Commodities

A Research Publication by DZ BANK AG

Methodology: Commodities Research

COMMODITIES

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- DZ BANK's commodity research analyses the many factors influencing the price of crude oil and gold. The analysis focuses on the relationship between supply and demand („the relative degree of scarcity") on the respective commodity markets. Based on the analysis knowledge is gained about the status quo and the directional development of this market balance. The objective of commodity research is to provide internal and external customers with forecasts about the expected direction of movement of crude oil and gold.

- These price forecasts are always 3-, 6- and 12-month forecasts. The timeliness of these price forecasts is checked regularly. In this context, it is important to note that commodity research only analyses the individual commodities of the predefined analysis universe (crude oil and gold); not, however, listed commodity companies whose analysis falls within the scope of DZ BANK's equity research and not financial instruments with commodities as underlying.

- DZ BANK's commodity research is primarily aimed at the Volksbanken and Raiffeisenbanken, which receive the various research publications as part of the subscribed house opinion packages. In addition, DZ BANK also indirectly (i.e. via the responsible DZ BANK relationship managers) addresses medium-sized and large companies in Germany as well as institutional clients in Germany and abroad (with the exception of the USA and US investors).

- The commodities analysis is essentially based on the maintenance, further development and updating of fundamental supply and demand models. In addition, "soft" indicators, such as market sentiment, are also included in the analysis. In addition, it is the analyst's task to place the relevance of other price influencing factors for the various commodities (including geopolitics) in the overall context. It should be noted that the valuation categories change over time and are significantly dependent on the current fundamental (economic and political) environment.

Author:
Gabor Vogel, MBA, ANALYST
+49 69 7447-99023
Gabor.Vogel@dzbank.de

METHODICAL BASIS

The price forecasts for crude oil and gold are prepared with care and taking into account all relevant facts discernible at the time. The analysts have a high degree of specific market knowledge, which enables them to make a qualified assessment even of the influencing factors that are difficult or impossible to quantify.

Various analytical approaches and a combination of such methods are used to derive forecasts for individual commodity markets.

Fundamental analysis: In order to generate price forecasts for raw materials, the relationship between supply and demand (ergo: the relative degree of scarcity) is by far the most important (fundamental) building block on the respective raw material market. In order to be able to observe these relative scarcities in crude oil and gold, Rohstoff-Research has developed supply and demand models. These are constantly updated, maintained and further developed. In order to record the factors relevant to supply and demand as promptly as possible in the model, the time series of the most important variables are continuously recorded, analysed and fed into the models, whereby (for reasons of timeliness) high-frequency data are used to a large extent.

For example, direct supply and demand data from the individual producer nations (e.g. crude oil production of the individual OPEC states) and consumer nations (e.g. Chinese precious metal imports) are regarded as variables. In the context of the aforementioned influencing factors, macroeconomic economic data (e.g. GDP, industrial production, unemployment) as well as monetary and fiscal policy developments relevant to the economy - in particular from the largest supply, demand, export and/or import nations - should also be mentioned.

Relative value analysis: The relative value analysis uses historical price ratios of two commodities (e.g. "gold/silver ratio") to analyse whether a commodity can be classified as cheap or expensive in the historical context in relation to the selected comparable commodities and whether any relative price conspicuousness can be adequately explained by the predominant set of fundamental data (e.g. short-term market shortages).

RELEVANT FACTORS IN COMMODITIES ANALYSIS

The analysis of the individual commodity markets reveals a number of factors that are relevant for the analysis of the market balance (or the supply/demand ratio). These initially include the fundamental economic developments of the most important producer and consumer states. Due to the particular vulnerability of the global raw materials infrastructure (e.g. mines, oil plants, pipelines), the general geopolitical environment as well as domestic conflict situations (e.g. elections, strikes) and "raw material-sensitive" legislative initiatives are of particular interest, especially in essential producer states. The global monetary policy environment (e.g. general supply of liquidity, interest rate policy) and the bilateral development of national currencies into the "commodity currency" US dollar are also important factors for the supply and demand side of commodity models.

Additional factors that are also included in the analysis include general market sentiment and the market positioning of investors and speculators.

In the following, we describe these factors, bearing in mind that the valuation of these factors varies greatly from raw material to raw material and that these price catalysts can also change over time. Thus, it is not possible to define specific periods of validity for the different aspects or to quantify exactly their relevance for the commodity markets as a whole.

Fundamental factors

As already underlined several times, the relationship between supply and demand on the respective commodity markets plays the main role in the structural price development. Global demand for raw materials in particular depends on the development of the world economy and the income available for consumption. Here the relationship is clearly positive: the stronger the global GDP growth, the stronger the demand for raw materials will grow *ceteris paribus.* Important adjusting screws for the direction of the global gross domestic product (GDP) are again the policy mixes of fiscal, monetary, industrial, energy and competition policy applied in the individual economies with their implications for interest rate, inflation and currency developments as well as the initialisation of technological innovations. Of course, in this context it has to be taken into account that large economies à la USA, China, India, Japan and the "EU-29 block" have a much higher weight in influencing world GDP than the dozens of smaller economies.

- **GDP growth**: For commodity analysis, the development of global GDP is of particular importance (on the demand side). The major US, Chinese and EU-29 economies in particular have a significant influence on world GDP. As a result, it is primarily these "global player economies" that are the focus of demand-side analysis. Nevertheless, especially in the raw material world, smaller nations can play a special role - on the supply side of the market - and thus make them highly relevant from an analytical point of view. The growth rates of these nations - relevant on the supply and/or demand side - should be viewed a) in relation to the growth of comparable economies, b) in relation to global growth and c) in relation to the country's historical growth performance. In addition, attention must be paid to whether a positive growth rate is the result of healthy, sustainable development or, for example, whether it is based on a deficit fiscal policy and is therefore not sustainable.

- **Development of the labour market**: Although the labour market is a lagging indicator (the unemployment rate only falls once the economy has recovered noticeably), it still plays an important role. Falling unemployment rates and the often accompanying rise in wages have a significant impact on consumption (and thus growth) and inflation.

- **Inflation**: The inflation rate is influenced by both national and external factors. Inflation and growth have a decisive influence on the monetary policy of the global central banks and thus have a massive impact on the yield level and thus also on the currency parities, including the US dollar, which is omnipresent in the commodity world. A weakening national currency, e.g. of an agricultural export nation (e.g. Russia) against the US dollar, can trigger a domestic impetus to increased exports of raw materials, which must then be counteracted by the government, e.g. in the context of a weaker harvest, by (price-relevant) export bans in order to prevent a surge in domestic inflation.

- **Monetary policy:** A country's monetary policy is influenced by national factors (growth, inflation, labour market, financial market developments), its mandate (inflation target) and external, global factors. With its monetary policy, a central bank exerts a direct influence on the yield level and the external value of the currency. High growth rates and rising inflation tend to be accompanied by a more restrictive monetary policy, while central banks react to low growth and falling inflation with an expansive policy. A central bank must include in its considerations how global monetary policy is developing. For example, an exceptionally restrictive exchange rate can lead to an undesirable appreciation of the domestic currency. Especially on the precious metal markets - mainly gold - the interest rate level plays an important role in influencing prices (keyword: opportunity cost argument).

- **Fiscal policy**: Fiscal policy refers to all measures taken by a state to steer economic development through changes in public revenue and expenditure. Counter-cyclical fiscal policy is a policy strategy aimed at counteracting cyclical fluctuations in economic activity and ensuring stable economic growth through targeted changes in government revenue and expenditure. Particularly in times of weaker economic growth, national politicians are regularly confronted with demands to introduce fiscal programmes to stimulate the economy. If a state (in particular one of the aforementioned "global player economies") implements such an economic stimulus programme - mostly debt-financed - demand for raw materials rises ceteris paribus. This applies all the more the stronger the focus of such an economic stimulus package is on "resource-consuming" infrastructure measures.

- **Geopolitics**: For many commodities, the supply side is dominated by a few production nations. If a geopolitical event, such as a strike, infrastructure attacks or even a civil war, has a negative impact on raw material production in one of these countries, the supply of raw materials on the affected individual market can become severely scarce in the short term and lead to sharp price movements in the absence of global inventories. Another variant of a geopolitical event may be the imposition of sanctions on a producing nation that severely curtail its production and/or export opportunities. As a general rule, if the supply/demand ratio on a commodity market is very tight, even the temporary loss of a smaller producer state can be sufficient to trigger noticeable price increases. On the other hand, extensive inventories and possible production reserve capacities provide valid protection against such geopolitically induced supply frictions.

- **Weather**: As the production of raw materials does not take place under laboratory conditions but mainly in the wild, weather in its multidimensional variations (e.g. temperature, precipitation, sunshine hours, storms) is an important supply-side component that must be kept in mind within the framework of supply/demand models. The energy sector can also be described as "weather-sensitive". For example, storms in the Gulf of Mexico can lead to the forced closure of oil and gas plants. On the demand side, the weather also plays a role that should not be underestimated, although this relates primarily to the energy sector. An above-average warm (cold) winter can lead to a significantly reduced (increased) "heating demand" (for natural gas or heating oil).

- **Relative price ratios:** Beyond the valuation dimension of relative price ratios (see p. 2 "Relative value analysis"), the bilateral price relation of two goods can also affect their supply and/or demand. On the one hand, it depends on whether the goods under consideration are so-called complementary or substitution goods. On the other hand, it is important whether a good is an essential input factor in the production of another raw material.

- **Policy initiatives:** New policy initiatives may also have important price-influencing effects on supply and/or demand for raw materials. These can consist in a changed legal landscape or in the macroeconomic reorientation of an entire industrial sector (e.g. German nuclear phase-out after the "Fukushima disaster") or an entire nation (e.g. restructuring of the Chinese economy).

- **Technological leaps:** Technological advances regularly require the adjustment of the supply and demand model parameters on which supply and demand are based. Technological quantum leaps, such as shale gas and shale oil production in the USA, are often the result of temporary high price phases.

MARKET SENTIMENT, MARKET EXPECTATIONS AND TECHNICAL INDICATORS

Although the aforementioned fundamental factors form the essential basis of the raw material forecast, they are supported by other "forecast pillars" such as market sentiment (and thus market positioning), market expectations and other indicators such as technical analysis.

- **Market sentiment**: There are various indicators that can be helpful in assessing the general market sentiment. Volatility indices (e.g. for the S&P 500 and the DAX) are regarded as a barometer for the prevailing risk aversion. Implicit volatilities for individual commodities, on the other hand, reflect the risk assessment of the market.

- **Market positioning**: The futures market positioning of important market participant groups (e.g. producers, swap dealers, speculators) is of great importance. For example, a high net long position of speculators (ergo: difference between long and short position) indicates that the market is already very positive about a certain commodity. In such a situation, for example, further positive fundamental news may have little impact on commodity prices. Conversely, surprisingly negative news can trigger a dynamic repositioning of speculators and thus a decline in the price of commodities.

- **Market expectations**: The same applies to market expectations: positive news will only really have a positive impact on the exchange rate if it exceeds general market expectations. Market expectations can also unfold their effect in advance: If, for example, the market begins to price in a supply reduction in an important producer state, this market expectation will already ex-ante lead to an increase in raw material prices.

- **Technical analysis**: Technical analysis is a tool for investigating and predicting price movements in the financial market based on chart history and the historical turnover movements of an asset (e.g. stock, commodity, currency). However, the basic prerequisite for successful technical analysis is that any fundamental factors are initially ignored. If technical and fundamental analysis point in the same direction, this may be an indication of a dynamic movement in commodity prices.

SOURCES: DATA, STUDIES, INFORMATION

DZ BANK AG's commodity analysts use a wide range of data and information. It is the task of the raw material analysts, based on their very special raw material expertise, to filter out the relevant information from the wealth of data available, which ultimately decides whether a raw material rises or falls in perspective.

External data

- **Fundamental data**: Economic data is largely obtained from data suppliers such as Bloomberg or Refinitiv. We also use data from various third-party providers such as EIU (Economist Intelligence Unit) and international organisations such as the IEA (International Energy Agency), the IMF (International Monetary Fund), OPEC and the USDA (US Department of Agriculture). National statistical institutes and central banks also provide relevant data. In general, care is taken to use trustworthy data. In case of doubt, the analyst is required to verify the data from one source against other sources.

- **Market indicators**: Exchange rates, interest rates, spreads, share prices, commodity prices, etc. are obtained through Bloomberg, Refinitiv and Reuters. The same applies to volatility indices and other market indicators.
- **Market positioning**: Data from Bloomberg and Refinitiv are generally used for the analysis of the superordinate portfolio flows. In some cases, the data are also obtained directly from the national central banks and statistical institutes.

forecasts

- **Economic forecasts**: Where available, these are obtained from the Economics Department of DZ BANK. For the remaining countries, data are obtained from the EIU and the IMF.
- **Other forecasts**: Where available, internal research forecasts are always used. In cases where this is not possible, other providers (EIU) or consensus forecasts (including Bloomberg) are used. This is disclosed in the source information.

news

- **Intelligence services**: Current news is obtained through news services such as Bloomberg and Reuters.
- **Media:** News from the daily press and various news portals on the Internet

FORECASTING PROCESS

commodity price forecast

Due to the many different influencing factors, the analysis of commodity markets is highly complex and subjective in nature. Analysts observe the various valuation categories described in detail above and must be able to assess which of these categories are or will be relevant to their commodities at different times. Over the forecast horizon (+3, +6 and +12 months) there can always be significant shifts here.

In addition, there is a variety of external factors, some of them political, which - as far as known - must be included in the forecast. If the circumstances change, the forecast must be revised and possibly changed.

These price forecasts are always 3-, 6- and 12-month forecasts. The timeliness of these price forecasts is checked regularly. In this context, it is important to note that commodity research only analyzes the individual commodities of the predefined analysis universe; not, however, listed commodity companies whose analysis falls within the scope of DZ BANK's equity research and not financial instruments with commodities as underlying.

I. IMPRINT

Published by:
DZ BANK AG Deutsche Zentral-Genossenschaftsbank, Frankfurt am Main,
Platz der Republik, 60265 Frankfurt am Main
Telephone: + 49 69 7447 - 01
Telefax: + 49 69 7447 - 1685
Homepage: www.dzbank.de
E-mail: mail@dzbank.de
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Uwe Fröhlich (Co-Chief Executive Officer),
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Responsible for the contents: Stefan Bielmeier, Head of Research and Economics

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Not every item of Other Research Information contains a statement on a certain investment or a valuation of this investment. The **categories** for **evaluations / statements** used in **Other Research Information** of DZ BANK are defined as follows.

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Statements on the **isolated evaluation of specific aspects** that **precede an investment recommendation** on a financial instrument and / or an issuer - **especially** according to the **sustainability criteria** defined by DZ BANK, its defined **value approach**, its defined **asset allocation** (DZ BANK Sample Portfolio), its defined sector strategy Euro-Stoxx (**DZ BANK Sector Favorites**), its defined valuation of payments to beneficiaries (**DZ BANK Dividend Aristocrats**), their **weighting recommendations for market segments** or otherwise defined groups of different issuers, i.e. their **weighting recommendations in the overall market strategy Fixed Income**, in the **sector strategy Corporates** and their **weighting recommendations for covered bond jurisdictions** - are **not investment categories** and therefore **do not contain** any **investment recommendations**. These isolated statements **alone** are **not sufficient** to form the basis of an investment decision. Reference is made to the explanation of the used relevant methods.

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Issuers of shares and bonds are analysed on the basis of predefined **sustainability factors** and classified in isolation as '**sustainable**' or '**non sustainable**'. For sovereigns, a classification as '**transformation state**' can be made that lies between these two classifications.

4.3 Share Indices

For defined share indices, share price forecasts are made at regular intervals. From the comparison between the current prices and the prepared forecasts on the development of such equity indices, **investment recommendations that are not generally definable and that cannot be defined in advance** may be developed.

4.4 Currency Areas

The assessment of an investment in a **currency area** is based on the total return that can be expected from an investment in the corresponding **currency area**. As a rule, this total return results primarily from the forecast exchange rate change. In addition, the general interest rate level and a possible change in the yield level of the bonds on the corresponding bond market to be taken into account are included in the assessment. A Sharpe ratio, which adjusts the expected yield using the average standard deviation of the total return over the past two years, is used to calculate which currency areas are "attractive", which are "unattractive" and which are "neutral".
"**Attractive**" means that the risk-adjusted exposure in the currency area is expected to show an above-average and positive return over the next six to twelve months.
"**Unattractive**" means that the risk-adjusted exposure in the currency area is expected to show a below-average and negative return over the next six to twelve months.
"**Neutral**" means that the risk-adjusted exposure in the currency area is expected to show relatively low or average returns over a period of six to twelve months.
The aforementioned returns are **gross returns**. The gross return as success parameter relates to bond yields before deduction of taxes, remunerations, fees and other purchase costs. This compares with the net return of a specific investment, which is not calculated and can deliver significantly lower returns and which measures the success of an investment in consideration of / after deducting these values and charges.

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The terms "overweight", "underweight" and "neutral weight" are used for recommendations on market segments or otherwise defined groups of different issuers.
"**Overweight**" means that the above bond segment is expected to perform significantly better than the average of the other coverage bond segments over a six-month horizon.
"**Underweight**" means that the above bond segment is expected to perform significantly worse over the six-month horizon than the average of the other coverage bond segments.
"**Neutral weighting**" means that the above bond segment is expected to perform roughly as well as the average of the other bond segments in coverage over a six-month period, or that the risk profile is subject to strong

fluctuations in both directions, so that no active positioning against the benchmark should be taken.
The weighting recommendations for market segments or differently defined groups of different issuers are independent of the recommendations for individual issuers or those for higher or lower market segments. They are relative, i.e. if not all the segments mentioned are rated "neutral", at least one bond segment is rated "overweight" and one bond segment is rated "underweight". Therefore, the weighting recommendations are not an absolute statement of profit and loss.

1.Overall market strategy
The weighting recommendations in the overall Fixed Income market strategy refer to the relative comparison of the covered bond segments with each other. These are currently government bonds, covered bonds, bank bonds (senior unsecured) and corporate bonds (senior unsecured).

2.Sector strategy Corporate Bonds
The weighting recommendations in the Corporates sector strategy refer to the relative comparison of the covered sectors within the corporate bond segment.

3.Strategy Covered Bonds
Our weighting recommendations for Covered Bond jurisdictions ("country") are based on the comparison of a jurisdiction with the iBoxx € Covered Index.

4.6 Derivatives
For derivatives (**Bund futures, Bobl futures, treasury futures, Buxl futures**) the **arrows (🡅) (🡇)(➔) merely indicate the trend direction** and **do not** contain **any investment recommendation**. The trend direction is derived solely from the use of generally recognised technical analysis indicators **without** reflecting **an analyst's own assessment**.

4.7 Commodities
"**Upward arrow (🡅)**" means that the absolute price increase expected in the next twelve months is greater than 10%.
"**Downward arrow (🡇)**" means that the absolute price decline expected in the next twelve months is greater than 10%.
"**Arrow pointing to the right (➔)**" means that the absolute price change expected in the next twelve months will lie between +10% and -10%.

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If no update is made, investment recommendations **end / lapse on expiry** of the **validity periods** named below. These periods **begin** on the **day** the Other Investment Information was **published**.

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Sustainability analyses:	twelve months
Analyses according to the **value approach**:	one month
Asset allocation analyses (**DZ BANK Sample Portfolio**):	one month
Euro Stoxx Sector Strategy **(DZ BANK Sector Favourites)**:	one month
Dividends **(DZ BANK Dividend Aristocrats)**:	three months
Share indices (fundamental):	three months
Currency areas:	six to twelve months
Weighting recommendations for market segments	six months
Overall market strategy	six months
Sector strategy Corporate Bonds	six months
Strategy Covered Bonds:	six months
Derivatives	
(Bund futures, Bobl futures, treasury futures, Buxl futures):	one month
Commodities:	one month

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EQUITY SALES	Kai Böckel	+49 – (0)69 – 74 47 – 12 28	kai.boeckel@dzbank.de
Germany	Kai Böckel	+49 – (0)69 – 74 47 – 12 28	kai.boeckel@dzbank.de
Benelux	Lars Wohlers	+49 – (0)69 – 74 47 – 68 34	lars.wohlers@dzbank.de
Switzerland	Petra Bukan	+49 – (0)69 – 74 47 – 49 92	petra.bukan@dzbank.de
Austria	Thomas Reichelt	+49 – (0)69 – 74 47 – 67 09	thomas.reichelt@dzbank.de
UK	Lars Wohlers	+49 – (0)69 – 74 47 – 68 34	lars.wohlers@dzbank.de
SALES TRADING	Marina Semmler	+49 – (0)69 – 74 47 – 13 81	marina.semmler@dzbank.de
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