



PricePedia.it

Methodological Note

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Introduction

This document describes the methodology adopted by StudiaBo for the processing of data in the PricePedia portal (www.pricepedia.it). The PricePedia project revolves around prices. Prices have different sources and nature but their use is aimed at extrapolating useful information to companies in the process of purchasing production inputs.

Types of information

Sources

The data used in the PricePedia¹ portal refer to:

- import flows of EU countries;
- official international quotations.

EU countries' import flows are from Eurostat, which periodically publishes monthly import declarations from EU countries, with a delay of about 2 months (e.g.: in April 2022, data concerning February 2022 declarations were published). For the PricePedia project we chose to use import data from EU countries for the following reasons:

- technology (transport and information exchange) has made sourcing processes increasingly international and, therefore, European data is more robust and representative than national data;
- the 8-digit Combined Nomenclature classifies about 8000 products, which allows for a high level of detail;
- data published by Eurostat are free and public. This guarantees transparency and control.

International quotations are sourced from the major futures markets:

- London Metal Exchange (LME);
- Chicago Mercantile Exchange (CME);
- London Bullion Market (LBMA);

- Intercontinental Exchange (ICE).

The data contained in the PricePedia portal, although from different sources, show a strong correlation.

Financial Prices

The financial data refer to the time series of daily and monthly prices of futures traded on the main international markets.

Futures are standardised forward contracts negotiated on a stock exchange, in which the underlying is the purchase of a certain quantity of an asset (usually commodities) at an agreed price. The price is therefore negotiated at the moment of conclusion on the basis of the information and expectations of the future price on that day, although the actual exchange will take place in the future. In the meantime, before the contract is realised, the price of the same good but contracted later may change significantly. The price considered refers to the settlement price, i.e. the average daily trading price of futures. Since these contracts are stipulated with an irregular frequency and with different maturities, for a medium-long term analysis we have taken into account the "continuous contracts".

Continuous Contracts

For the study of the time series of single contracts, it is therefore necessary to calculate the trend of homogeneous contracts, creating a temporal continuity. This calculation, carried out on the basis of the trading volumes and of course of the average contract prices, allows a study of the evolution of the dynamics of the transactions and of the strategic positions assumed by the market operators. The continuous contracts used in the PricePe-

¹One of the main differences concerns the level of product detail: while quotations refer to materials with standard shape, size and weight, customs prices refer to very specific commodities and semi-finished products (8-digit Combined Nomenclature).

dia portal have been elaborated from the Quandl platform (<https://www.quandl.com/>), which also contains the price trends of the contracts (*futures*). Continuous contracts are calculated in order to give the possibility to study the time series of the single contracts.

PricePedia shows two contracts for each commodity (if any): a futures contract with an expiry date within one month, also called "*spot*", and one with a longer expiry date, from a minimum of two months to a maximum of 3 years.

The role of financial prices

It is particularly important to monitor financial dynamics in the context of interconnected global markets such as those in which commodities are traded.

The actors in these markets may have different purposes. Generally, dealers use financial contracts to:

- hedging against speculative risks;
- insurance against possible situations of excessive scarcity of materials;
- increase of the contractual force towards producers.

On the side of specific financial operators, such as hedge funds, geopolitical events determine the possibility of speculative actions that often have a strong impact on market operators. Very often the interconnection between the financial and real markets allows the transmission of increases or decreases caused by speculative actions.

In PricePedia, financial data have a dual function. First of all, they inform about the trend of international prices of commodities. The differentiation of one-month (or spot) and futures contracts also provides "expert opinion". Distances in the price level of the two contracts can reveal two types of market situations:

- a situation considered normal in which the prices of short-term contracts are lower than those of long-term contracts. The higher price of the long term contract reflects some costs (inventory, etc.);
- the higher price of the longer maturity contract reflects some costs (inventory, etc.); the higher price of the shorter maturity contract reflects some costs (inventory, etc.); and the higher price of the longer maturity contract reflects some costs (inventory, etc.). A further key may be the expectation of future reduction experts, who may believe that the short-term price is not sustainable in the medium to long term.

In PricePedia financial data are finally used for updating customs prices. They are used to update customs data to the current month. The modalities of use will be specified in the section concerning the Error Correction Model (ECM) and **nowcasting**.

Customs Prices

Customs data are the result of the aggregation of European customs inflows (import quantities and values). The main problem related to these data is the frequency with which they are updated: about two months late. In order to overcome this limitation and to offer up-to-date prices, econometric models and short-term forecasting methods, also known as snowcasting, have been used.

PricePedia Indexes

For a broader and more general understanding of the trends of the products present in PricePedia, synthetic indices aggregated by product types have been constructed.

They provide a robust representation of the phenomena taking place within a given type of pro-

duct.

Moreover, being relative measures, they allow a comparison of the performance of the various indices despite the fact that the products within the types have very different price levels.

- an index for each product type (energy, ferrous, etc.);
- a total index representative of the indices of the types.

These have been constructed considering 2017 as the base year. In the calculation no specific weights have been attributed to each product, so they are constructed as a simple arithmetic average.

The methodology

Nowcasting

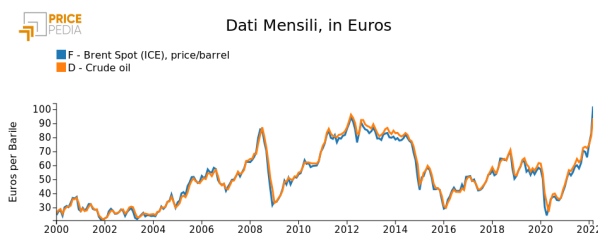
The term '*nowcasting*' refers to a short-term forecasting technique. In this case, *nowcasting* has been used to update customs prices to the current month, exploiting the link between "real prices" and the trend of financial prices. In particular, it is possible to divide the methodology into three phases:

- study of the link between customs and financial prices;
- ECM and calculation of the "*forecast in sample*";
- application of the "*constant adjustment*" model.

The study of the link between prices

The first phase requires the preliminary study of the price series. This is done first by means of a graphical analysis and then by statistical tests such as the Engle and Granger cointegration test and the Dickey-Fuller test on the order of integration of the series considered. Both the graphical analysis and the tests provide information necessary to study the link between financial and customs price series. In particular,

- the graphical analysis shows us first of all if the dynamics of the series considered have common "movements" and, if they do, it is also possible to notice the series that drives the dynamics. In most cases financial prices are the first to anticipate or show signs of structural turning points.



The proposed graph shows the evolution of the customs and financial price of oil, with a very slight lag of the customs price which "follows" the financial price. In some cases, financial prices are affected by temporary movements.

Indeed, prices are very sensitive to market forces but also to external ones: they react almost instantaneously even to international monetary and economic policy factors;

- the Dickey-Fuller test (order of integration) is used to check the order of integration of the series.
- the Engle and Granger test (cointegration test) is used to understand whether there is a long-run relationship between two series. This is done by studying the stationarity of the residual component (or error) of the static regression between the two variables in question.

If the two series have the same order of integration and cointegrate then there is a specification of the ECM that represents the link between the variables studied.

The Error Correction Model-ECM and the Forecast

After the preliminary analysis we proceed with the specification of the error-corrected model (ECM). This is one of the most robust models in the study of the link between time series. The ECM is able to capture both short-run and long-run effects. Moreover, the model is able to calculate the so-called "speed of adjustment", i.e. it is

able to determine in how many periods the model should reach the long-run equilibrium (target equilibrium). The model is specified as follows:

$$\Delta Y_t = c + \gamma \Delta X_t + \alpha[Y_{t-1} - \beta X_{t-1}] + v_t \quad (1)$$

oppure:

$$Y_t = c + \gamma \Delta X_t + (1 + \alpha)Y_{t-1} - \alpha(\beta X_{t-1}) + v_t \quad (2)$$

where: Y is the customs price series to be updated while X is a vector including both the financial quotation series expressed in dollars and the monthly exchange rate series. Alpha (*alpha*) reflects the speed of adjustment of the model.

As prices are monetary measures, to reduce possible scale effects for estimation, the variables have undergone a logarithmic transformation (monotonic transformation). (monotonic transformation).

After the model estimation phase using the OLS method, we move on to the "**forecast in sample**". In this phase, the value of the dependent variable (customs price) is reconstructed over the entire time span of the explanations, based on the estimated short- and long-run coefficients. The result is what can be defined as the *fit* of the *forecast in sample*: the evolution of the "expected" price series with the estimated link between the customs price and the quotations.

Constant Adjustment

After constructing this series, the percentage changes of the *fit* of the *forecast in sample* in the periods between the last historical observation of the customs price and the current month (last 3 months) are calculated. The changes are then applied to the last period of the historical series to obtain the update of the series to the current month.

Data Updating

The information in PricePedia is updated **daily** and **monthly**.

The monthly update takes place within the first 5 days of the following month. The choice of a single monthly update is a function both of the nature of the data offered by the portal and of the objective of maximum reliability. In order for the monthly averages to be representative of the ongoing phenomena, it has been decided to calculate them only after recording the observations of at least half of the current month.