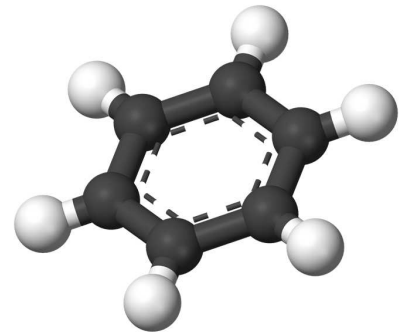
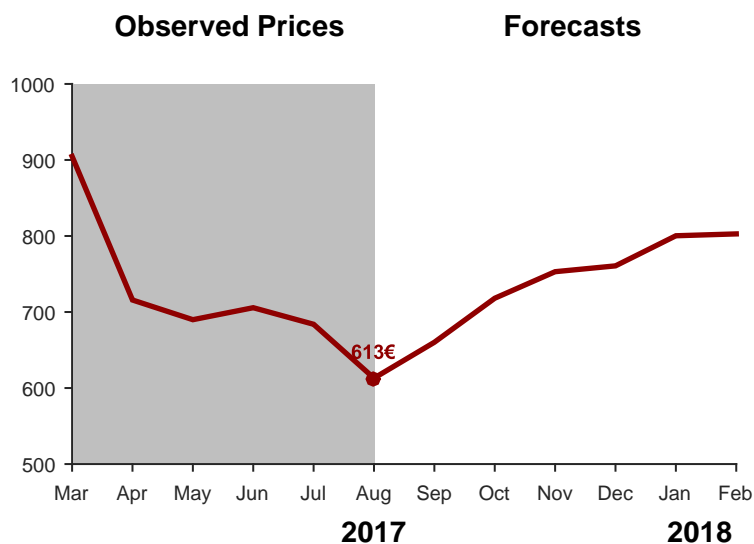


Forecasting the Price of Benzene

Commodity	Benzene (Spot FOB Rotterdam)
Forecast Period	September 2017 – February 2018
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
Sep. 2017	660€	69 %
Oct. 2017	718€	86 %
Nov. 2017	753€	82 %
Dec. 2017	761€	75 %
Jan. 2018	800€	75 %
Feb. 2018	803€	70 %

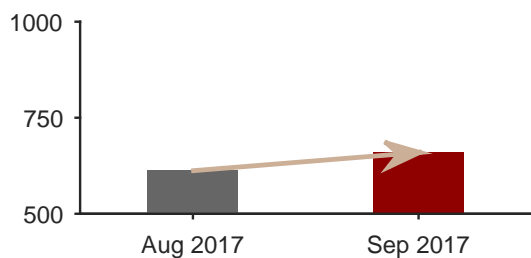
Suggested Action for Procurement

Purchase Limit Month	Suggested Action
September 2017	Buy in August at 613€
October 2017	Buy in August at 613€
November 2017	Buy in August at 613€
December 2017	Buy in August at 613€
January 2018	Buy in August at 613€
February 2018	Buy in August at 613€

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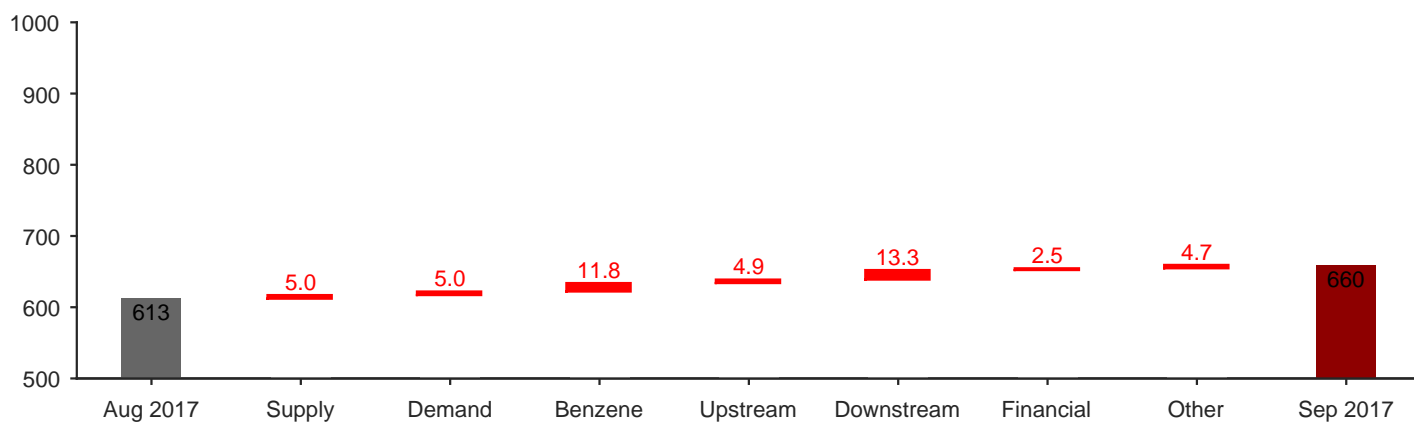
Forecasting the Price of Benzene

Impact Analysis: One Month Forecast



Our algorithm forecasts a higher price of Benzene in one month: it is expectable that the price increases 7.69% from 613€ to 660€ until the beginning of September.

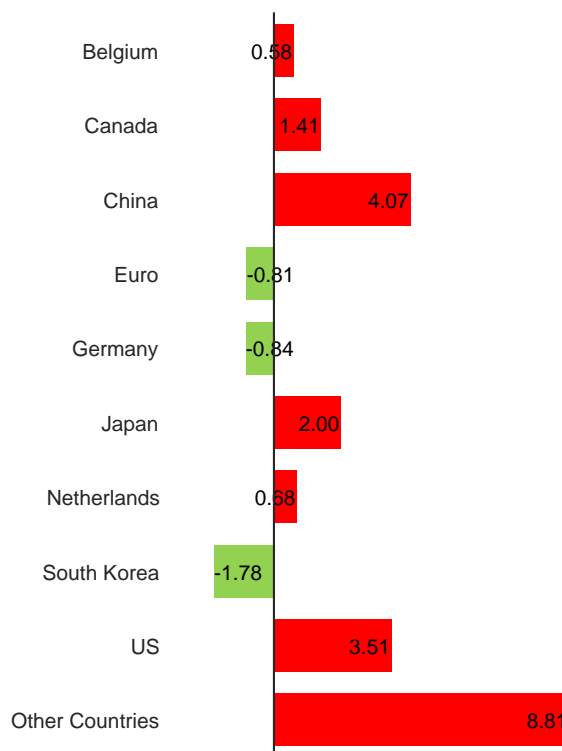
Indices of Factors



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 Benzene
- 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 China, Australia, and US

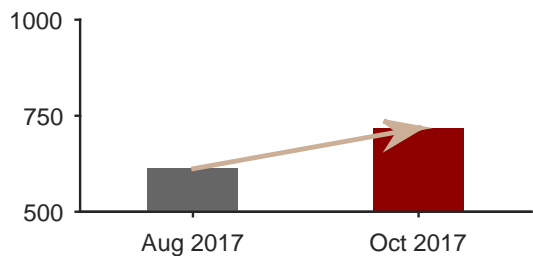
Impact per Country



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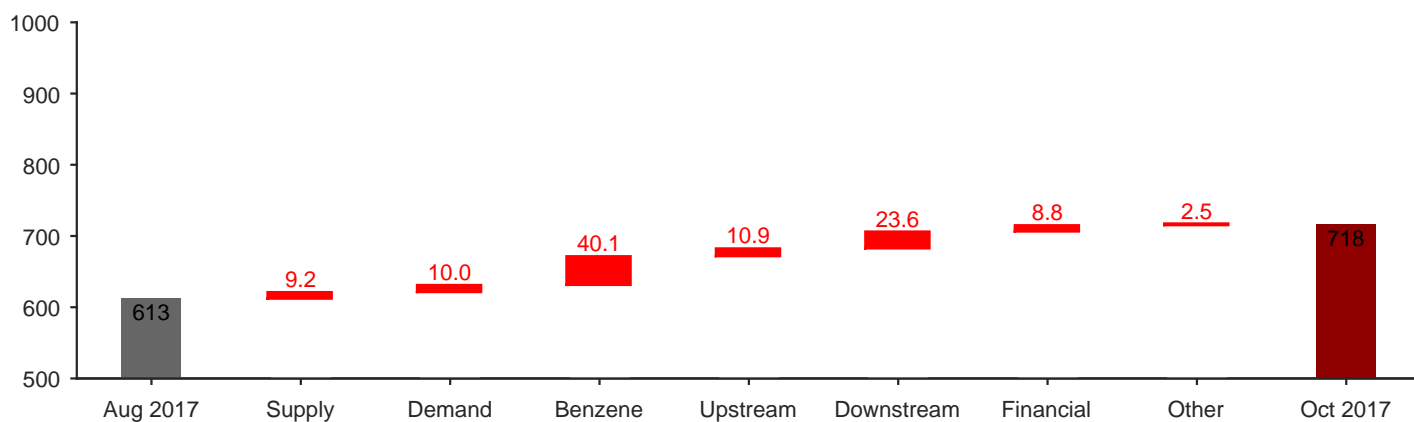
Forecasting the Price of Benzene

Impact Analysis: Two Months Forecast



Our algorithm forecasts a higher price of Benzene in two months: it is expectable that the price increases 17.14% from 613€ to 718€ until the beginning of October.

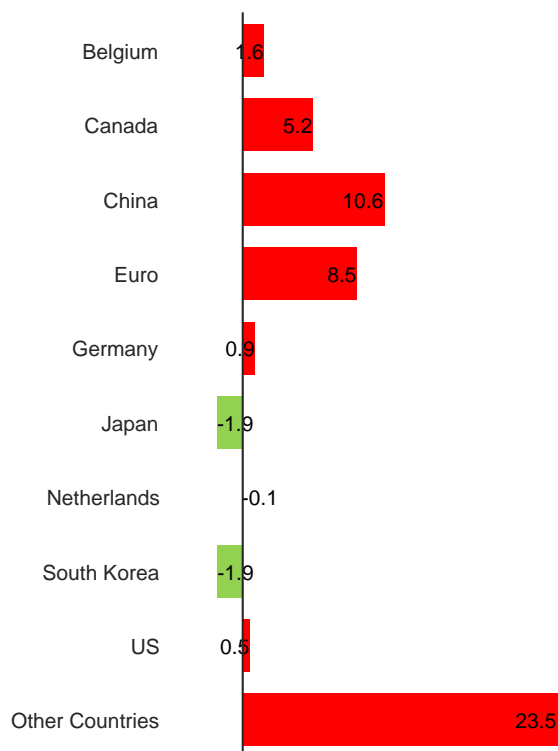
Indices of Factors



Interpretation

- **Decrease of Supply:** Positive pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- **Considerably positive pressure of the index of Benzene**
- 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
- Slightly positive pressure of other commodities and other factors
- Focus on China, Australia, and Euro

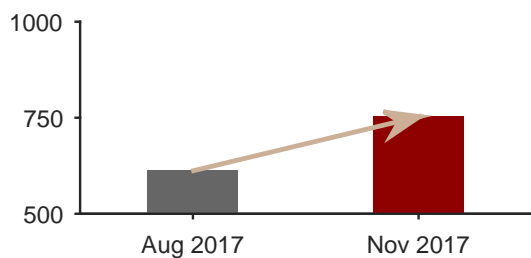
Impact per Country



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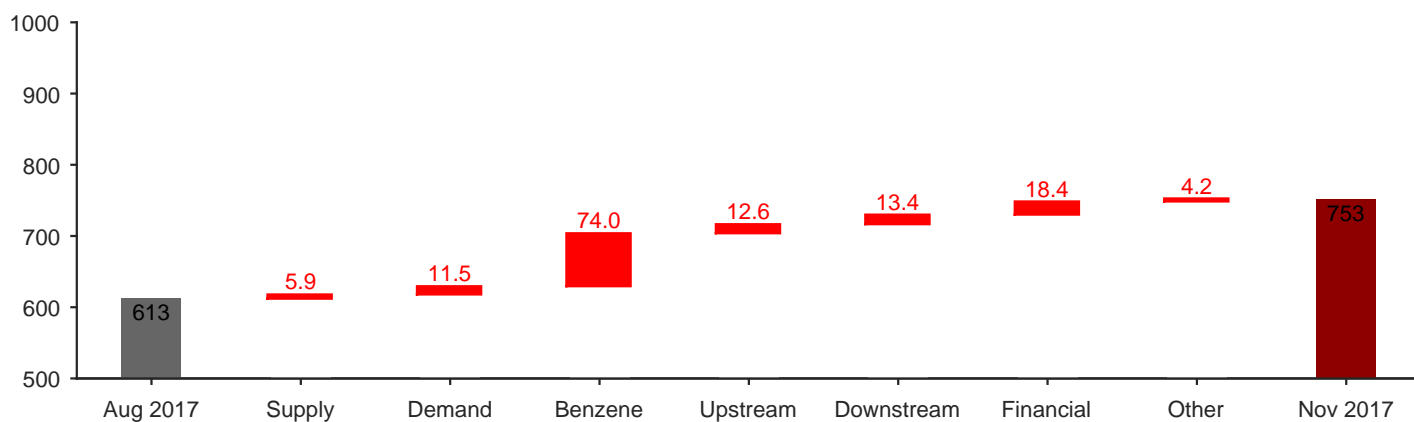
Forecasting the Price of Benzene

Impact Analysis: Three Months Forecast



Our algorithm forecasts a higher price of Benzene in three months: it is expectable that the price increases 22.84% from 613€ to 753€ until the beginning of November.

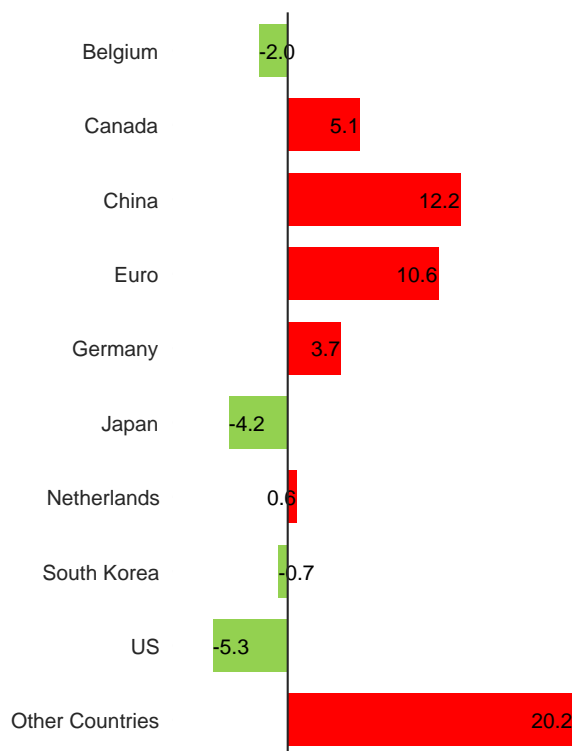
Indices of Factors



Interpretation

- **Decrease of Supply:** Positive pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- **Considerably positive pressure of the index of Benzene**
- 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
- Slightly positive pressure of other commodities and other factors
- Focus on China, Euro, and US

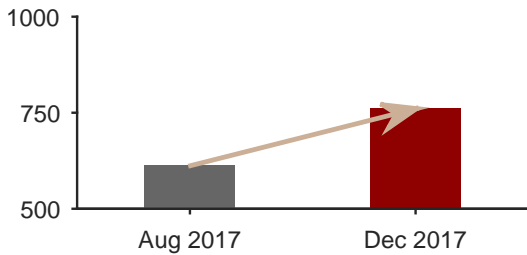
Impact per Country



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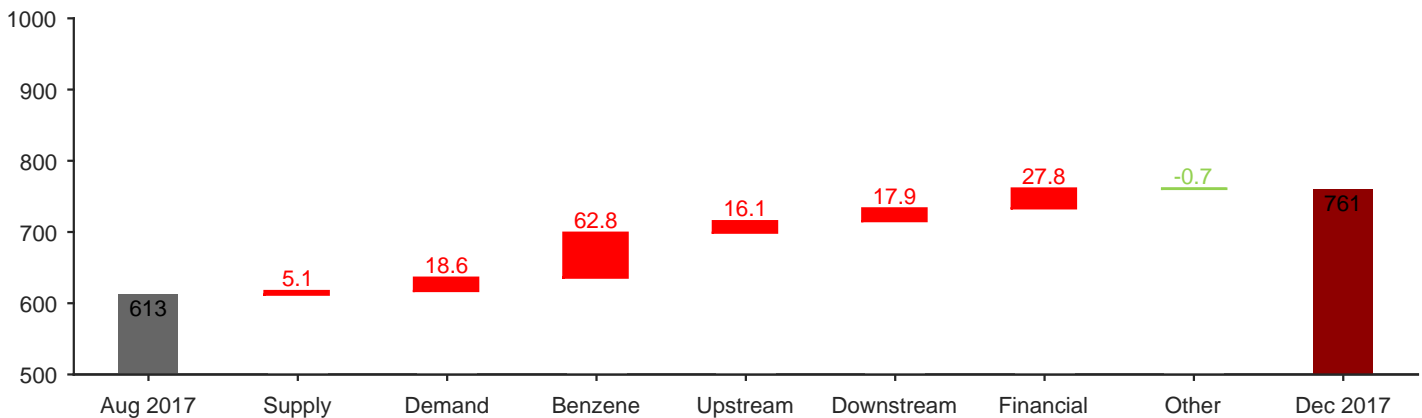
Forecasting the Price of Benzene

Impact Analysis: Four Months Forecast



Our algorithm forecasts a higher price of Benzene in four months: it is expectable that the price increases 24.09% from 613€ to 761€ until the beginning of December.

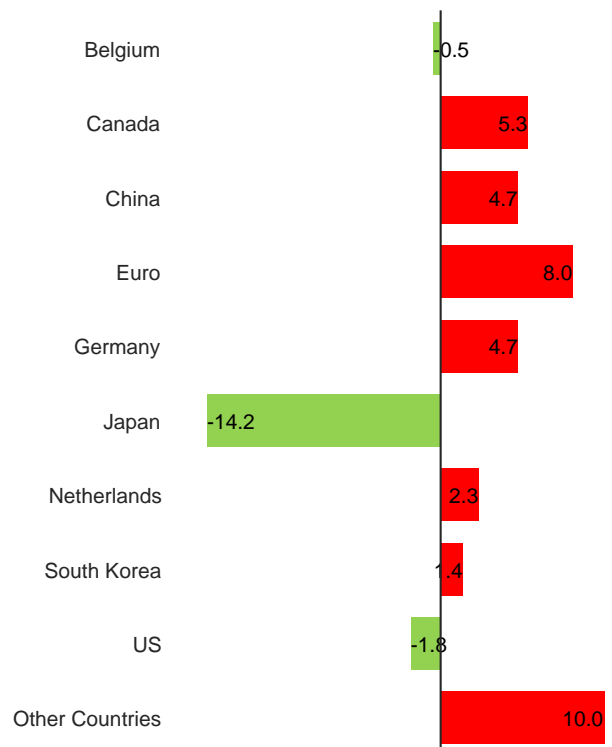
Indices of Factors



Interpretation

- Slight decrease of Supply: Positive pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- **Considerably positive pressure of the index of Benzene**
- 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
- Slightly negative pressure of other commodities and other factors
- Focus on Japan, Euro, and UK

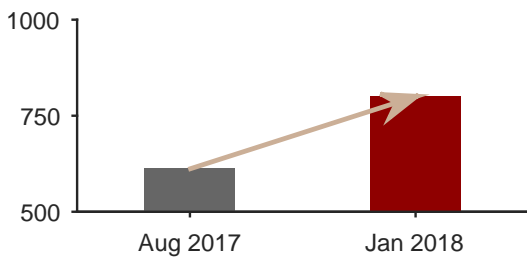
Impact per Country



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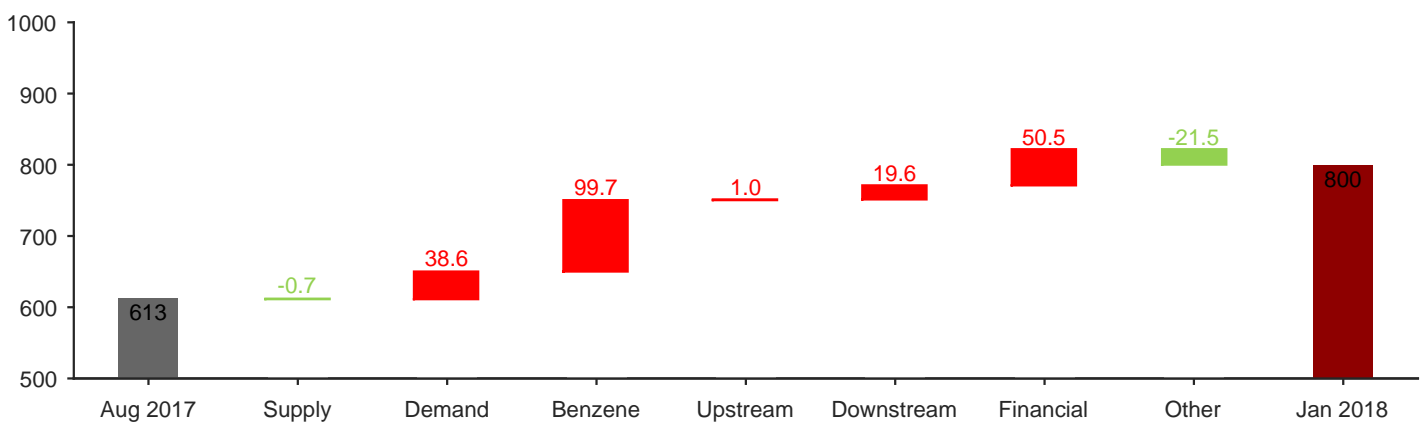
Forecasting the Price of Benzene

Impact Analysis: Five Months Forecast



Our algorithm forecasts a higher price of Benzene in five months: it is expectable that the price increases 30.55% from 613€ to 800€ until the beginning of January.

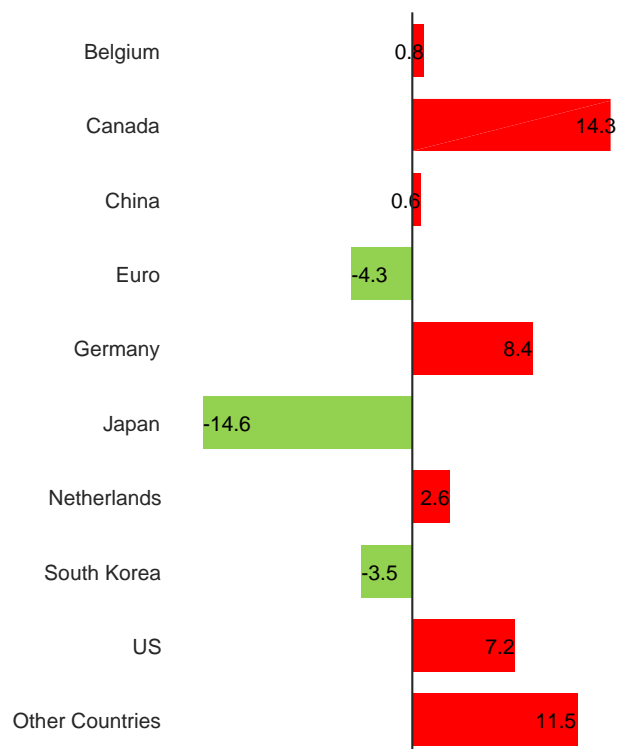
Indices of Factors



Interpretation

- Slight increase of Supply: Negative pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- **Considerably positive pressure of the index of Benzene**
- Slightly positive pressure of the index of variables representing the market upstream
- Positive pressure of the index of variables representing the market downstream
- **Considerably positive pressure of the financial index**
- Negative pressure of other commodities and other factors
- Focus on UK, Japan, and Canada

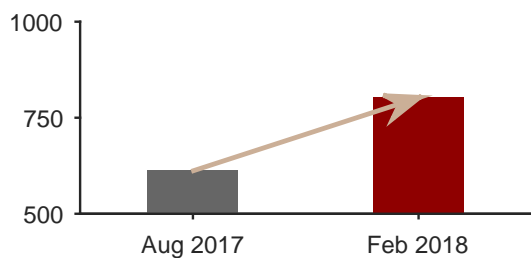
Impact per Country



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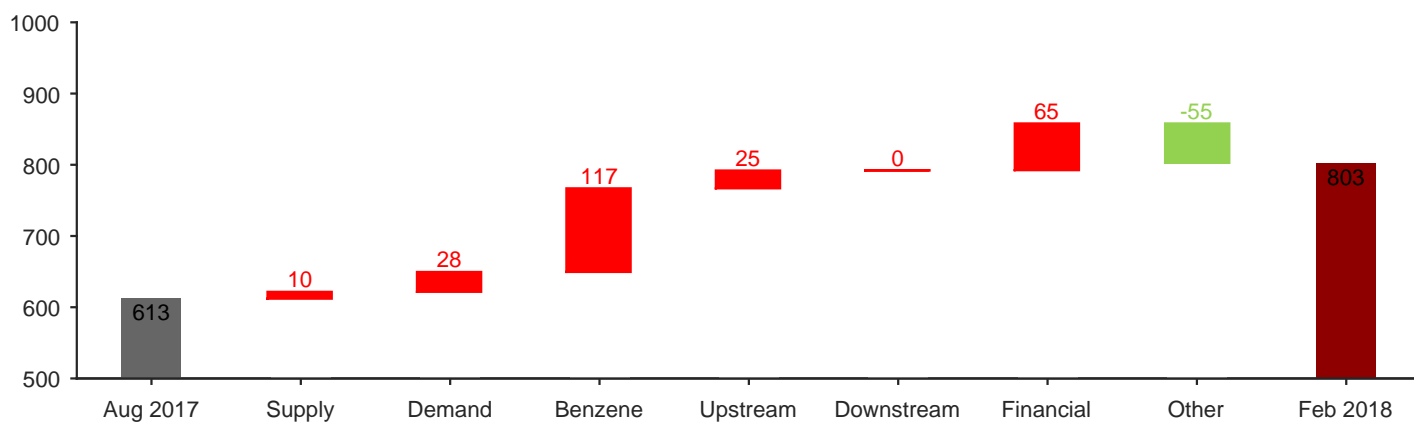
Forecasting the Price of Benzene

Impact Analysis: Six Months Forecast



Our algorithm forecasts a higher price of Benzene in six months: it is expectable that the price increases 30.95% from 613€ to 803€ until the beginning of February.

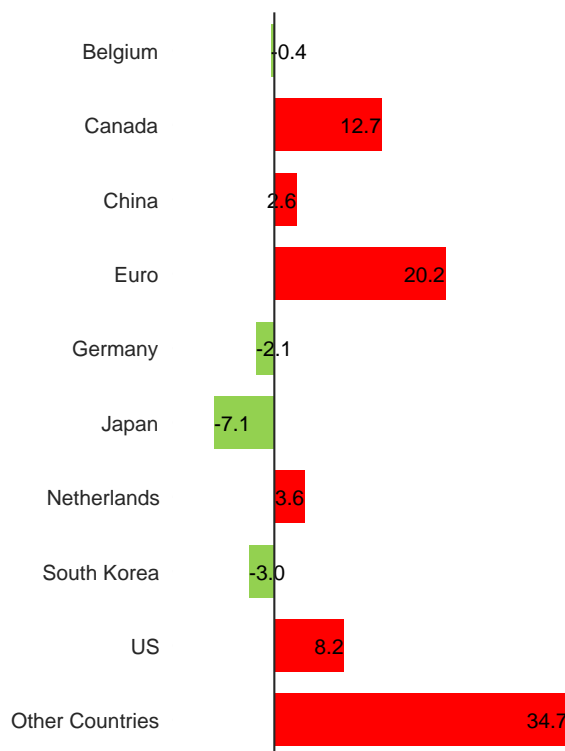
Indices of Factors



Interpretation

- Slight decrease of Supply: Positive pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- **Considerably positive pressure of the index of Benzene**
- Positive pressure of the index of variables representing the market upstream
- Slightly positive pressure of the index of variables representing the market downstream
- **Considerably positive pressure of the financial index**
- **Considerably negative pressure of other commodities and other factors**
- Focus on UK, Euro, and Canada

Impact per Country



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Forecasting the Price of Benzene

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;

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

Upstream index: composed of variables related to Oil and Natural Gas. 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 Oil should (in linear, general, and ceteris paribus terms) generate an increase in the price of Benzene;

Forecasting the Price of Benzene

APPENDIX – Technical Explanation of the Impact Analysis (II)

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

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

Other Variables Index: composed of variables related to other commodities, such as Propylene, Toluene, and Ethylene. 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 Benzene, and thus, of the price of Benzene.

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 Benzene.

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.