



The EnergyStock Volatility Methodology Document

EnergyStock B.V



Introduction

Market price volatility is a key driver of the value and risk associated with flexible gas assets in European energy portfolios, for customer supply contracts, gas swing contracts and gas storage capacity.

As a result, volatility is a key input for commercial and risk management decisions of energy companies and energy traders. Even though every company has its own vision on volatility and the fact that historic volatility is relatively easy to calculate, at EnergyStock we believe that there is a large interest and additional value in publishing a clear and objective volatility index.

We attach great importance to a clean, transparent and objective calculation methodology. EnergyStock has developed its methodology in consultation with reputable industry market parties.

This document provides insight into the calculation methodology of the volatility information published on our website.

Index Definition

Historical volatility is a statistical measurement of the realised price variations of a specified contract over a specified time period. At present the indicator is only backward looking ; it is based on measurement of historical price behaviour. The EnergyStock volatility indices indicate the fluctuations of TTF spot prices, day- and month ahead prices, in time. Separate indices are published for different delivery periods: we calculate a rolling-30 day and an annual volatility index.

Dataset selection

Our volatility indices are based on the TTF price information of ICIS Heren. EnergyStock uses TTF End of Day midpoint prices (average between bid and ask). The Day Ahead and Month Ahead prices are used to calculate the indices. Weekend prices are excluded in the data set.

Given the varying applications of volatility by trading functions of utilities, producers, commodity traders and funds, we have developed indices based both on short and long term delivery periods. The rolling 30-days volatility index takes into account the TTF spot prices of the last 30 trading days. The annual volatility index is based on the TTF prices of the last 252 trading days. So if the first described volatility is higher than the last one, overall volatility over the last month was higher than over the last year.

The end of month volatility showed in the graph is based on the TTF prices of that particular month.

Price returns

In order to be able to calculate volatility a consistent measure of price fluctuations or price returns is required. The index uses a log return measure to calculate price fluctuations. The advantage of using a log return measure is that it normalises price changes so they are independent of the absolute level of market price. This means relative price movements when prices are high can be consistently compared with relative movements when prices are low. The second advantage is that the log returns of prices with a log normal distribution are normally distributed. This is a useful feature for gas markets where prices tend to be log normally distributed.



Standard Deviation

The formula for standard deviation of the sample population is used to calculate dispersion of the data points.

$$St.Dev.S. = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (x_{i=1} - \bar{x})^2}$$

Scaling

As a convention, historical volatility tends to be quoted on an annualised basis. Historic volatility is "annualised" by multiplying the standard deviation by the square root of the number of observations across a full year. To keep the calculation transparent, EnergyStock uses an average number of trading days in a typical year, 252 days, to annualise the index.

Spot volatility formula

In summary, EnergyStock indices are calculated using the following formula.

1. Calculate the normalised daily price return

$$\Delta P_T = LN\left(\frac{P_T}{P_{T-1}}\right)$$

2. Calculate the standard deviation of all the price returns included in the defined delivery period

$$St.Dev.S. = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (x_{i=1} - \bar{x})^2}$$

3. Annualise the standard deviation
Volatility=St.Dev.S.* $\sqrt{252}$

Price Jumps

In periods of market stress (e.g. major asset outages) extreme price jumps / spikes (up or down) can occur. A price jump is defined as a price return larger than three standard deviations. Given the need for simplicity and transparency, price jumps are included in the calculation of EnergyStock indices. Additional information is provided on the amount of price jumps that have occurred within the delivery periods of the separate indicators, either 30 or 252 trading days.

Quality Assurance

EnergyStock strives for consistent and high quality information on the website. A number of daily checks are executed to assure the quality of the published information. However, we remain dependent on the price data quality provided by ICIS Heren. Where any issues are detected, the last correct update of the index remains published on the website. Once the issue has been solved, the indices are updated. The time stamp on the website shows the last update of the indices.

By default, the update of the volatility indices takes place every day at 11:00 pm to maximize the chance that correct and the most recent prices are available on ICIS Heren.

In addition to implementing controls and checks into the daily process, published indices of the last 3 months are re-calculated each day to guarantee that the current view of all prices is used.

Disclaimer

No rights can be derived from the indices published on the website. EnergyStock can not be held responsible for the use made of the indices or for any losses incurred in such usage.



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