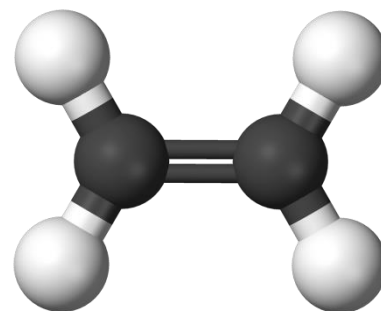
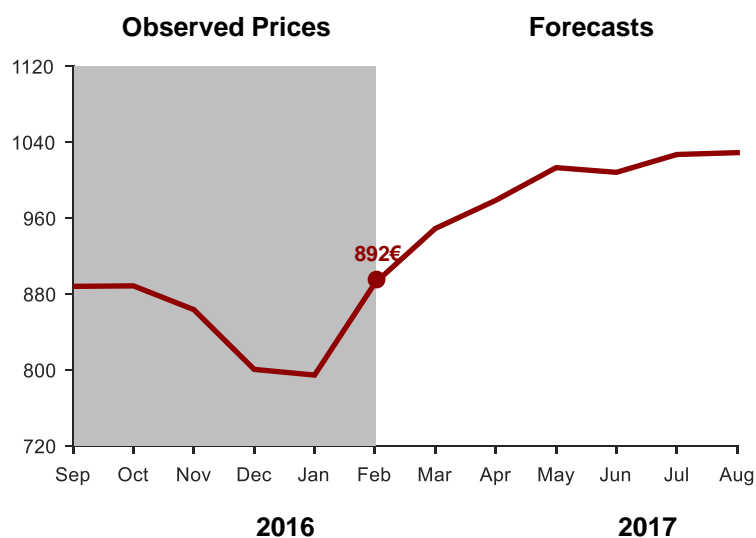


Forecasting the Price of Ethylene

| | |
|------------------------|---|
| Commodity | Ethylene (Spot FD NW Europe) |
| Forecast Period | March 2017 – August 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 |
|------------|----------|----------------|
| Mar. 2017 | 949€ | 82% |
| Abr. 2017 | 979€ | 74% |
| Mai. 2017 | 1013€ | 72% |
| Jun. 2017 | 1008€ | 68% |
| Jul. 2017 | 1027€ | 64% |
| Aug. 2017 | 1029€ | 54% |

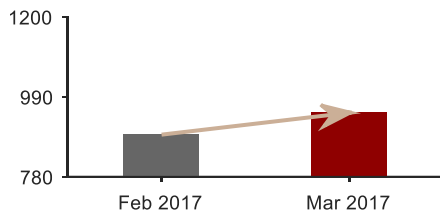
Suggested Action for Procurement

| Purchase Limit Month | Suggested Action |
|----------------------|-------------------------|
| March 2017 | Buy in February at 892€ |
| April 2017 | Buy in February at 892€ |
| May 2017 | Buy in February at 892€ |
| June 2017 | Buy in February at 892€ |
| July 2017 | Buy in February at 892€ |
| August 2017 | Buy in February at 892€ |

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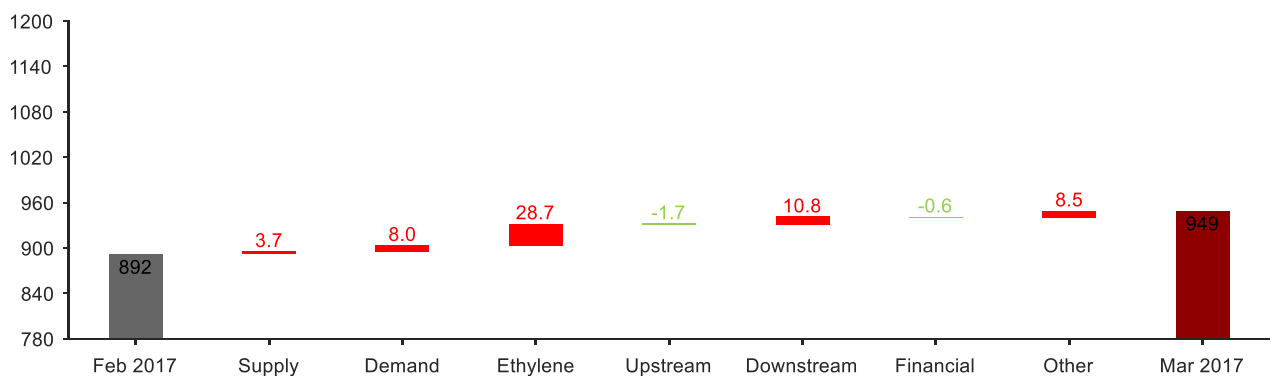
Forecasting the Price of Ethylene

Impact Analysis: One Month Forecast



Our algorithm forecasts a higher price of Ethylene in one month: it is expectable that the price increases 6,44% from 892€ to 949€ until the beginning of March.

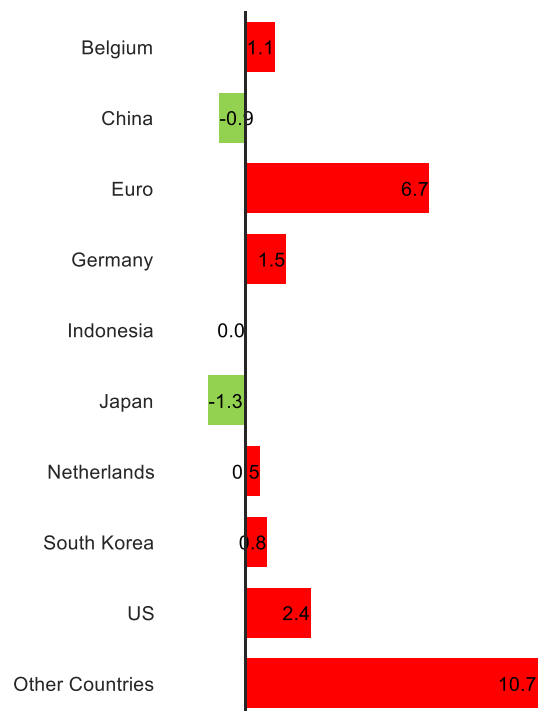
Indices of Factors



Interpretation

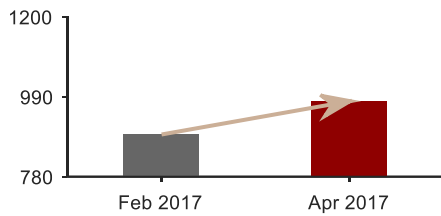
- **Decrease of Supply:** Positive pressure of the Supply index
- **Increase of Demand:** Positive pressure of the Demand index
- **Considerably positive pressure of the index of Ethylene**
- Slightly negative pressure of the index of variables representing the market upstream
- Positive pressure of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

Impact per Country



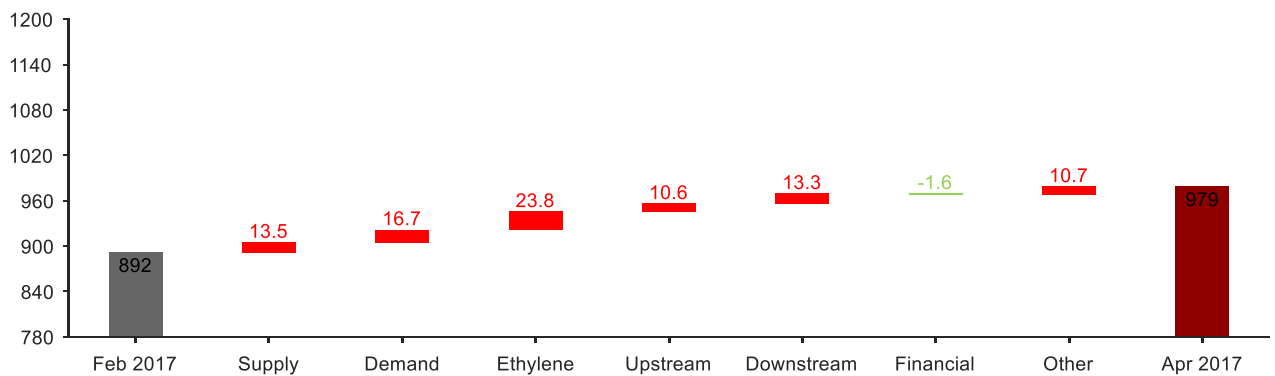
Forecasting the Price of Ethylene

Impact Analysis: Two Months Forecast



Our algorithm forecasts a higher price of Ethylene in two months: it is expectable that the price increases 9,76% from 892€ to 979€ until the beginning of April.

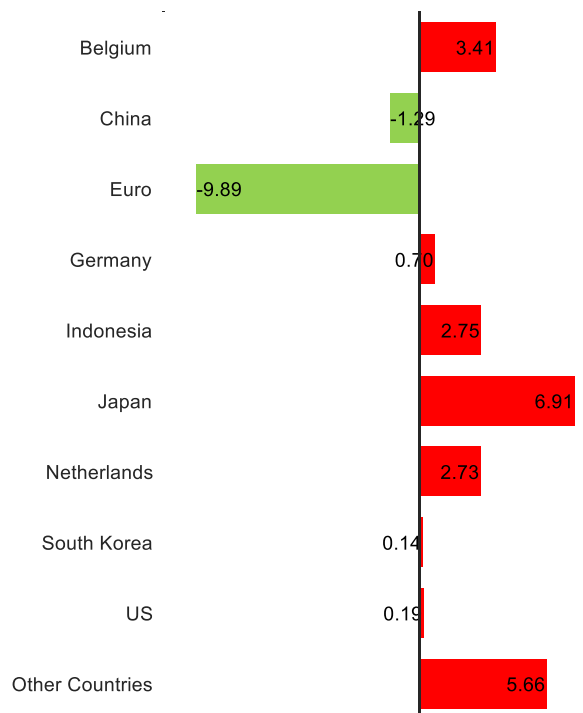
Indices of Factors



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 Ethylene
- Positive pressure of the index of variables representing the market upstream
- Positive pressure of the index of variables representing the market downstream
- Slightly negative pressure of the financial index
- Positive pressure of other commodities and other factors
- Focus on UAE, Euro, and Japan

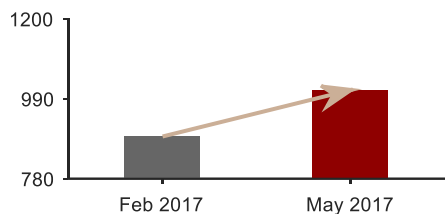
Impact per Country



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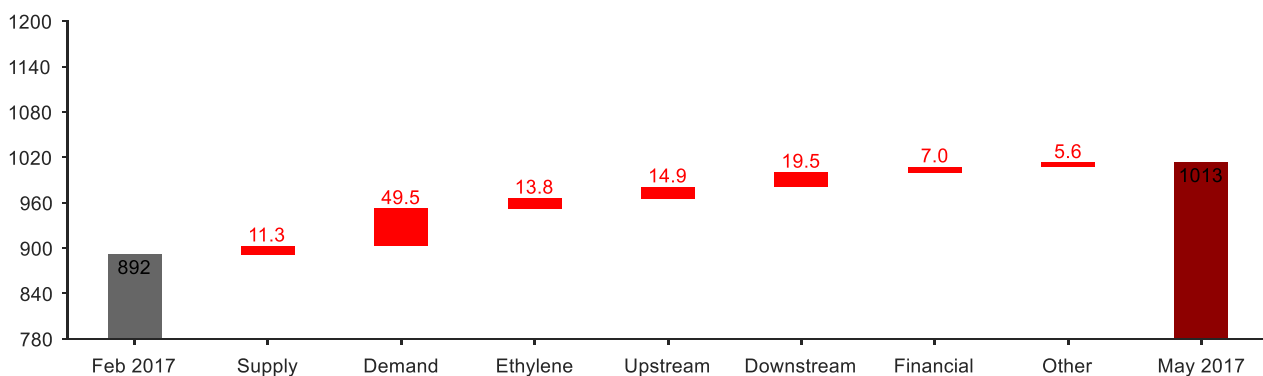
Forecasting the Price of Ethylene

Impact Analysis: Three Months Forecast



Our algorithm forecasts a higher price of Ethylene in three months: it is expectable that the price increases 13,63% from 892€ to 1013€ until the beginning of May.

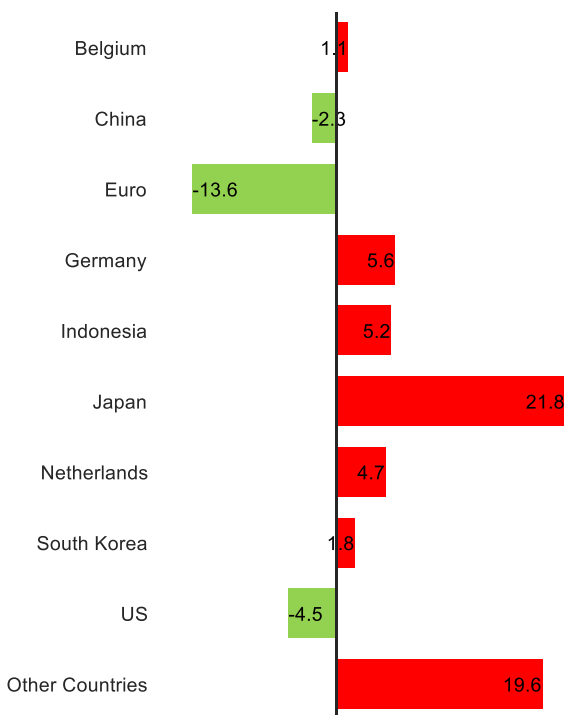
Indices of Factors



Interpretation

- **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 Ethylene
- 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 UAE, Japan, and Euro

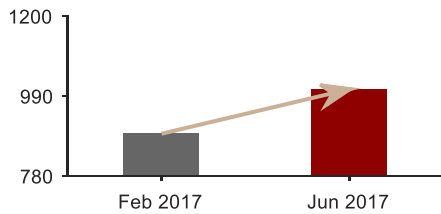
Impact per Country



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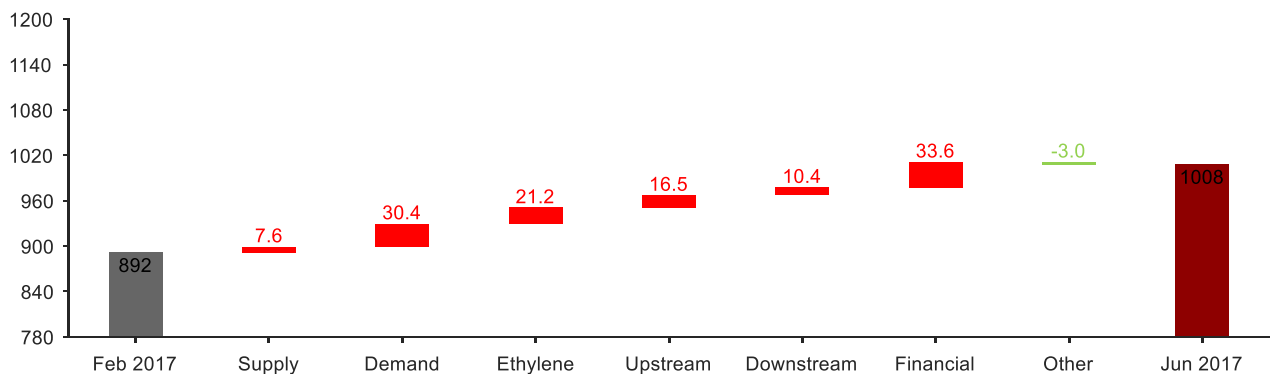
Forecasting the Price of Ethylene

Impact Analysis: Four Months Forecast



Our algorithm forecasts a higher price of Ethylene in four months: it is expectable that the price increases 13,08% from 892€ to 1008€ until the beginning of June.

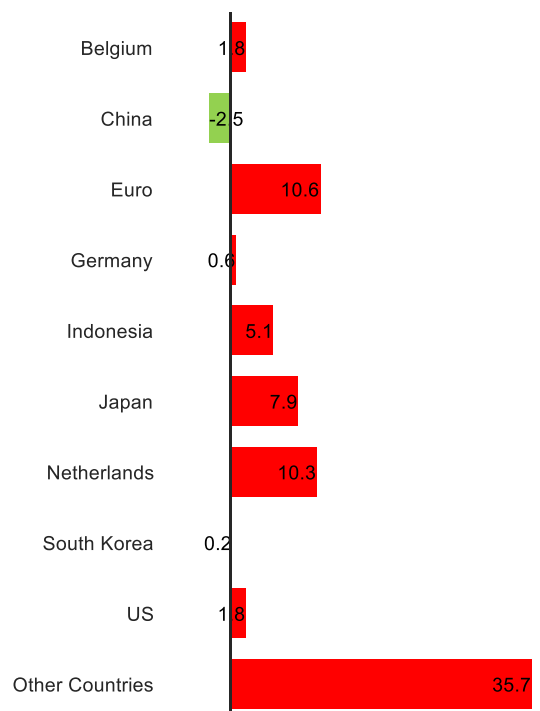
Indices of Factors



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 Ethylene
- 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 Sweden, UAE, and Euro

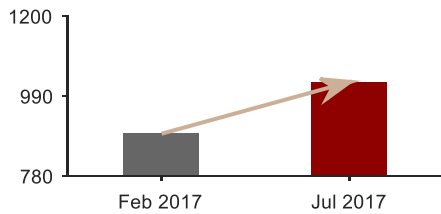
Impact per Country



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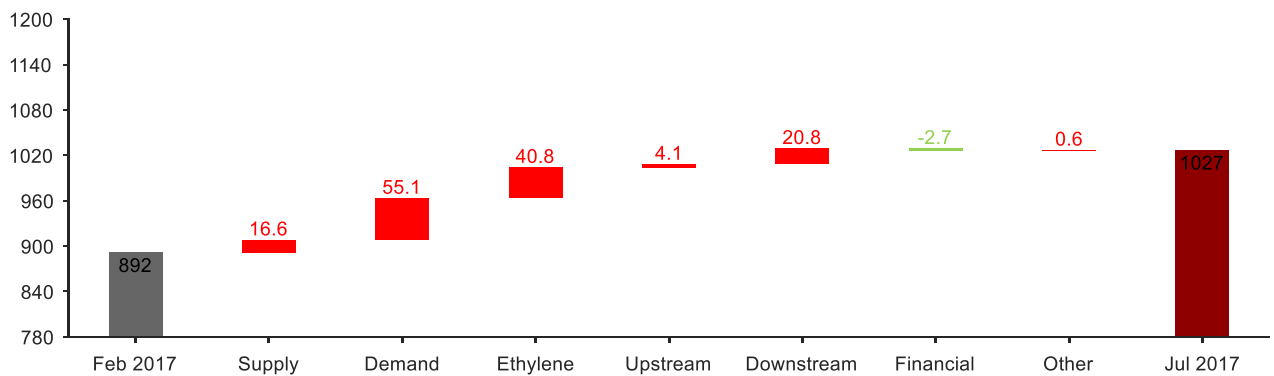
Forecasting the Price of Ethylene

Impact Analysis: Five Months Forecast



Our algorithm forecasts a higher price of Ethylene in five months: it is expectable that the price increases 15,19% from 892€ to 1027€ until the beginning of July.

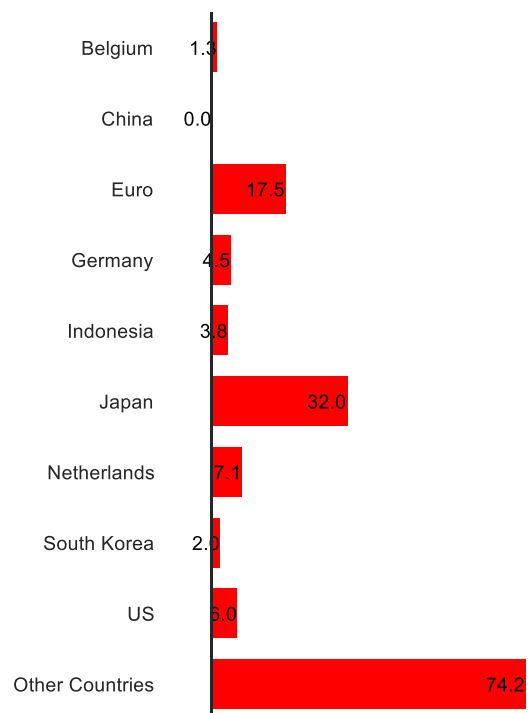
Indices of Factors



Interpretation

- **Decrease of Supply:** Positive pressure of the Supply index
- **Considerable increase of Demand:** Positive pressure of the Demand index
- Considerably positive pressure of the index of Ethylene
- Slightly positive pressure of the index of variables representing the market upstream
- Positive pressure of the index of variables representing the market downstream
- Slightly negative pressure of the financial index
- Slightly positive pressure of other commodities and other factors
- Focus on Japan, UAE, and Euro

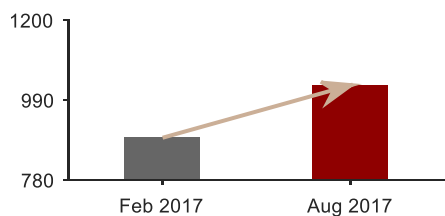
Impact per Country



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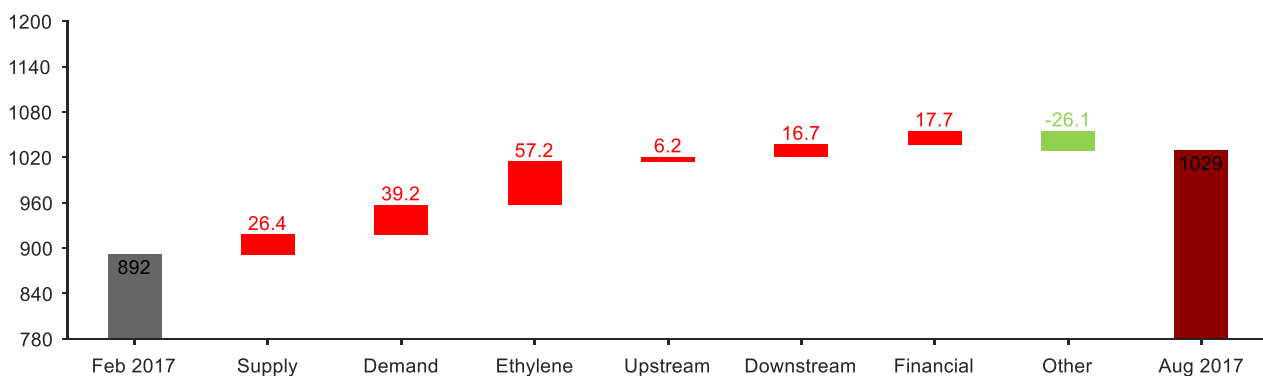
Forecasting the Price of Ethylene

Impact Analysis: Six Months Forecast



Our algorithm forecasts a higher price of Ethylene in six months: it is expectable that the price increases 15,41% from 892€ to 1029€ until the beginning of August.

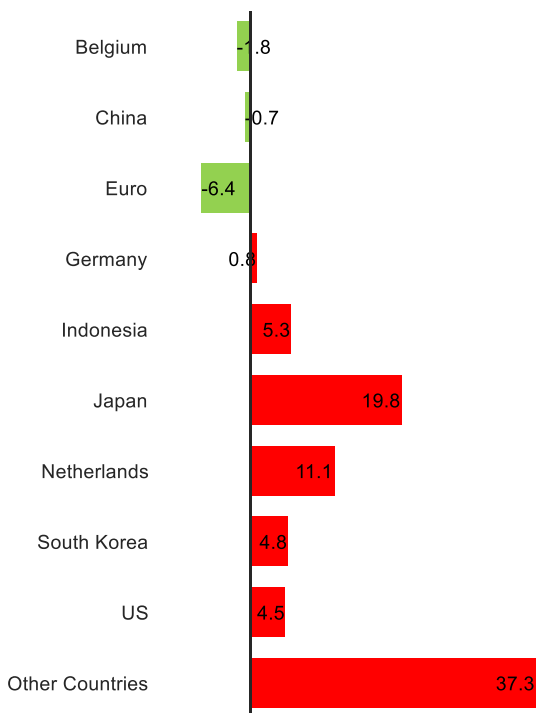
Indices of Factors



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 Ethylene**
- 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
- Negative pressure of other commodities and other factors
- Focus on UAE, Japan, and Netherlands

Impact per Country



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Forecasting the Price of Ethylene

APPENDIX I – 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;

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

Upstream index: composed of variables related to other commodities such as Ethane and Propane. 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 Ethane should (in linear, general, and *ceteris paribus* terms) generate an increase in the price of Ethylene;

Forecasting the Price of Ethylene

APPENDIX – Technical Explanation of the Impact Analysis

Downstream index: composed of variables related to Polyethylene and downstream industries, such as Packaging. It includes variables such as the exports, imports, and producer prices of 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 Ethylene;

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

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

Country Indices

Country Indices 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 Ethylene.

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.