity
    - Sarasin Commodity
    - Schroder AS Commodity
    - Tiberius Active Commodity
    - Tiberius Commodity Alpha
    - Vontobel Belvista Dynamic
  - Discretionary decision; Criteria: long only; long/short, cash

### Beta
- Beta

### Enhanced Beta
- Alpha + Beta

### Alpha
- Beta

---

*Note: The table above summarizes various indices, quantitative strategies, and discretionary investments in commodity markets, focusing on different strategies and their differentiation criteria.*
Investment Strategies – Example Deutsche Bank / Mean Reversion (DBLCI MR)

Mean reversion methodology overweights "cheap" commodities and underweights "expensive" commodities based on their respective 5Y moving average versus 1Y moving average price.

Source: Deutsche Bank 2012
Introduction to Commodity Markets
Asset Allocation und Portfolio Management

Investment Strategies – Example UBS / Constant Maturity (CMCI)

Traditional commodity indices

UBS Bloomberg CMCI

CMCI methodology diversifies across the entire future curve. Leads to lower volatility compared with traditional indices (also reduction of negative roll yields).

Source: UBS 2014
Introduction to Commodity Markets
Asset Allocation und Portfolio Management

Investment Strategies – Example Deutsche Bank / Optimum Yield (DBLCI OY)

Contract Selection
On the first DBLCI business day of each month (the “Verification Date”) each commodity futures contract currently in the index is tested for continued inclusion in the index based on the month in which the contract delivery of the underlying commodity can start (the “Delivery Month”). If, on the Verification Date, the Delivery Month is the next month, a new contract is selected. For example, if the first New York business day is May 1, 2012, and the Delivery Month of a contract currently in the index is June 2012, a new contract with a later Delivery Month will be selected.

For each commodity in the index, the new commodity futures contract selected will be the contract with the maximum “implied roll yield” based on the closing price for each eligible contract. Eligible contracts are any contracts having a Delivery Month (i) no sooner than the month after the Delivery Month of the commodity future currently in the index, and (ii) no later than the 13th month after the Verification Date. For example, if the first New York business day is May 1, 2012 and the Delivery Month of the contract currently in the index is therefore June 2012, the Delivery Month of an eligible new contract must be between July 2012 and June 2013. The roll yield is expressed as:

\[ Y(t,i) = \left( \frac{PC(t,b)}{PC(t,i)} \right) \left( \frac{1}{F(t,i)} \right) - 1 \]

Where:
- \( Y(t,i) \) = On any day \( t \), the implied roll yield for entering into the commodity futures contract with exchange expiration month \( i \)
- \( PC(t,b) \) = Closing price of the base commodity future \( b \)
- \( PC(t,i) \) = Closing price of any eligible futures contract \( i \)
- \( F(t,i) \) = Fraction of year between the base futures contract \( b \) and the futures contract with exchange expiration month \( i \). Calculated as number of calendar days between dates divided by 365
- \( b \) = Base commodity future is the commodity future currently in the index

The contract with the maximum roll yield is selected. If two contracts have the same roll yield the contract with the minimum number of months to the exchange expiry month is selected.

Optimum yield methodology selects a maximum backwardation or minimum contango future contract.

Source: Deutsche Bank 2014
### Real Economy versus Financial Markets

<table>
<thead>
<tr>
<th>(Physical) Commodities</th>
<th>Commodity Futures (fully collateralized)</th>
<th>Commodity related Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Focus on precious metals</td>
<td>- Exchange listed and OTC</td>
<td>- Industries: oil&amp;gas, metals&amp;mining, and agriculture (consumer)</td>
</tr>
<tr>
<td>- Private investors</td>
<td>- Institutional Investors (Discretionary or Index based)</td>
<td>- Higher correlation to equity markets than to commodity prices</td>
</tr>
<tr>
<td>- Return (Price)</td>
<td>- Separate asset class</td>
<td>- Natural resources equities (public equity): global equity allocation</td>
</tr>
<tr>
<td>- Low to negative correlation to traditional asset classes</td>
<td>- Return (Price, Roll-Yield, Collateral Yield)</td>
<td>- Natural resources equities (private equity): Alternative Investment</td>
</tr>
<tr>
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<td>- Low to negative correlation to traditional asset classes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Alternative Investment</td>
<td></td>
</tr>
</tbody>
</table>

### (physical) Commodity Trading
Assets under Management (AUM) rose from USD 150 bn in 2008 to over USD 350 bn in 2013. Now down 33% to 260 bn USD. Precious metals attracted most of the assets.
(Physical) Commodity Trading / Switzerland

- What does commodity trading mean? **Example Crude Oil**

- Global commodity exports value more than **USD 6000 bn** (2012). More than 50% is energy related (WTO/UNCTAD).

- In Switzerland commodity trading equals **3.5% of GDP** (aprox. CHF 20 bn) and employs about 10,500 people.

- About 570 commodity trading companies are registered in Switzerland. Most of them are based in Geneva (400), Zug (100), and Lugano (70).
(Physical) Commodity Trading: Example Aluminium Cash&Carry Trade

Buying Spot (S+P) and selling it forward (P+F) is larger than warehouse rental rate (R)
«Secret» Giants of Commodity Trading

Vitol, GlencoreXstrata, Trafigura, Gunwar and Mercuria are global champions in commodity trading. Sales volume of Vitol and GlencoreXstrata are higher than of any DAX30 company.
In Contrast: Public listed natural resources companies
Life Cycle of Commodity Exploration and Development

<table>
<thead>
<tr>
<th>Micro Cap</th>
<th>Small Cap</th>
<th>Mid Cap</th>
<th>Large Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>Production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-5 years</td>
<td>2-3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preliminary Economic Assessment (PEA) / Pre-Feasibility Study</td>
<td>Feasibility Study (FS)</td>
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</tr>
<tr>
<td>Financing</td>
<td>Construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td>2 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Decreasing Risk
Introduction to Commodity Markets

Summary

- The majority of all commodities are part of the categories energy, metals, or agriculture.
- Commodities are an established separate and investable asset class for institutional investors since more than 10 years.
- It is important to segregate between commodities, commodity futures, physical commodity trading, and commodity linked companies.
- Total return of fully collateralized commodity futures derives from three sources: price return, roll return, and collateral return.
- Commodities as an asset class are part of alternative investment universe.
- In the past commodities offered a equity-like risk/return-profile, while correlation to equities and bonds had been low to negative (positive diversification benefit).
- Including commodities in equity-bond-portfolios increased portfolio results (inc. higher Sharpe ratio).
Suggested Further Reading


Introduction to Commodity Markets

Vita

Dr. Torsten Dennin
Head of Portfolio Management & Research

As Head of Commodity Portfolio Management and Research Dr. Dennin is responsible for the performance of all commodity investment strategies at Tiberius Asset Management AG in Zug, Switzerland.

Dr. Dennin holds a ten year+ track record in managing commodity related investments at Deutsche Bank AG and VCH Investments in Frankfurt am Main, Germany. For Deutsche Bank AG he has been responsible for managing commodity single accounts since 2004, and for the „db Flexible Commodity Strategy Fund“ since 2007. In 2008 he also has been appointed to be responsible for „PWM Commodity Optimum Fund“. In 2010 Dr. Dennin was hired by Altira Group in Frankfurt am Main, an independent asset management boutique, to build up commodity and natural resources business for VCH Investments. As Managing Director and Co-Head Natural Resources, he analyzed international commodity markets, covered natural resources equities, and managed „VCH Commodity Alpha Fund“ and co-managed „VCH Expert Natural Resources“. In April 2013 Dr. Dennin joined Tiberius Asset Management AG, an independent Swiss asset management company focussed on commodities.

Dr. Dennin studied Economics at University of Cologne, Germany, and at Pennsylvania State University, USA. He wrote his PhD-thesis on collateralized commodity futures at Schumpeter School of Business and Economics. Dr. Dennin is author of several commodity related books and published numerous articles in industry journals.
Introduction to Commodity Markets

Publications


__ Dennin (2013): Wettlauf um die Rohstoffe Afrikas, in: Mediterranes, Magazin der Euro-Mediterranean Association for Cooperation and Development e.V., 02/2013


__ Dennin (2011): Das Risiko steigt, viele Minen arbeiten an der Kapazitätsgrenze, PLATOW Rohstoffe, Oktober 2011

__ Dennin (2011): Schuldenkrise und Konjunktursorgen – Investitionen in Rohstoffe gewinnen an Bedeutung, Börse am Sonntag, September 2011


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