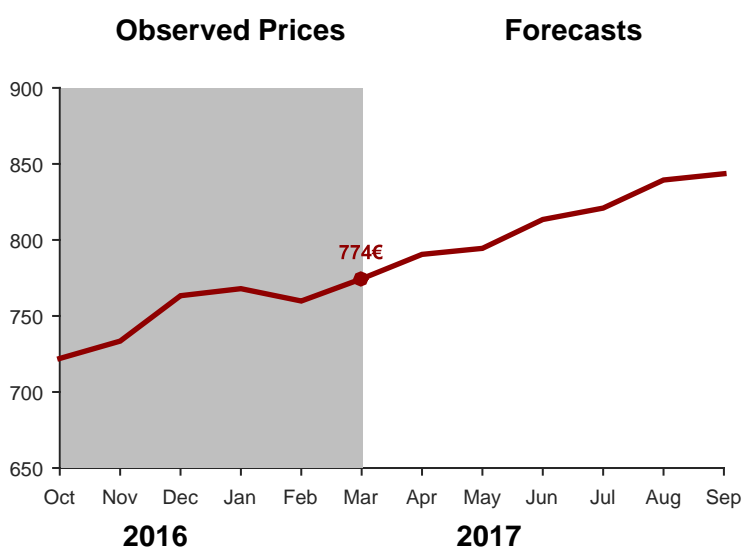


Forecasting the Price of NBSK

Commodity	NBSK (CIF W Europe)
Forecast Period	April 2017 – September 2017
Currency	€
Unit	Metric Tonne
Observations	Monthly forecasts of the spot price in the first day of the month



Forecasts



Month/Year	Forecast	Prob. of Raise
Apr. 2017	791€	58 %
May 2017	794€	65 %
Jun. 2017	813€	75 %
Jul. 2017	821€	61 %
Aug. 2017	839€	72 %
Sep. 2017	844€	61 %

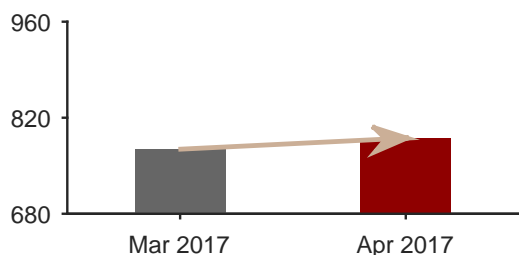
Suggested Action for Procurement

Purchase Limit Month	Suggested Action
April 2017	Buy in March at 774€
May 2017	Buy in March at 774€
June 2017	Buy in March at 774€
July 2017	Buy in March at 774€
August 2017	Buy in March at 774€
September 2017	Buy in March at 774€

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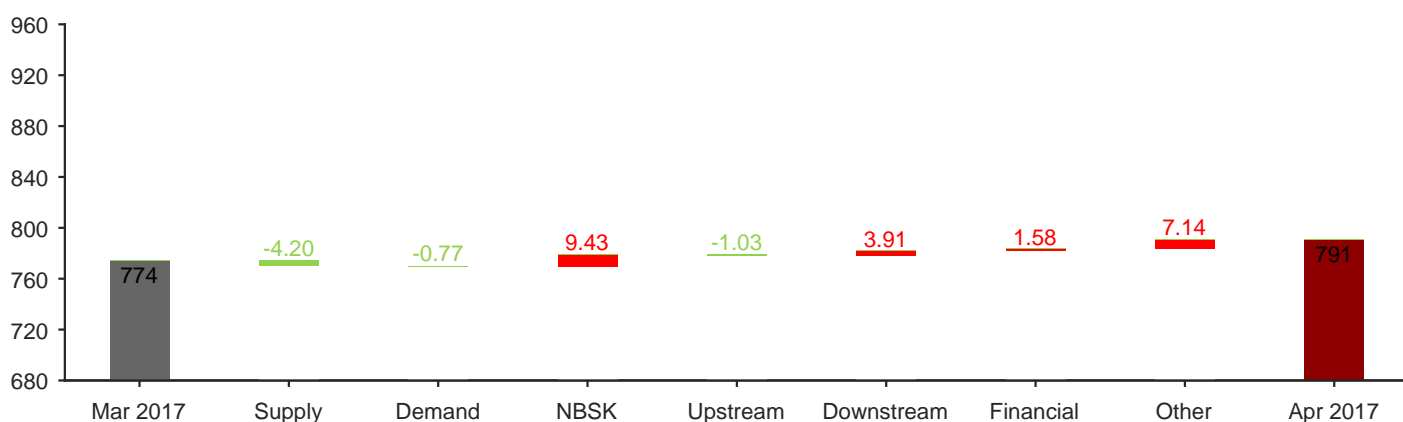
Forecasting the Price of NBSK

Impact Analysis: One Month Forecast



Our algorithm forecasts a higher price of NBSK in one month: it is expectable that the price increases 2.07% from 774€ to 791€ until the beginning of April.

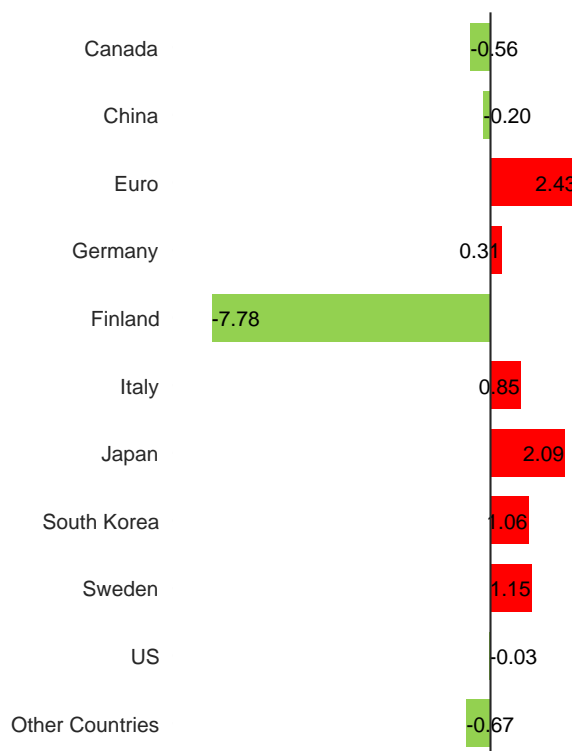
Indices of Factors



Interpretation

- **Increase of Supply:** Negative pressure of the Supply index
- Slight decrease of Demand: Negative pressure of the Demand index
- **Considerably positive pressure of the index of NBSK**
- Negative pressure of the index of variables representing the market upstream
- Positive pressure of the index of variables representing the market downstream
- Positive pressure of the financial index
- Positive pressure of other commodities and other factors
- Focus on Finland, Euro, and Japan

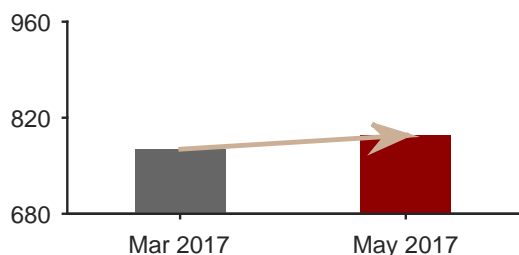
Impact per Country



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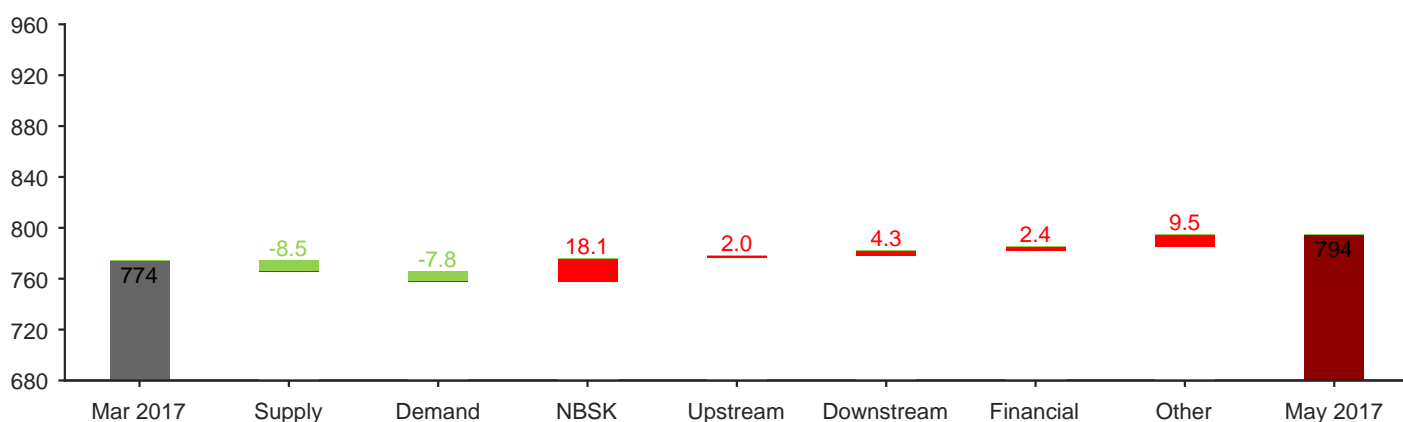
Forecasting the Price of NBSK

Impact Analysis: Two Months Forecast



Our algorithm forecasts a higher price of NBSK in two months: it is expectable that the price increases 2.58% from 774€ to 794€ until the beginning of May.

Indices of Factors



Interpretation

- **Increase of Supply:** Negative pressure of the Supply index
- **Decrease of Demand:** Negative pressure of the Demand index
- **Considerably positive pressure of the index of NBSK**
- Positive pressure of the index of variables representing the market upstream
- Positive pressure of the index of variables representing the market downstream
- Positive pressure of the financial index
- Positive pressure of other commodities and other factors
- Focus on Finland, US, and Netherlands

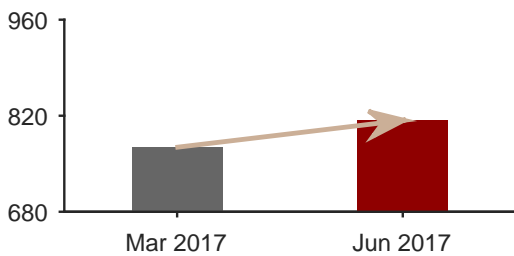
Impact per Country



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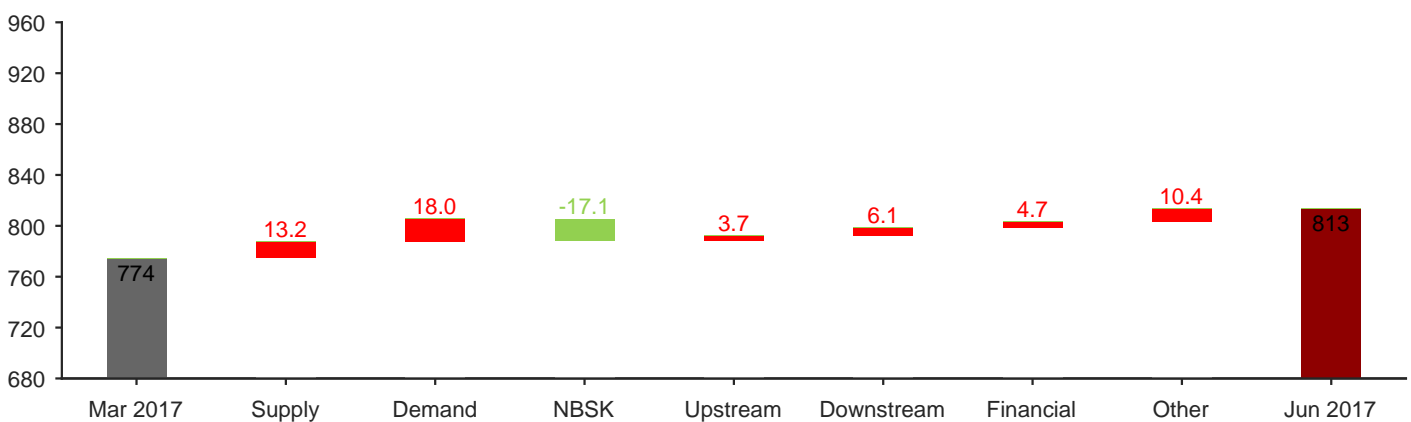
Forecasting the Price of NBSK

Impact Analysis: Three Months Forecast



Our algorithm forecasts a higher price of NBSK in three months: it is expectable that the price increases 5.03% from 774€ to 813€ until the beginning of June.

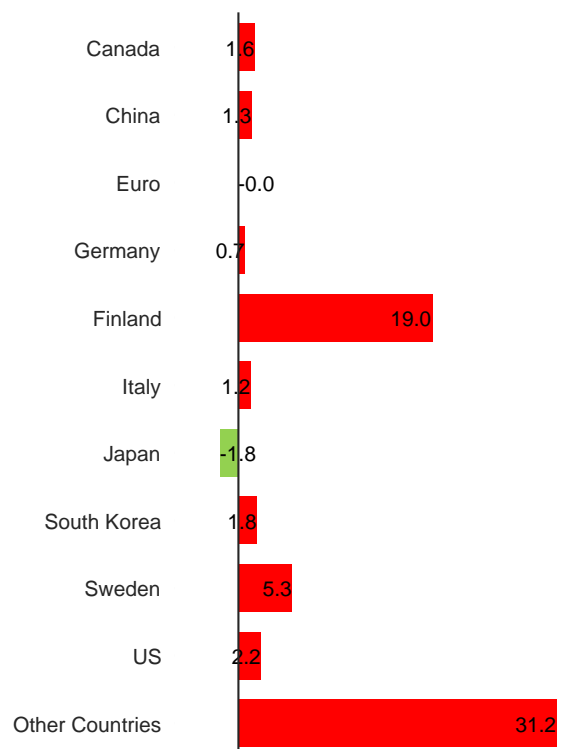
Indices of Factors



Interpretation

- **Considerable decrease of Supply:** Positive pressure of the Supply index
- **Considerable increase of Demand:** Positive pressure of the Demand index
- **Considerably negative pressure of the index of NBSK**
- Positive pressure of the index of variables representing the market upstream
- Positive pressure of the index of variables representing the market downstream
- Positive pressure of the financial index
- Positive pressure of other commodities and other factors
- Focus on Finland, Sweden, and US

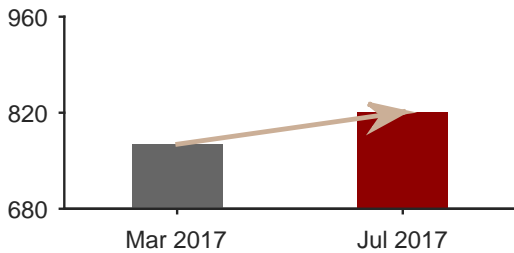
Impact per Country



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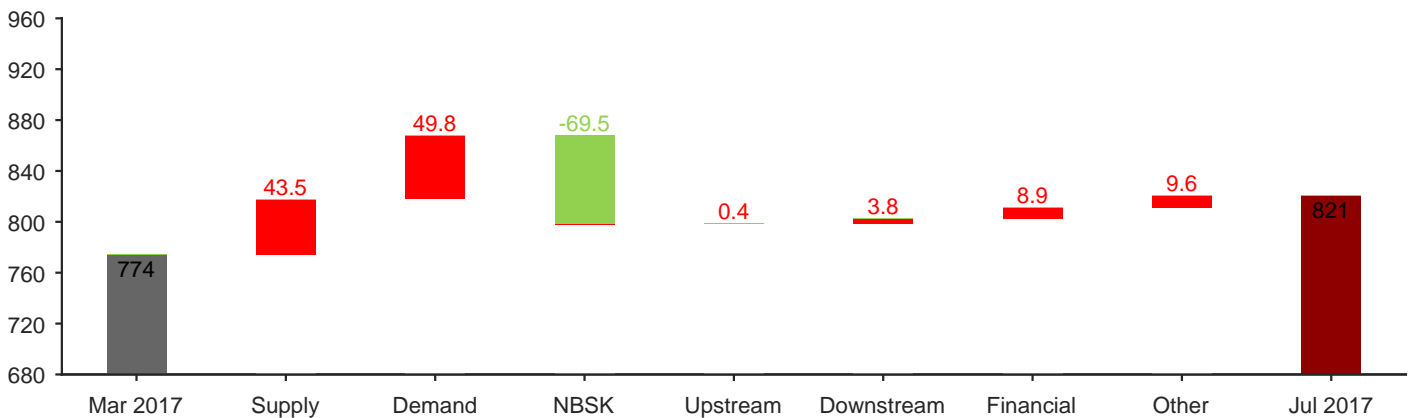
Forecasting the Price of NBSK

Impact Analysis: Four Months Forecast



Our algorithm forecasts a higher price of NBSK in four months: it is expectable that the price increases 6.00% from 774€ to 821€ until the beginning of July.

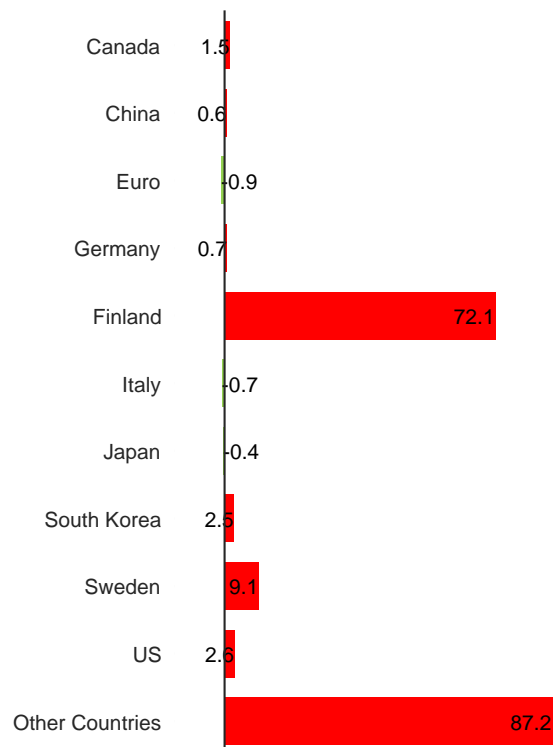
Indices of Factors



Interpretation

- **Considerable decrease of Supply:** Positive pressure of the Supply index
- **Considerable increase of Demand:** Positive pressure of the Demand index
- **Considerably negative pressure of the index of NBSK**
- Slightly positive pressure of the index of variables representing the market upstream
- Slightly positive pressure of the index of variables representing the market downstream
- Positive pressure of the financial index
- Positive pressure of other commodities and other factors
- Focus on Finland, Sweden, and Netherlands

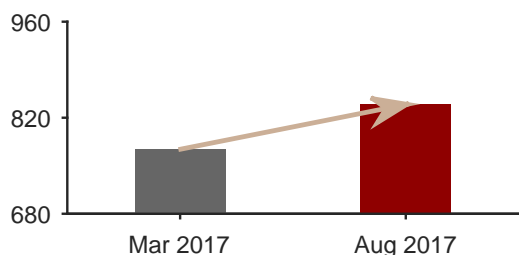
Impact per Country



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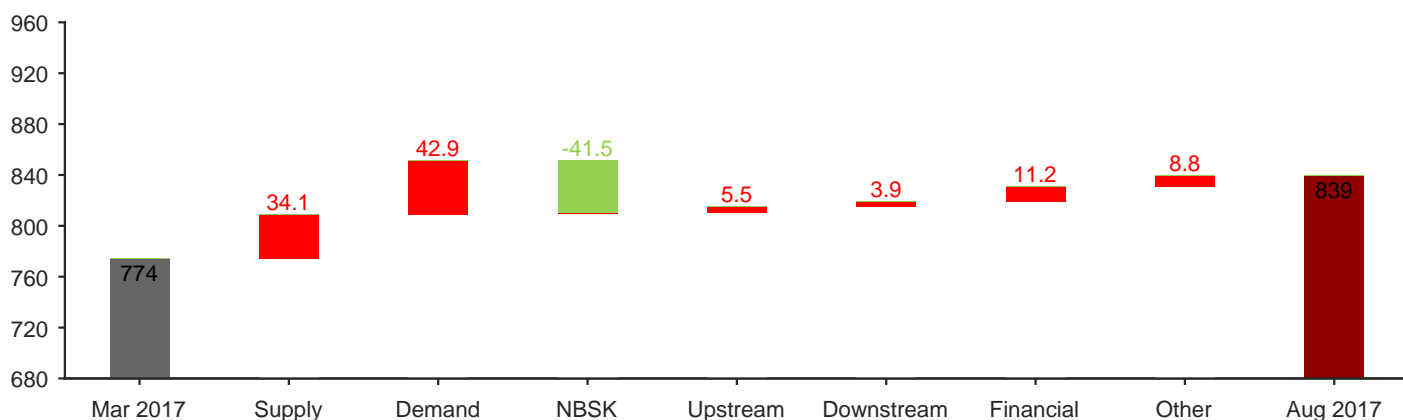
Forecasting the Price of NBSK

Impact Analysis: Five Months Forecast



Our algorithm forecasts a higher price of NBSK in five months: it is expectable that the price increases 8.38% from 774€ to 839€ until the beginning of August.

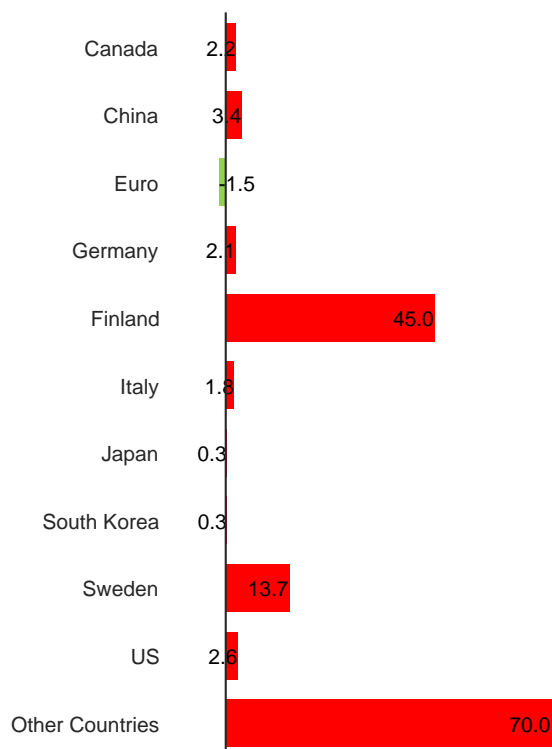
Indices of Factors



Interpretation

- **Considerable decrease of Supply:** Positive pressure of the Supply index
- **Considerable increase of Demand:** Positive pressure of the Demand index
- **Considerably negative pressure of the index of NBSK**
- Positive pressure of the index of variables representing the market upstream
- Slightly positive pressure of the index of variables representing the market downstream
- Positive pressure of the financial index
- Positive pressure of other commodities and other factors
- Focus on Finland, Sweden, and UK

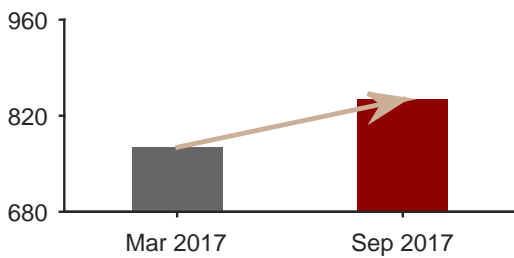
Impact per Country



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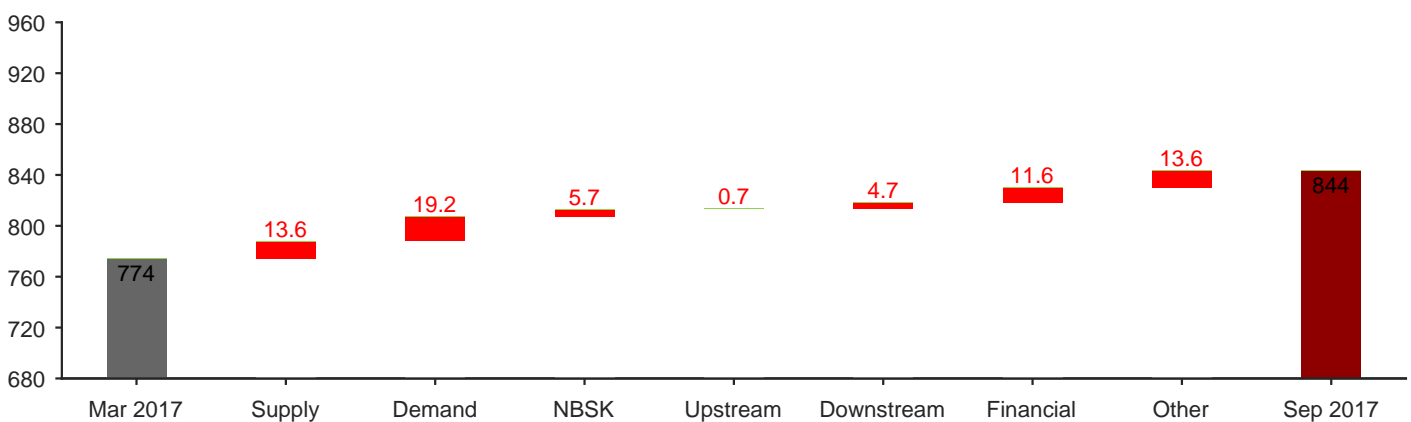
Forecasting the Price of NBSK

Impact Analysis: Six Months Forecast



Our algorithm forecasts a higher price of NBSK in six months: it is expectable that the price increases 8.92% from 774€ to 844€ until the beginning of September.

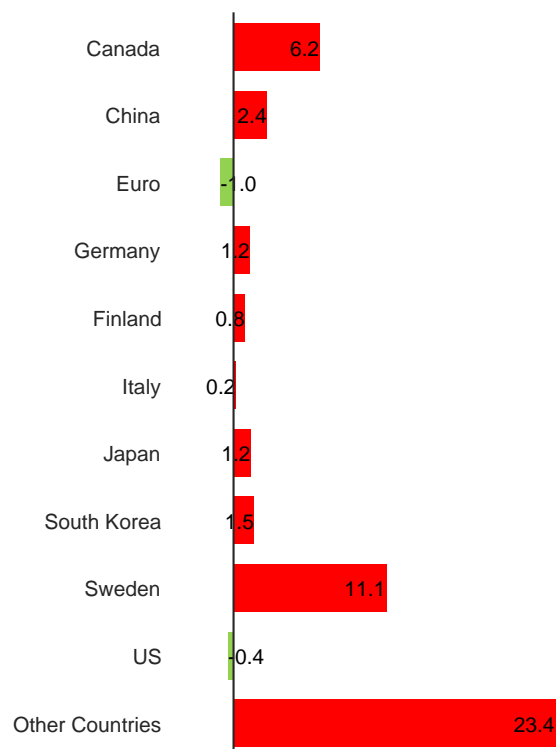
Indices of Factors



Interpretation

- **Considerable decrease of Supply:** Positive pressure of the Supply index
- **Considerable increase of Demand:** Positive pressure of the Demand index
- Positive pressure of the index of NBSK
- Slightly positive pressure of the index of variables representing the market upstream
- Positive pressure of the index of variables representing the market downstream
- Positive pressure of the financial index
- **Considerably positive pressure of other commodities and other factors**
- Focus on Sweden, UK, and Canada

Impact per Country



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Forecasting the Price of NBSK

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;

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

Upstream index: composed of variables related to Lumber and Caustic Soda. 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 Lumber should (in linear, general, and ceteris paribus terms) generate an increase in the price of NBSK;

Forecasting the Price of NBSK

APPENDIX – Technical Explanation of the Impact Analysis (II)

Downstream index: composed of variables related to downstream industries, such as Packaging and Paper. It includes variables such as the exports, imports, and producer prices of these industries in some countries. For example, an increase in the demand of these industries should (in linear, general, and ceteris paribus terms) generate an increase in the price of NBSK;

Financial Variables Index: composed of financial market variables. It includes the share price of companies that produce NBSK. It also includes financial indices related to this sector. For example, a positive change in the share price of a producer of NBSK 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 NBSK;

Other Variables Index: composed of variables related to other commodities, such as 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 NBSK, and thus, of the price of NBSK.

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 NBSK.

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.