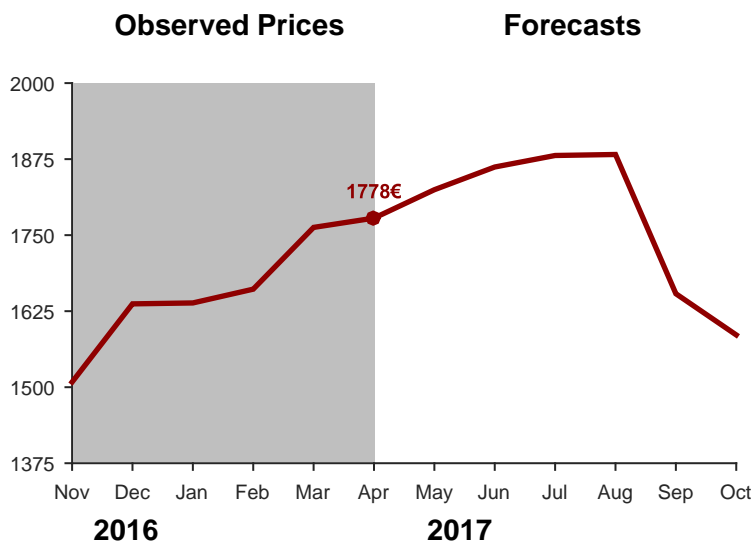


Forecasting the Price of Aluminium

Commodity	Aluminium (London Metal Exchange)
Forecast Period	May 2017 – October 2017
Currency	€
Unit	Metric Tonne
Observations	Monthly forecasts of the monthly average price



Forecasts



Month/Year	Forecast	Prob. of Raise
May 2017	1825€	79 %
Jun. 2017	1862€	68 %
Jul. 2017	1881€	57 %
Aug. 2017	1883€	54 %
Sep. 2017	1654€	49 %
Oct. 2017	1586€	48 %

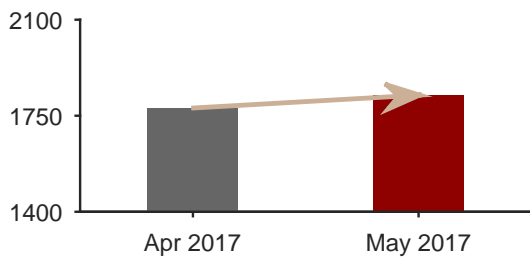
Suggested Action for Procurement

Purchase Limit Month	Suggested Action
May 2017	Buy in April at 1778€
June 2017	Buy in April at 1778€
July 2017	Buy in April at 1778€
August 2017	Buy in April at 1778€
September 2017	Buy part of requirements
October 2017	Buy part of requirements

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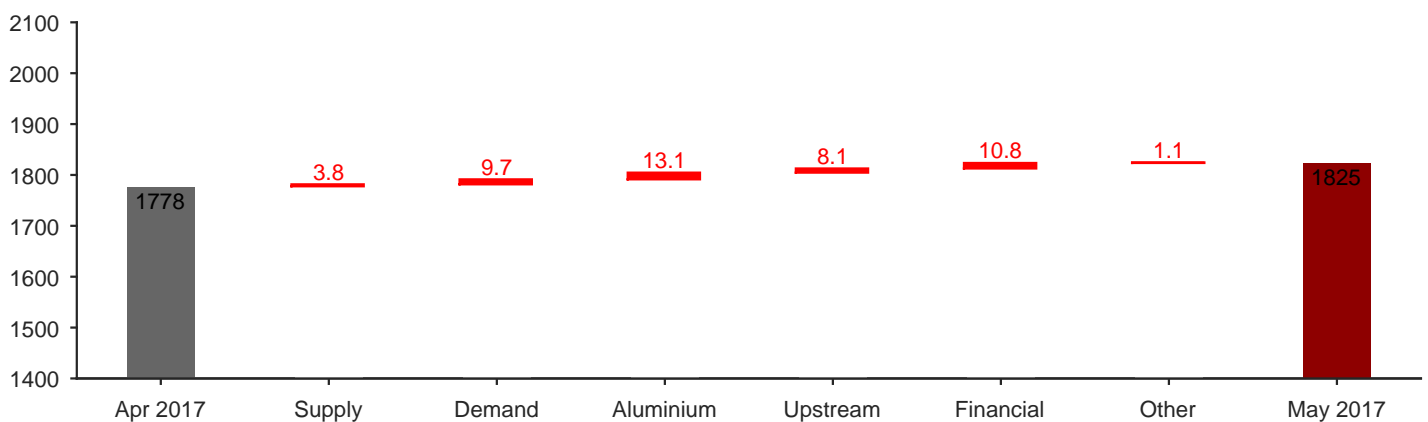
Forecasting the Price of Aluminium

Impact Analysis: One Month Forecast



Our algorithm forecasts a higher price of Aluminium in one month: it is expectable that the price increases 2.62% from 1778€ to 1825€ until the beginning of May.

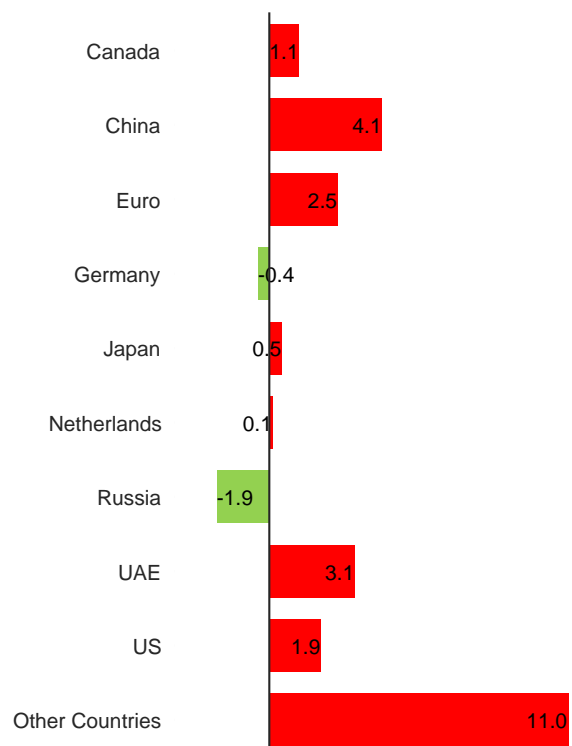
Indices of Factors



Interpretation

- **Decrease of Supply:** Positive pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- Positive pressure of the index of Aluminium
- Positive pressure of the index of variables representing the market upstream
- Positive pressure of the financial index
- Slightly positive pressure of other commodities and other factors
- Focus on UK, Mexico, and China

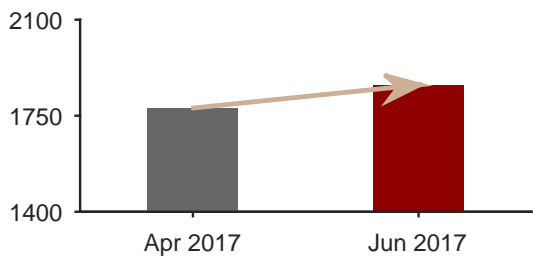
Impact per Country



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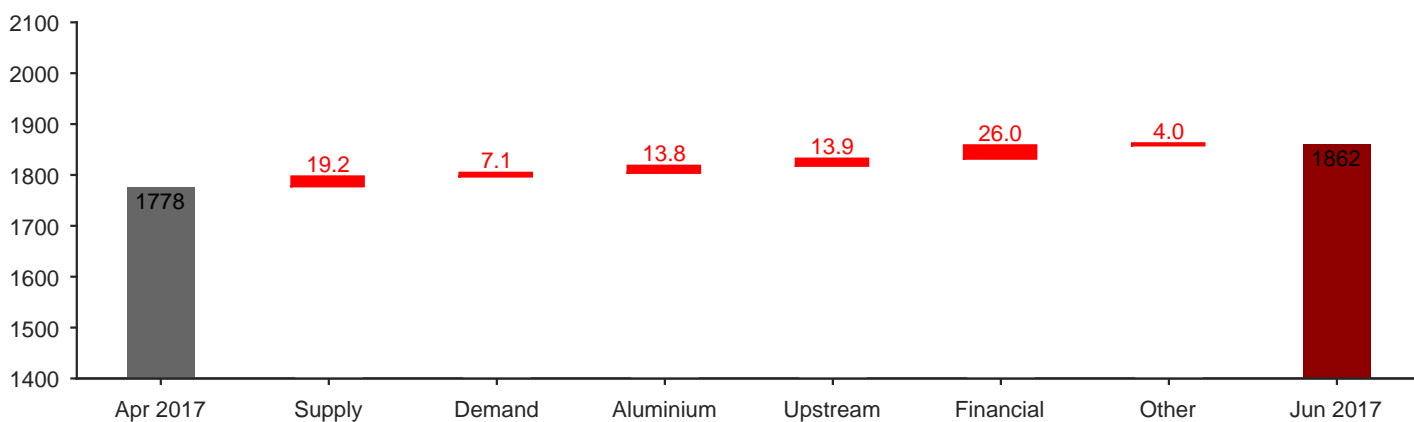
Forecasting the Price of Aluminium

Impact Analysis: Two Months Forecast



Our algorithm forecasts a higher price of Aluminium in two months: it is expectable that the price increases 4.72% from 1778€ to 1862€ until the beginning of June.

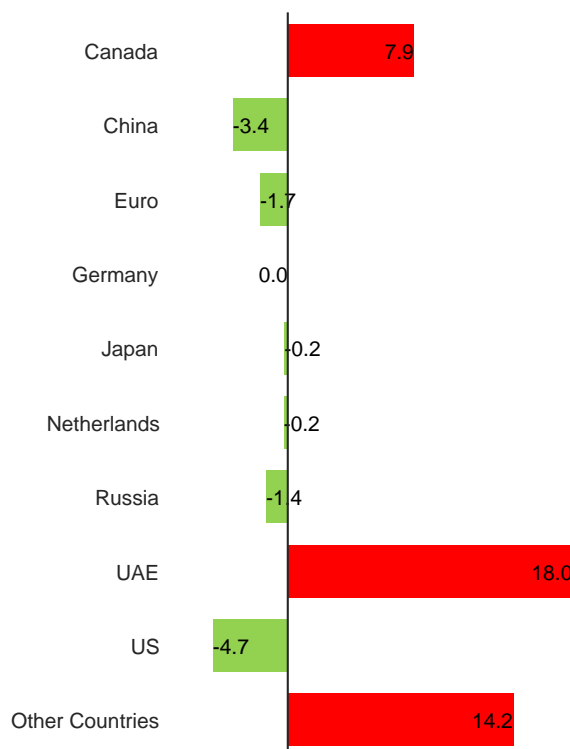
Indices of Factors



Interpretation

- **Decrease of Supply:** Positive pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- Positive pressure of the index of Aluminium
- Positive pressure of the index of variables representing the market upstream
- Positive pressure of the financial index
- Positive pressure of other commodities and other factors
- Focus on UAE, Mexico, and Canada

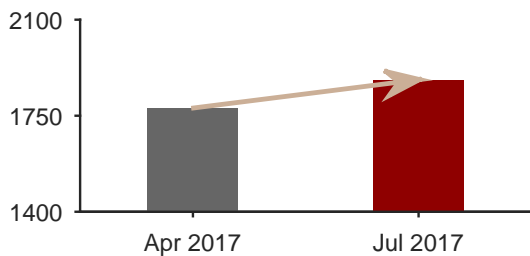
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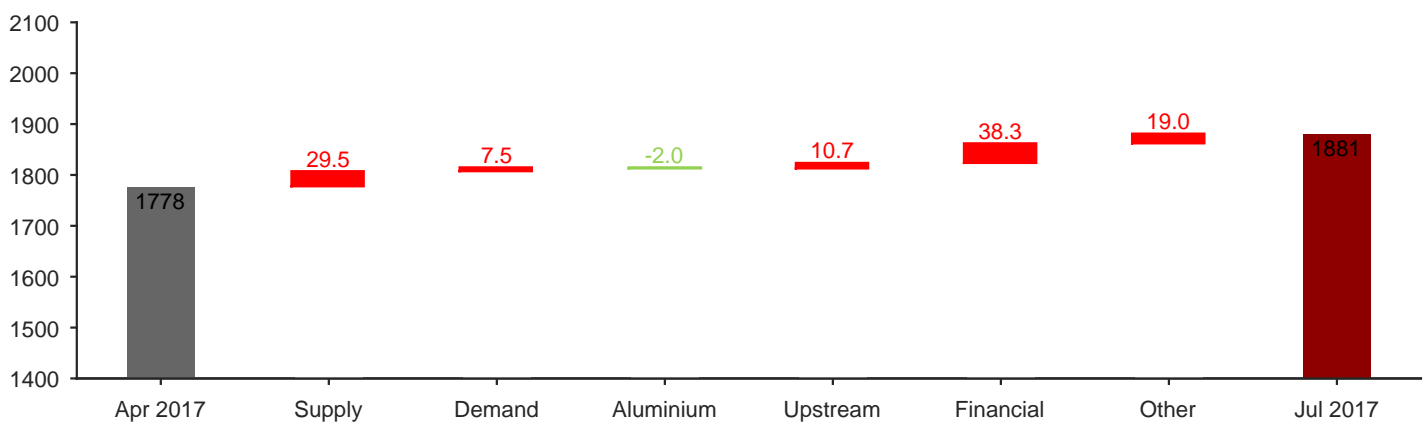
Forecasting the Price of Aluminium

Impact Analysis: Three Months Forecast



Our algorithm forecasts a higher price of Aluminium in three months: it is expectable that the price increases 5.79% from 1778€ to 1881€ until the beginning of July.

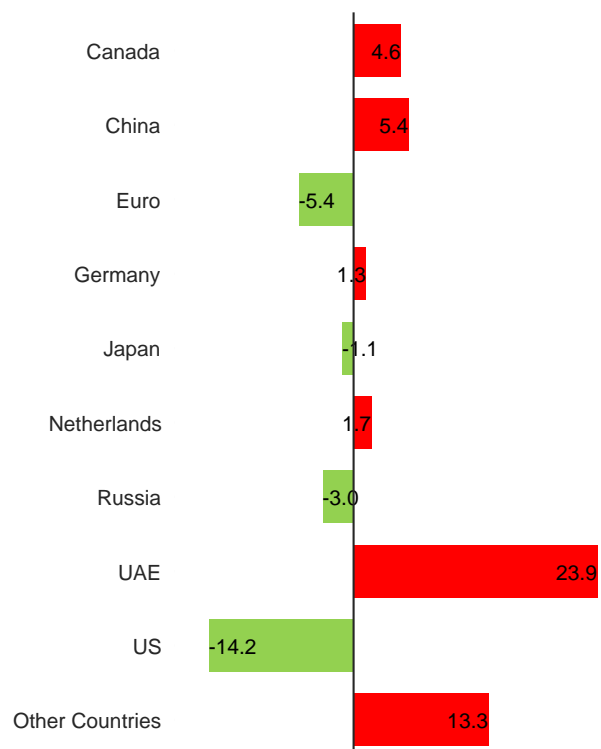
Indices of Factors



Interpretation

- **Decrease of Supply:** Positive pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- Slightly negative pressure of the index of Aluminium
- Positive pressure of the index of variables representing the market upstream
- **Considerably positive pressure of the financial index**
- Positive pressure of other commodities and other factors
- Focus on UAE, US, and India

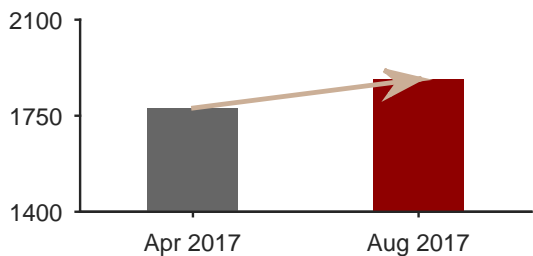
Impact per Country



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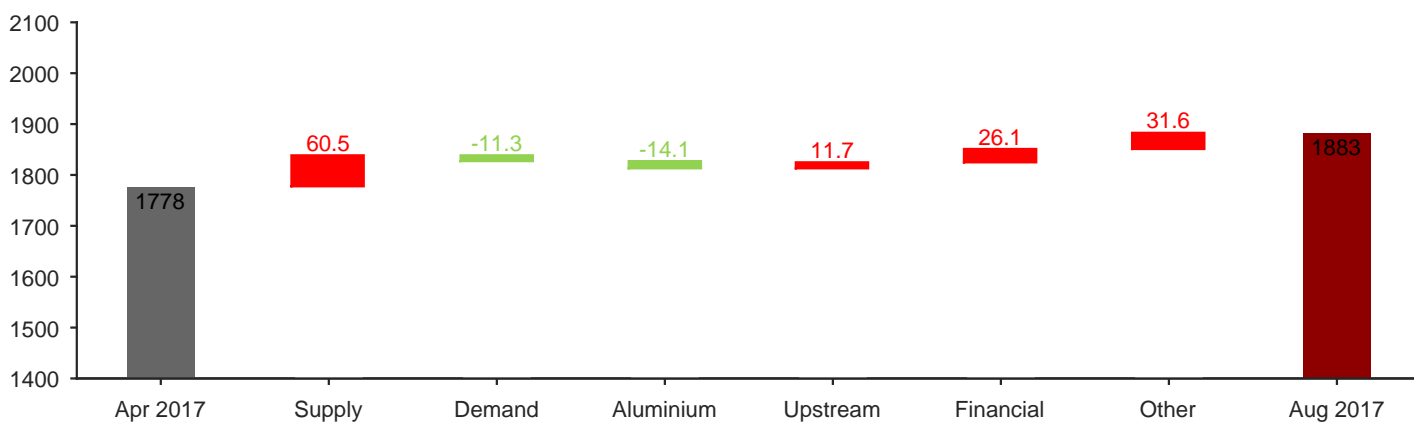
Forecasting the Price of Aluminium

Impact Analysis: Four Months Forecast



Our algorithm forecasts a higher price of Aluminium in four months: it is expectable that the price increases 5.88% from 1778€ to 1883€ until the beginning of August.

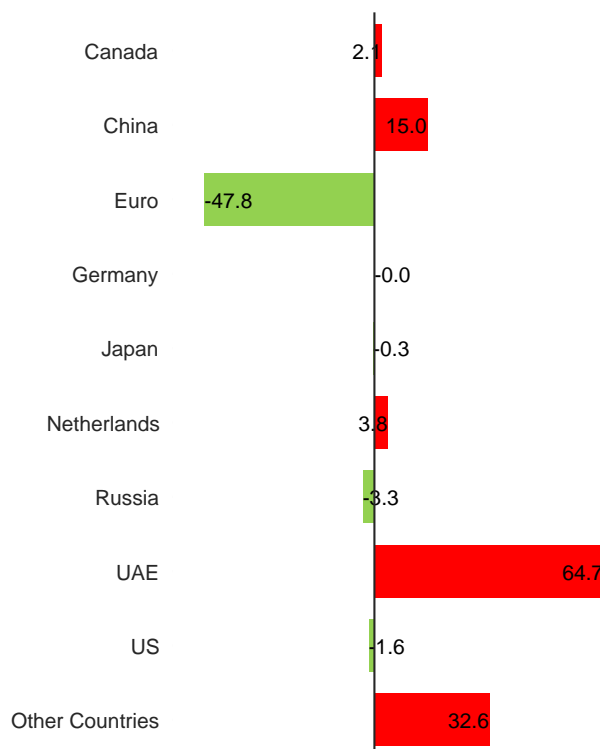
Indices of Factors



Interpretation

- **Considerable decrease of Supply:** Positive pressure of the Supply index
- **Decrease of Demand:** Negative pressure of the Demand index
- Negative pressure of the index of Aluminium
- Positive pressure of the index of variables representing the market upstream
- Positive pressure of the financial index
- Positive pressure of other commodities and other factors
- Focus on UAE, Euro, and India

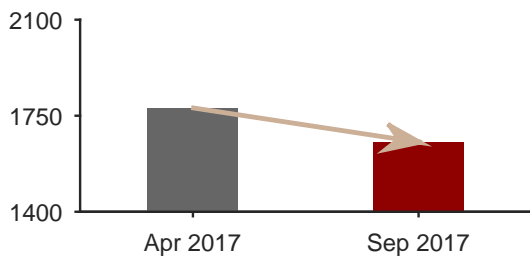
Impact per Country



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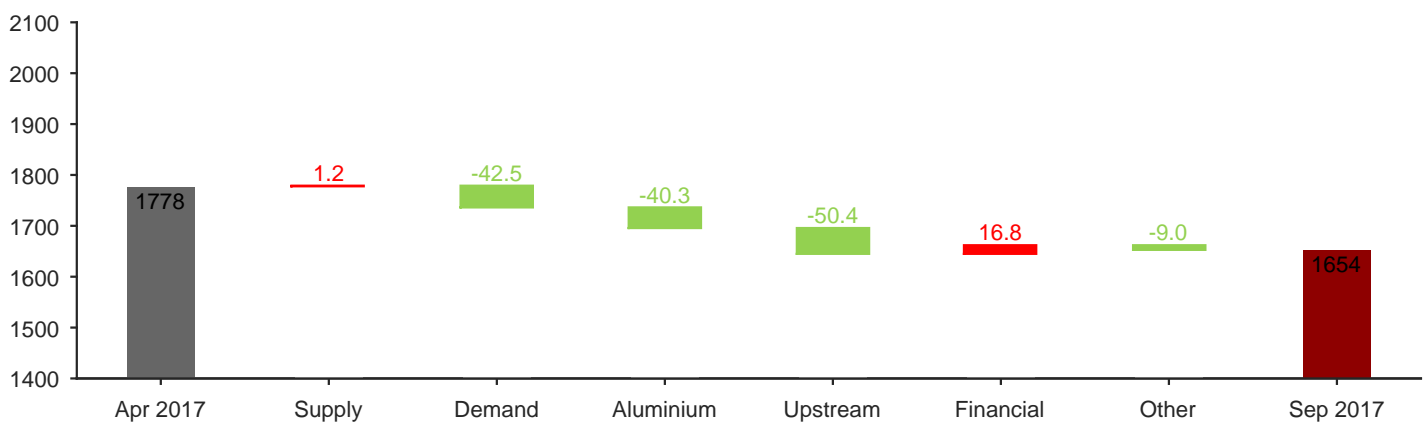
Forecasting the Price of Aluminium

Impact Analysis: Five Months Forecast



Our algorithm forecasts a lower price of Aluminium in five months: it is expectable that the price decreases 6.99% from 1778€ to 1654€ until the beginning of September.

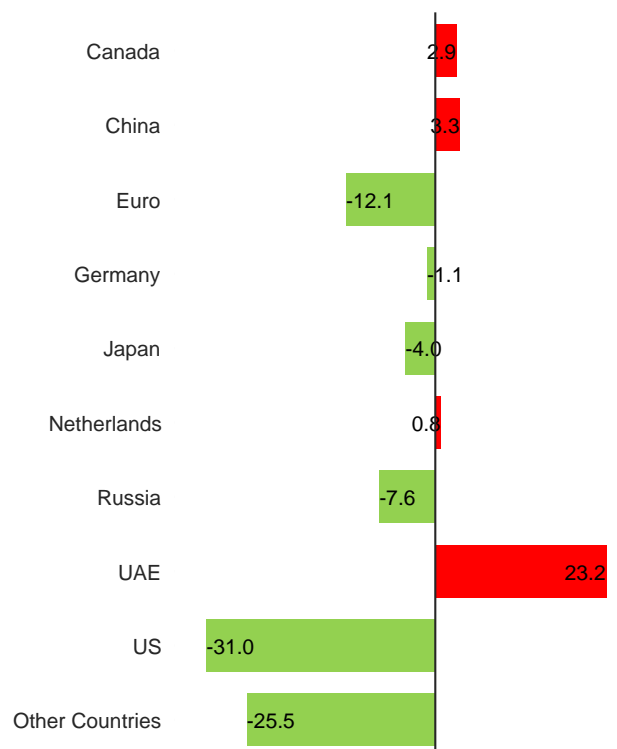
Indices of Factors



Interpretation

- Slight decrease of Supply: Positive pressure of the Supply index
- **Considerable decrease of Demand:** Negative pressure of the Demand index
- **Considerably negative pressure of the index of Aluminium**
- **Considerably negative pressure of the index of variables representing the market upstream**
- Positive pressure of the financial index
- Negative pressure of other commodities and other factors
- Focus on US, UAE, and Norway

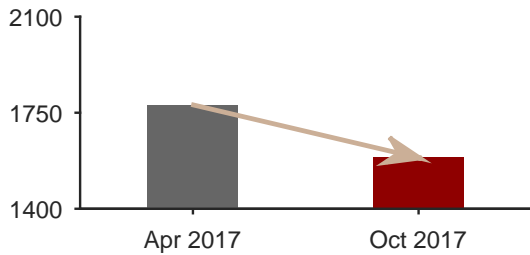
Impact per Country



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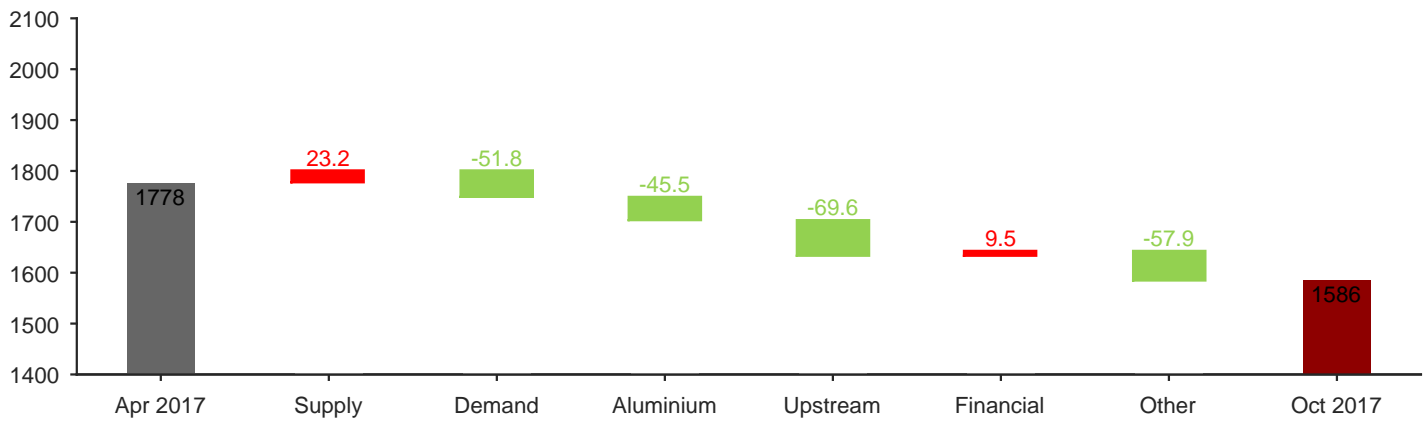
Forecasting the Price of Aluminium

Impact Analysis: Six Months Forecast



Our algorithm forecasts a lower price of Aluminium in six months: it is expectable that the price decreases 10.80% from 1778€ to 1586€ until the beginning of October.

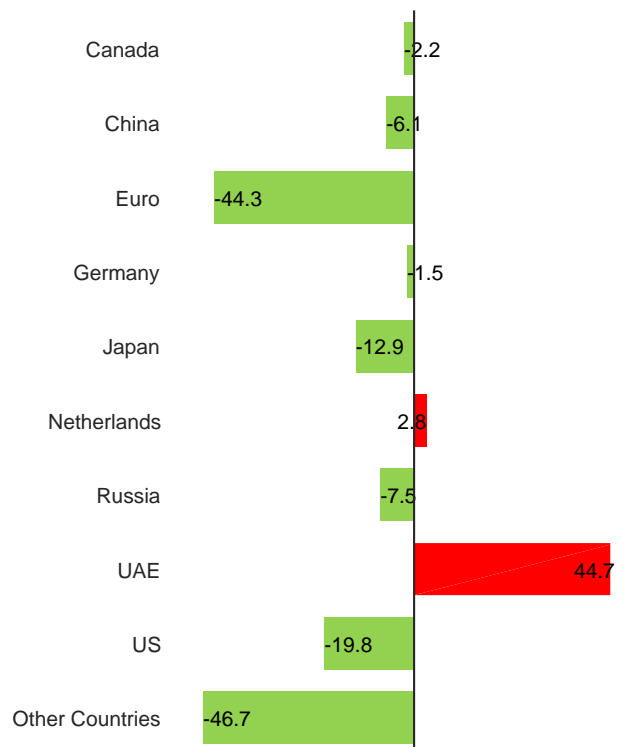
Indices of Factors



Interpretation

- **Decrease of Supply:** Positive pressure of the Supply index
- **Considerable decrease of Demand:** Negative pressure of the Demand index
- **Considerably negative pressure of the index of Aluminium**
- **Considerably negative pressure of the index of variables representing the market upstream**
- Slightly positive pressure of the financial index
- **Considerably negative pressure of other commodities and other factors**
- Focus on UAE, Euro, and Italy

Impact per Country



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Forecasting the Price of Aluminium

APPENDIX – Technical Explanation of the Impact Analysis

In this appendix, we explain the impact analysis of the factors that most contribute for our forecasts.

This Impact Analysis is conducted individually for **each time horizon**, allowing for a distinction between the indices of variables that contribute for our forecasts at short and medium run.

For each time horizon, our analysis has **two components**: first, we present the impact of variables grouped by **indices of factors**; second we present the impact of variables grouped by **indices of countries**.

Indices of Factors

Indices of factors are indices of the weighted contributions of the variables grouped in those factors.

Supply Index: composed of macroeconomic variables of the producing and exporting countries. It includes variables such as production, exchange rates, inflation, monetary policy, and wages. For example, an increase in wages implies higher production costs which should (in linear, general, and ceteris paribus terms) generate an incentive to increase prices;

Demand index: composed of macroeconomic variables of the consuming and importing countries. It includes variables such as production, exchange rates, inflation, monetary policy, and wages. For example, a decrease in a consumer confidence index should (in linear, general, and ceteris paribus terms) increase savings and decrease demand, leading to lower prices;

Aluminium Index: composed of variables related to Aluminium. It includes variables such as the price of Aluminium in different regions of the world and exports, imports, and producer prices of Aluminium in some countries. For example, an increase in the price of Aluminium in other region may imply an increase in the price of Aluminium in Europe due to arbitrage movements;

Upstream index: composed of variables related to Aluminium Ore and Coal. It includes variables such as the price and exports, imports, and producer prices of the inputs in some countries. For example, an increase in the price of Coal should (in linear, general, and ceteris paribus terms) generate an increase in the price of Aluminium;

Forecasting the Price of Aluminium

APPENDIX – Technical Explanation of the Impact Analysis (II)

Financial Variables Index: composed of financial market variables. It includes the share price of companies that produce Aluminium. It also includes financial indices related to this sector. For example, a positive change in the share price of a producer of Aluminium should (in linear, general, and ceteris paribus terms) imply an increase in expected profitability of the firm. This may signal an expectation of increase in the price of Aluminium;

Other Variables Index: composed of variables related to other commodities, such as Steel and Oil. It includes the price, exports, and imports of these commodities. For example, a positive change in the price of a substitute commodity, should (in linear, general, and ceteris paribus terms) imply an increase of demand of Aluminium, and thus, of the price of Aluminium.

Indices of Countries

Indices of Countries: are indices of the weighted contributions of the macroeconomic variables of each country. The countries we present are the most relevant countries in the production, consumption, and international commerce of Aluminium.

Interpretation Warning

It is important to note that the contribution of individual variables and indices of variables is not linear. The interaction between variables and between variables of different factors may not be neglectable, which means that the importance of each variable and indices of variables is determined together with the importance of all other variables.

Furthermore, the analysis of changes in variables is not linear. This means that the same variable with the same change in different moments of time may have different impacts given its previous evolution. For example, the algorithm contrasts the change in a variable with its expected change. A positive change but inferior to the expected change may originate an effect of price correction.