Intratec Primary Commodity Prices Methodology

Contents

Introduction

What Are Intratec Primary Commodity Prices?

Overall, Intratec Primary Commodity Prices are provided as an annual subscription where subscribers have access to trustworthy and independent pricing data of commodities worldwide. For each commodity, prices are presented in a set of locations recognized as relevant for international trade. This product includes monthly prices of commodities spanning the industries of fertilizers & gases; olefins & derivatives; aromatics & derivatives; alcohols & organic acids; inorganic chemicals; polymers; metals & mining. When available, price forecasts covering a rolling 9-month forward are also presented. More information about Intratec Primary Commodity Prices, can be checked at https://intrat.ec/ipcp-brochure.

A new price value for each available series is released every month, according to the schedule presented at https://intrat.ec/release-schedule.

Unlike most competitors, Intratec does not rely on the opinions of market participants to supply price assessments. Intratec Primary Commodity Prices rather rely on artificial intelligence to generate valuable price information from huge amounts of public information gathered monthly by data robots developed by Intratec.

The price values are obtained through a structured big data strategy developed by a team of market experts, computer, and data scientists. Such strategy relies on advanced technologies to extract, store, process, and analyze various publicly available data from a wide range of open sources as soon as they are released, so they can be transformed into valuable price information through machine-learning algorithms.

The computer-based proprietary strategy developed by Intratec significantly reduces human errors and also prevents our price assessments from being biased by opinions of market participants who are interested in driving prices according to their own interests.

How to Use Intratec Primary Commodity Prices

Intratec Primary Commodity Prices has been successfully used in several ways over the years, such as:

* To evaluate transaction prices in international markets
* To assess procurement planning performance

* To identify monthly/yearly price trends
* To doublecheck price references
* To conveniently view pricing data, in different currencies, units, on a quarterly or annual basis
* To develop internal commercial studies/investment analyses
* To support, in combination with other indexes, commercial strategies decision making

Check Illustrative Cases

Some examples of how to use commodity prices can be found in Intratec Primary Commodity Prices User Guide at https://intrat.ec/ipcp-user-guide.

Limitations

While Intratec price data can be a useful guide in several situations, when used alone it may not capture specific and/or sharp price movements in periods of high price volatility. Therefore, unless in combination with other price indexes, we discourage using the monthly price data from our databases as a reference of commodities' real-time prices, or as an index for structuring contracts between suppliers and consumers.

When using prices from Intratec Primary Commodity Prices, the price assessment scope is especially important. Due to official trade statistics summarization, price data presented may refer to an average price related to a set of different types of contracts, commodities' specifications, order size, geographical location, and customer status. Therefore, it is important to pay special attention to the price description provided within each assessment.

Price estimates derived from predictive models (either preliminary or forecasted) have been created for information purposes only, as a possible forward view of commodity prices.

Intratec Primary Commodity Prices Basis

First, to fully understand the data published in Intratec Primary Commodity Prices, it is important to note that the actual price paid by each customer is influenced by factors such as order size, trade terms, customer status, types of negotiation, and geographical location. In this context, prices provided by Intratec for commodities indicate prices commonly observed in transactions between major producers and great end-users according to the basis related to each price assessment, i.e.,

the set of definitions related to the price that may comprise the price category, Incoterm, sublocation, and commodity specifications.

The concepts used as the basis for Intratec Primary Commodity Prices are better described in the following sections.

Further Details

A complete document presenting all basis defining each assessment can be found in the document "Intratec Primary Commodity Prices - Assessments Basis" at: https://intrat.ec/assessments-basis.

Types of Prices

Spot

Spot prices reflect the prices at which the commodity can be purchased for immediate delivery. Differently from contract prices, spot prices are ruled by the current availability of the commodity in the marketplace – the lower the availability, the higher will be the commodity price. Therefore, they can be highly impacted by shocks such as plant shutdowns, natural disasters, or supply shortages due to any other causes. On the other hand, low demand and higher producers' inventories will lead to lower spot prices.

Long-Term Contract

Contract prices reflect the average of the prices agreed on long-term contracts settled in a given month. These contracts usually refer to long-term relationships, in which the commodity is regularly delivered over months.

Futures Contracts

Futures contracts prices refer to standardized agreements to buy or sell a specific quantity of a commodity at a predetermined price on a future date. They are traded on exchanges and serve as a means of managing price risks. Futures contracts are widely used for speculative purposes as well. Producers and consumers can utilize futures contracts to hedge against potential price fluctuations. Speculators, on the other hand, take positions in futures contracts based on their expectations of future price movements.

Unit Value

This value reflects the total amount of money divided by the total quantity of a given commodity traded between countries (with no statistical treatment, i.e., as reported by countries custom authorities). This value refers to commodities as grouped by the sources that release the data and

may be representative of a commodity trade through a single specification or a mix of commercial specifications. Therefore, unit value may be representative of a single grade, or include mixed commercial grades of a commodity.

Transaction

Transaction Price refers to an estimate of an average price at which international trade transactions of a given commodity were effectively closed. It does not indicate specific long-term contract prices or spot prices, but rather it is a combination of all concluded negotiations. Unlike the "Unit Value," trade information between countries undergoes statistical treatment to estimate price information. This treatment involves eliminating transactions that do not align with market logic such as transactions with low quantities that do not represent commercial exchanges, and correcting discrepancies.

Volume-Weighted Average Acquisition (VWA)

The Volume-Weighted Average Acquisition price (VWA) reflects an average price of concluded negotiations in the acquisition of commodities in large quantities. Similar to the “Transaction Price,” it does not represent specific long-term contract prices or spot prices, but rather it is a volume-weighted average of concluded negotiations of commodities in large quantities. Such negotiations typically occur by maritime transportation, between locations of great influence in commodity markets.

The VWA price is based on statistical treatment of data from governments’ statistics bureaus, involving:

* Selecting locations associated with the significant commercialization of a particular commodity with regular trade frequency, primarily involving maritime transport.
* Eliminating trade data that may distort the results due to low trade quantities, infrequent commercialization, and other deviations from free market principles.

Therefore, this price provides a better reference for estimating the margins of large producers, as it reflects the average acquisition price of the total quantity of a given commodity produced and sold by such producers.

Large Buyer

The Large Buyer price is an estimate price calculated to serve as an up-to-date indicative benchmark price for the acquisition of commodities in large quantities. It represents an estimate to obtain an updated combination of long-term contract prices and spot prices when there is no data available from the official trade statistics sources at the moment the price is published. This

price is calculated using a set of mathematical models based on parameters already disclosed at the time the price is released, such as:

* Trade transactions earlier released by other countries.
* Inflation rates and producer price indexes.
* Future contracts of commodities in market exchanges.
* Prices of related commodities.

This price serves as a valuable reference for evaluating procurement strategies of large buyer organizations, as it provides up-to-date information.

Contractual Obligations Terms

The International Chamber of Commerce's Incoterms are utilized to express which costs are incurred by buyers and sellers in commercial transactions in terms of delivery location, transport, unloading, insurance, duties of the goods. Table 1 presents the allocation of costs to buyers and sellers according to those Incoterms. The definitions of the Incoterms can be seen below:

* Ex-Works (EXW): The seller's minimum obligation, that is, placing the goods at the buyer's disposal, is this term's definition. The buyer is responsible for all required aspects of export and import clearance, as well as organizing carriage and insurance.
* Free on Board (FOB): This term indicates that the delivery to and loading of the goods onto the ship designated by the buyer is the responsibility of the seller, who also assumes any costs and must handle export documentation and clearing goods for export. Following this delivery, the remainder of the transaction (transportation, unloading, insurance and associated costs) is the buyer's responsibility.
* Cost and Freight (CFR): In this case, the costs of delivering the goods to the indicated destination port are paid by the seller, with any risk and origin costs transferring to the buyer once the goods have been loaded onto the ship in the country of export. Origin costs, such as export clearance and freight costs for carriage to the designated port, fall to the shipper. Following delivery and onboarding, the remainder of the operation, including insurance, transportation of the goods from the port of destination to his/her premises, unloading, and associated costs, is the buyer's responsibility.

* Cost, Insurance & Freight (CIF): Despite the similarity of this term to CFR, there is one exception, the need for the seller to insure the goods as they are transiting to the designated destination port. Phrased differently, in terms of CIF, the costs of the goods, freight or transport, and insurance are included in the selling price. As discussed, following delivery and loading of the goods, the remainder of the operation and associated costs are assumed by the buyer. However, that excludes insurance and sea transportation, both of which are paid by the seller.

* Delivery Duty Paid (DDP): This term refers to the agreement of the seller to deliver the goods to the buyer at a named place of destination and unload at his own cost, as well as clearing those goods for import and covering all import duties, taxes, and charges.

Table 1 Allocations of costs to buyer and seller according to Incoterms

Obligations	EXW	FOB	CFR	CIF	DDP
Loading at origin	Buyer	Seller	Seller	Seller	Seller
Export customs declaration	Buyer	Seller	Seller	Seller	Seller
Carriage to port of export	Buyer	Seller	Seller	Seller	Seller
Unloading of truck in port of export	Buyer	Seller	Seller	Seller	Seller
Loading in port of export	Buyer	Seller	Seller	Seller	Seller
Carriage to port of import	Buyer	Buyer	Seller	Seller	Seller
Insurance	Buyer	Buyer	Buyer	Seller	Seller
Unloading in port of import	Buyer	Buyer	Buyer	Buyer	Seller
Loading on truck in port of import	Buyer	Buyer	Buyer	Buyer	Seller
Carriage to place of destination	Buyer	Buyer	Buyer	Buyer	Seller
Import customs clearance	Buyer	Buyer	Buyer	Buyer	Seller
Import duties and taxes	Buyer	Buyer	Buyer	Buyer	Seller
Unloading at destination	Buyer	Buyer	Buyer	Buyer	Buyer

Further Details

Intratec displays, for each published price assessment, its respective price type and Incoterm, which can be seen in the document "Intratec Primary Commodity Prices - Assessments Basis" at: https://intrat.ec/assessments-basis.

World Regions

Intratec Primary Commodity Prices covers price assessments for the following world regions: North America, Europe, Northeast Asia, Southeast Asia, South America, and Middle East / Africa. A listing of such regions with the respective countries included is presented below.

* **North America:** United States, Canada, Mexico.
* **South America:** Argentina, Brazil, Chile, Colombia.
* **Europe:** Austria, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom.
* **Southeast Asia:** Australia, India, Indonesia, Malaysia, New Zealand, Pakistan, Philippines, Singapore, Thailand.
* **North Asia:** China, Japan, Russia, South Korea, Taiwan, Ukraine.
* **Africa and Middle East:** Kenya, Morocco, Nigeria, Saudi Arabia, South Africa, Turkey, United Arab Emirates.

Methodology

How Data Are Gathered

Intratec largely gathers useful data for price calculations from public sources, i.e., national governments' statistics bureaus and foreign trade agencies, international organizations, as well as futures markets exchanges. The data gathered include prices, indexes, economic indicators, transactions, bids, offers, volumes, and any other information that can make a material contribution to price calculations or forecasts.

Given the wide range of sources used and the huge amount of data collected, it is Intratec's goal to ensure both the integrity and the accuracy of the collected data. For that goal, Intratec's data gathering process relies whenever possible on automated systems and algorithms to extract, transform, and load the data into our databases.

The automated collection processes are thoroughly tested and validated on a monthly basis, ensuring the integrity of any data collected. Furthermore, data consistency is ensured by several

layers of data checking algorithms, as described in the next paragraphs. The automated extraction relies on Application Programming Interfaces (APIs) either provided by the data sources or developed by Intratec. Requests are automatically according to the sources' update schedule and the data retrieved by the API enter an automated workflow for data integrity check.

Some specific data sources demand manual collection. In such cases, to prevent errors derived from human mistakes, the same collection process is performed by two independent professionals and the result is cross-checked through computer algorithms. If any differences are found in the data collected, a third professional reviews the data and checks the original source to attest which is the correct data. Once the manually collected data passes cross-checking step, they are sent to automated workflows for further testing and validation to confirm that they are correct.

A second layer to certify data integrity consists of collecting the same data set from various sources. The data points are cross-checked across several sources. Once again, if any inconsistencies are found, the system automatically generates alerts that demand human verification. An Intratec analyst must then check the inconsistency and confirm the correct data.

When dealing with critical data for decision-making, as Intratec does, it is obvious that sources reliability is key. Therefore, Intratec continuously works to assure the quality of our data in the following ways:

* To increase the number of sources evaluated.
* To increase the usage of national governments' statistics bureaus, foreign trade agencies, international organizations, as well as other recognized institutions.
* To improve data validation.
* To ensure the quick replacement of any discontinued source.

How Prices Are Calculated

Historical Data

Historical data presented is derived from data released by official sources, including national governments, international organizations or any other entity that publicly releases price or trade data. Depending on the contractual obligations terms and whether exporting or importing countries' data are presented, transport costs are also estimated and taken into consideration. Internally developed statistical models are employed for data reconciliation to correct discrepancies and to obtain more reliable pricing data.

Once raw data integrity is attested, the data is transformed through automated workflows, which convert units and currencies to the ones usually employed as industry standard or defined as default by Intratec. Values are rounded to 3 significant figures, which better represent accuracy of data presented, and loaded to our databases. Any historical data presented by Intratec is also always rounded to 3 significant figures, even if conversion to different visualizations (e.g., different currencies and units) is applied. The unit conversion factors used are listed at: https://intrat.ec/unit-conversion.

It is important to highlight that some official foreign trade statistics may have a lag usually varying from 1 to 3 months to release data (i.e., there may be a delay in the final data publication). For these cases, Intratec has developed a set of strategies to estimate updated pricing data.

Assessments Lag

The lag for each assessment covered in Intratec Primary Commodity Prices is presented in the "Intratec Primary Commodity Prices - Assessments Basis" document available at: https://intrat.ec/assessments-basis. This document is monthly updated with the lag of the assessment as soon as new pricing data is released.

Primarily, if the source also publishes preliminary trade statistics, the price value derived from them will be used. When there are no data from the primary sources, Intratec uses mathematical models to estimate price based on indicators that have already been released by the moment of the update. Such indicators can be of many kinds, as described below.

Since national governments release data with different delays, the data released by some countries are used to estimate preliminary prices for those countries that take longer to release trade information. For instance, if a country A takes 3 months to release its foreign trade data for a given month, and country B releases data in the following month, Intratec uses big data strategies to find trade transactions involving the country A among the data already released by country B.

If no foreign trade data is available, Intratec collects other indicators that may serve as a proxy for the target commodity price and are released on higher frequency by national governments. Such indicators include inflation rates and producer price indexes.

As soon as final values become available, preliminary price values are replaced.

Forecasted Data

Intratec provides short-term price forecasts for selected commodities. Those forecasts are obtained from mathematical models based on correlations with (i) future contracts of commodities in market exchanges; (ii) forecasts from national agencies and international

organizations; (iii) official industry/economic indexes; (iv) prices of main raw materials employed in the production of the commodity; and (v) prices of main products manufactured from the commodity.

Most multilateral organizations and big investment banks provide one-year forecasts for fuel, fertilizers, metals, and agricultural prices, along with future contracts of these commodities in market exchanges. This enables us to derive a "consensus" forecast and a range within which most forecasts fall. Using these parameters, fuel price forecasts can be generated. In other words, the price forecasts are estimated following the steps below.

To begin, the price forecasts that use forecasts from national agencies and international organizations, as well as future contracts of commodities in market exchanges, are calculated. Next, a statistical approach, such as multiple regression, is applied to the other fuel prices that do not have a published forecast. A time series of fuel prices is estimated based on historical data. This will determine the level of fuel prices for a given level of price forecasts that have already been calculated. The estimations should be based on monthly data for at least three years to capture periods of high and low prices.

The R-squared, coefficient of variation, and Pearson correlation coefficient should be examined to determine if these variables can be used to predict fuel prices with a reasonable degree of confidence. A R-square and Pearson value greater than about 0.85, and a coefficient of variation less than 10% are acceptable.

Finally, the estimated parameters from the regression model can be used to estimate what the level of fuel prices would be if the crude oil price predictions come true. Outliers should be eliminated, and out-of-sample predictions should be calculated to evaluate the predictive power of the model. The model's performance during periods of high and low reference prices should also be checked.

The accuracy of the price estimates derived from the statistical models are monthly checked. Significant differences between the forecasted price for a given month and the actual price in that given month are assessed by Intratec market analysts. They may detect relevant changes in the market conditions (e.g., plant shutdowns, economic crisis) occurred after the moment the forecast was calculated or find that the model is not reflective of market dynamics any longer. Significant changes in the market conditions may cause inaccurate forecasts, but that does not mean the models are poor at predicting prices. However, in case of a market dynamics change, the existing model must be reviewed. It is either improved to reflect more aspects of the market dynamics or replaced by a new model. In that case, brand new models are developed, tested, and compared to

each other. The one that best reflects the new market dynamics will be chosen to replace the outdated model.

The price forecasts presented are reflective of what Intratec considers to be the most probable scenario for the upcoming nine months, as of the date such forecasts are updated. In other words, specific, "frozen" market conditions, at the time they were calculated, serve as the basis of forecasted prices. It should be noted that market parameters utilized in the calculation of these forecasts can undergo significant revision within short periods of time, which is the reason for monthly updates.

Unlike historical data, any forecasted data presented by Intratec is rounded to 2 significant figures. This is more in line with the intrinsic nature of future data forecast.

How Prices Are Validated

Once prices are calculated, specific Artificial Intelligence (AI) algorithms are used to check if price variations fall within expected ranges given the market conditions at the time of the analysis. If, at any time, the accuracy of the calculated prices is called into question, the price calculation is potentially anomalous or when the data is otherwise suspect, the algorithm triggers alarms that notify Intratec experts about the need to carefully analyze the price data. This includes instances in which there is a significant deviation from the mean of the behavior of that price; prices that do not coincide with that commodity's usual lows and highs; when volume transactions are appreciably higher or lower than those normally found in that market; or if, for any reason, we identify theoretically irregular details of a particular transaction.

When alarms are triggered, Intratec experts do a manual analysis of that data and conduct some checks and treatments, described below.

Initially, bilateral trade flows with partner countries involving a particular commodity made by the country are analyzed and compared to one another. If any abnormal values or quantities are identified, they may be removed from the calculation of that price.

For example, the unit values of trades with 10 countries are around USD 1,000 per ton, but a transaction with the Netherlands at USD 10,000 per ton skews the average transaction price to USD 5,000 per ton. This data is compared with prices from other countries. When available, it is checked what the Netherlands also reports for this transaction too. If the prices around the world are also USD 1,000 per ton, or the data from Netherlands don't match with USD 10,000 per ton in recent months, the abnormal transaction is removed from the calculation.

When there is scant or a dearth of sufficient transaction/price information, or when a method based on transaction data fails to elicit a representative price, a price data adjustment will be done following a rigorous, replicable assessment process using mathematical models, as well as broadly accepted valuation metrics, combined with an informed judgment bolstered by a broad array of factual market information. This is all done using great care in the collection and validation of all data utilized in the determination of prices that will ultimately be published.

This highly stringent procedure of combining valuation metrics with sound and proven judgment substantially narrows the band within which the assessment of a commodity can be completed while greatly increasing each price series' accuracy and consistency. Valuation metrics include the following:

* Comparison between bilateral trades of the same location and commodity
* Comparison to the same commodity in another location
* Comparison to the data traded reported by exporting and importing countries
* Comparison to the commodity's main feedstock(s) or main derived product(s)
* Comparison to a different commodity but produced from the same main feedstock(s)

To guarantee that the any price adjustment procedure is accurate, Intratec analysts are thoroughly trained in the elements of a variety of commodities; their expertise is reassessed annually. Internal training guides for each of the different commodities we cover are made available with the goal of ensuring that the price data Intratec publishes is accurate and consistent. Our analysts are also schooled in the identification of potentially anomalous data, i.e., any information, including transactions, in which there are inconsistencies or deviations from our methodology or standard market conventions.

Important Considerations

Price Data Corrections

Intratec is committed to accurately presenting reliable and representative pricing data; thus, occasionally, published price data might be reviewed. This is done to correct any errors caused by clerical mistakes, calculation errors, or a misapplication of our stated methodology, as well to retroactively adjust prices when new information becomes available.

Check Reviewed Data

Whenever such data reviews are made, they are communicated in the "Release Notes," at https://medium.com/intratec-release-notes.

Ethics and Compliance

Independence and impartiality are central to Intratec and what we do. Intratec has no financial interest in the price of the commodities on which it reports; our goal is to reflect the actual market level of those commodities.

All Intratec employees are required to annually confirm the absence of any personal relationships or financial interests that may serve to influence or even be perceived to impact their ability to perform their jobs as objective, impartial and effective individuals.

Review of Methodology

The publication of reliable, distortion-free prices that are representative indicators of market values is any methodology's overriding goal. To achieve that goal, Intratec employees perform regular examinations of our methodologies and frequently speak with those in the industry. In addition to this ongoing review of methodology, Intratec undertakes at least an annual review of all its methodologies and methodology documents.

As necessary, this process includes periodic reviews of commodities covered based on a qualitative analysis of liquidity, visibility, consistency, and quality of market data, as well as industry use of Intratec's assessments. These analyses include:

* Appropriateness of the methodology of existing commodities
* Termination of existing pricing series
* Initiation of new pricing series

If merited, an internal discussion will take place which will address changes in or terminations of existing commodities pricing data, as well as the initiation of new data. If necessary, formal procedures for conducting such changes or terminations will ensue.

Transparency is a non-negotiable value at Intratec. Thus, as important as a solid and reliable methodology, is a clear redaction that ensures that database users can understand both the kind of

data we provide and how we produce such data. Therefore, based on the feedback of database users, the redaction of our methodology is regularly reviewed regarding clarity and simplicity.

Intratec methodology is continuously tested and proven accurate by those who are reliant on our commodities pricing databases, e.g., chemical and oil corporations, R&D centers, EPC companies, biotech startups, local manufacturers and consultants, financial institutions, and government agencies.