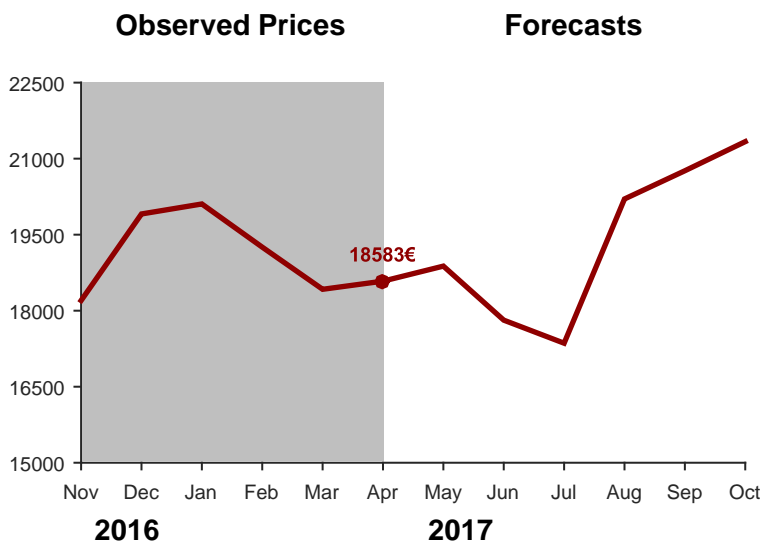


Forecasting the Price of Tin

Commodity	Tin (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	18880€	60 %
Jun. 2017	17814€	42 %
Jul. 2017	17359€	47 %
Aug. 2017	20204€	63 %
Sep. 2017	20761€	58 %
Oct. 2017	21336€	59 %

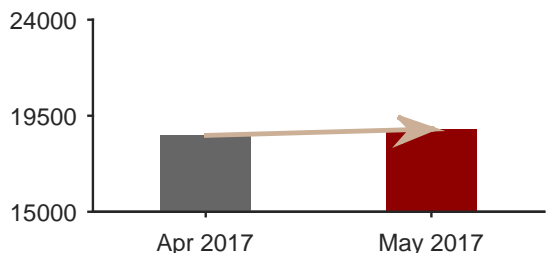
Suggested Action for Procurement

Purchase Limit Month	Suggested Action
May 2017	Buy in April at 18583€
June 2017	Buy part of requirements
July 2017	Buy part of requirements
August 2017	Buy part of requirements
September 2017	Buy part of requirements
October 2017	Buy part of requirements

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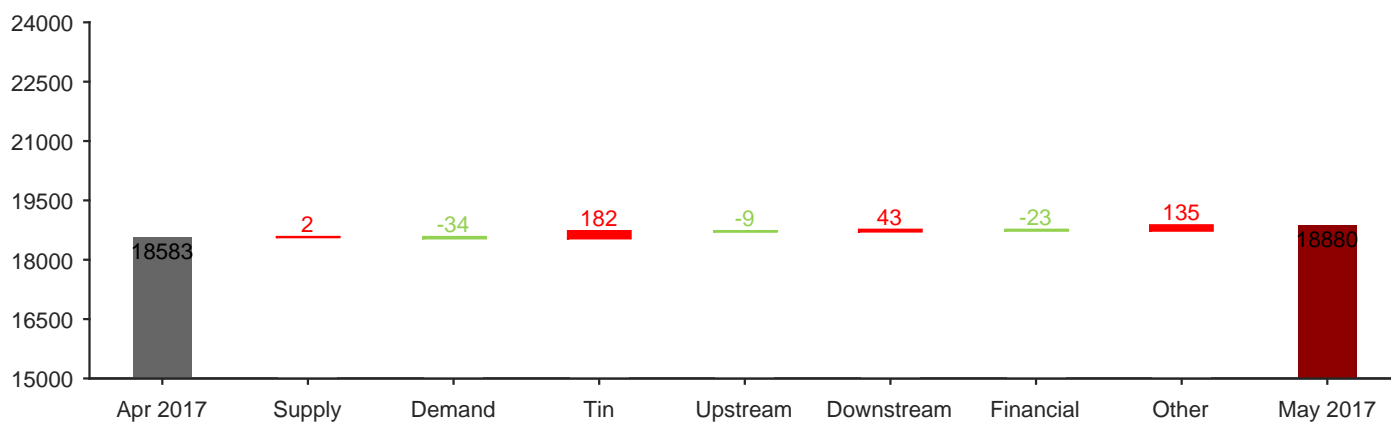
Forecasting the Price of Tin

Impact Analysis: One Month Forecast



Our algorithm forecasts a higher price of Tin in one month: it is expectable that the price increases 1.59% from 18583€ to 18880€ until the beginning of May.

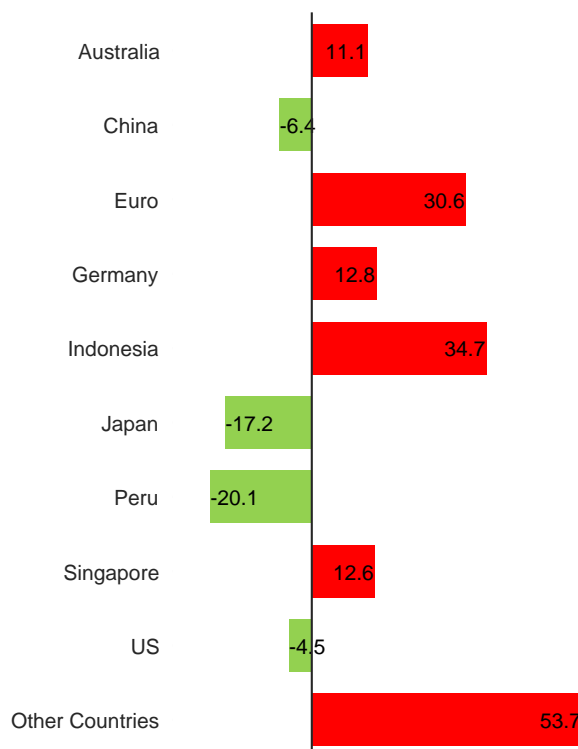
Indices of Factors



Interpretation

- Slight decrease of Supply: Positive pressure of the Supply index
- **Decrease of Demand:** Negative pressure of the Demand index
- **Considerably positive pressure of the index of Tin**
- Slightly negative pressure of the index of variables representing the market upstream
- Positive pressure of the index of variables representing the market downstream
- Negative pressure of the financial index
- **Considerably positive pressure of other commodities and other factors**
- Focus on Indonesia, Euro, and Peru

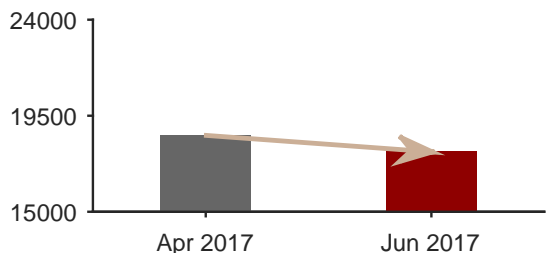
Impact per Country



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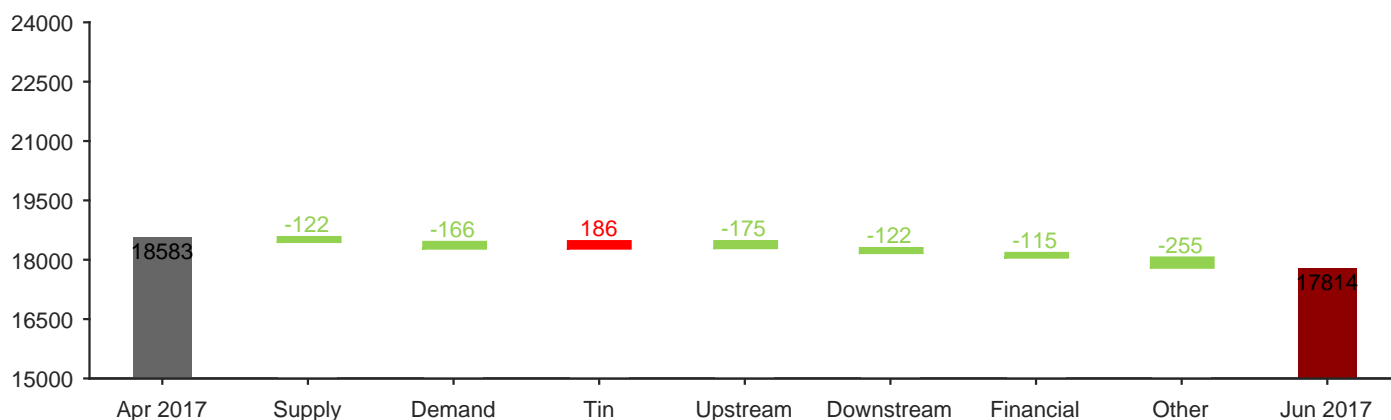
Forecasting the Price of Tin

Impact Analysis: Two Months Forecast



Our algorithm forecasts a lower price of Tin in two months: it is expectable that the price decreases 4.14% from 18583€ to 17814€ until the beginning of June.

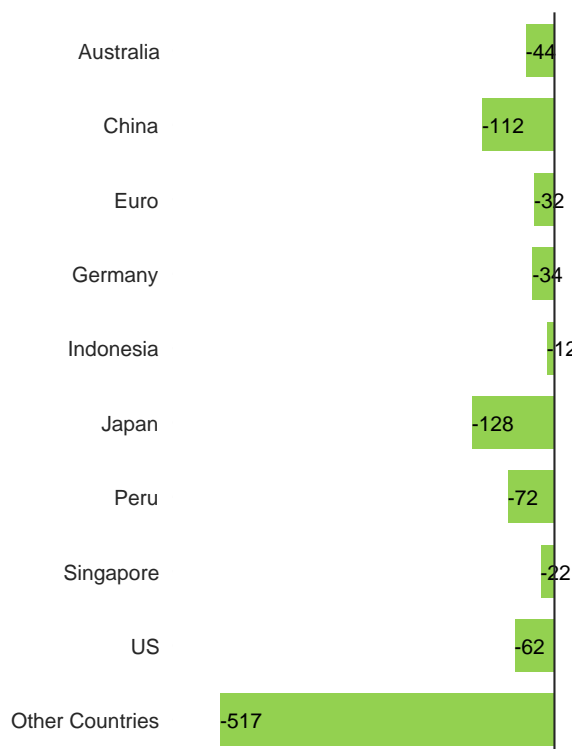
Indices of Factors



Interpretation

- **Increase of Supply:** Negative pressure of the Supply index
- **Decrease of Demand:** Negative pressure of the Demand index
- Positive pressure of the index of Tin
- Negative pressure of the index of variables representing the market upstream
- Negative pressure of the index of variables representing the market downstream
- Negative pressure of the financial index
- **Considerably negative pressure of other commodities and other factors**
- Focus on Japan, China, and Peru

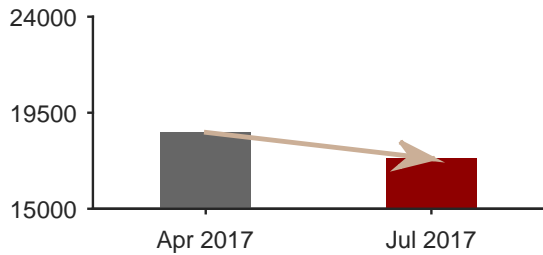
Impact per Country



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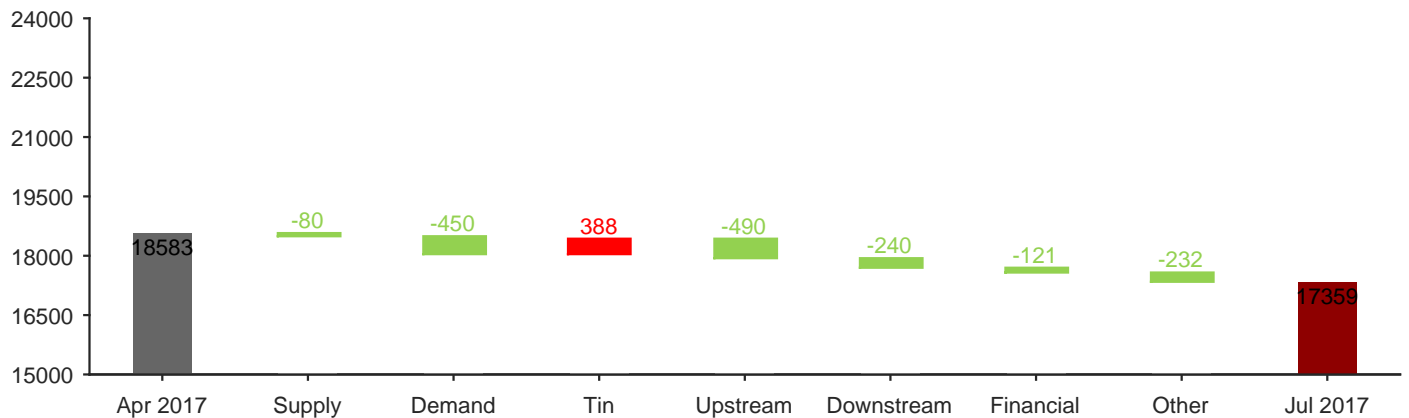
Forecasting the Price of Tin

Impact Analysis: Three Months Forecast



Our algorithm forecasts a lower price of Tin in three months: it is expectable that the price decreases 6.58% from 18583€ to 17359€ until the beginning of July.

Indices of Factors



Interpretation

- **Increase of Supply:** Negative pressure of the Supply index
- **Considerable decrease of Demand:** Negative pressure of the Demand index
- **Considerably positive pressure of the index of Tin**
- **Considerably negative pressure of the index of variables representing the market upstream**
- **Considerably negative pressure of the index of variables representing the market downstream**
- Negative pressure of the financial index
- **Considerably negative pressure of other commodities and other factors**
- Focus on Japan, Nigeria, and China

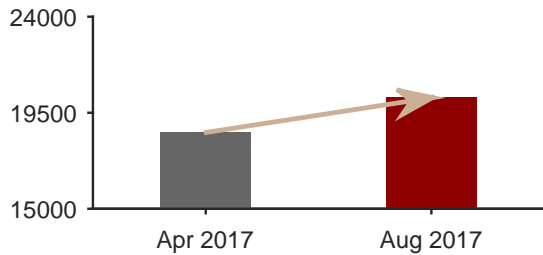
Impact per Country



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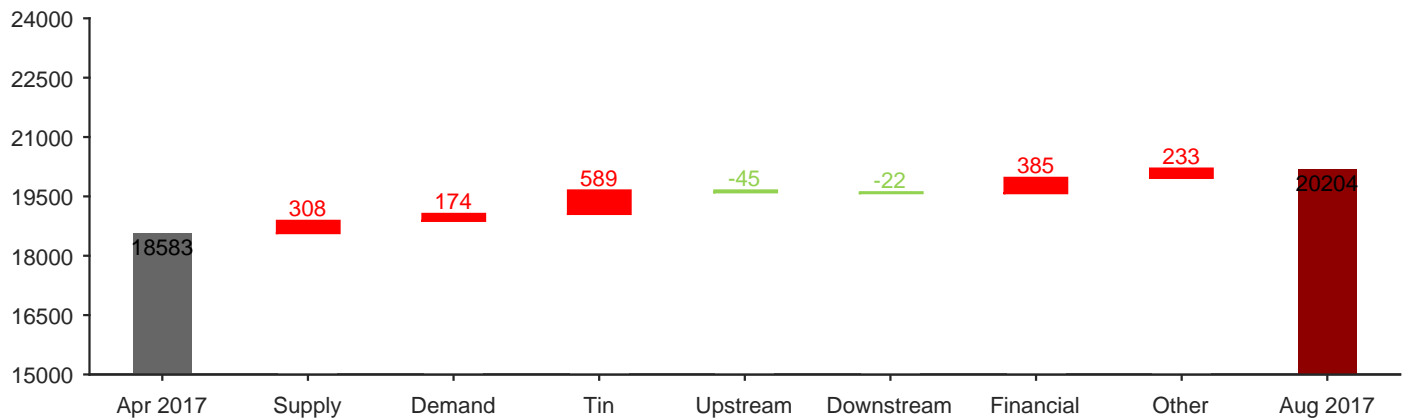
Forecasting the Price of Tin

Impact Analysis: Four Months Forecast



Our algorithm forecasts a higher price of Tin in four months: it is expectable that the price increases 8.72% from 18583€ to 20204€ until the beginning of August.

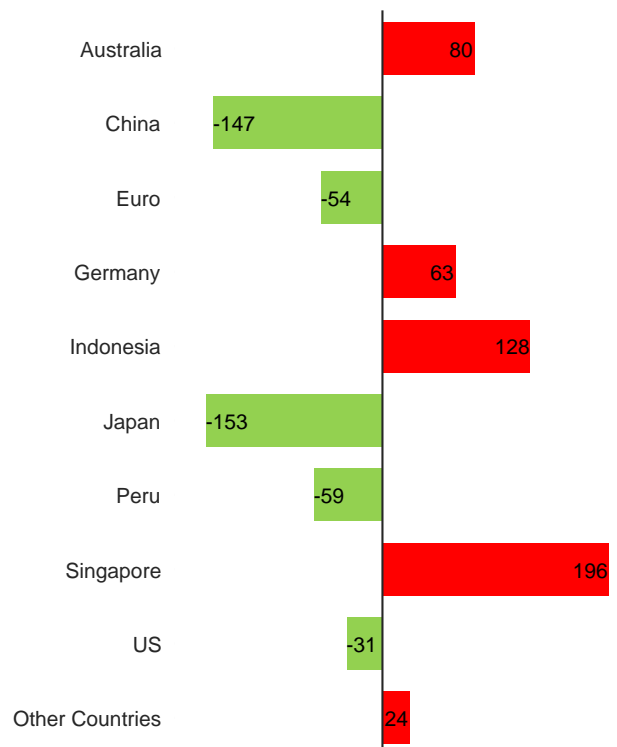
Indices of Factors



Interpretation

- **Considerable 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 Tin**
- Slightly negative pressure of the index of variables representing the market upstream
- Slightly negative pressure of the index of variables representing the market downstream
- **Considerably positive pressure of the financial index**
- Positive pressure of other commodities and other factors
- Focus on Singapore, Japan, and China

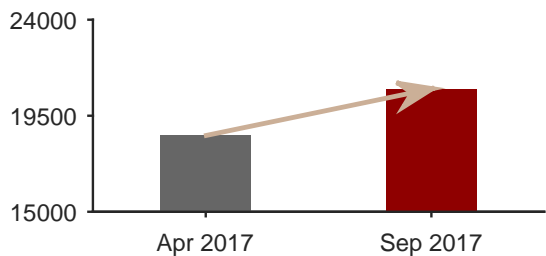
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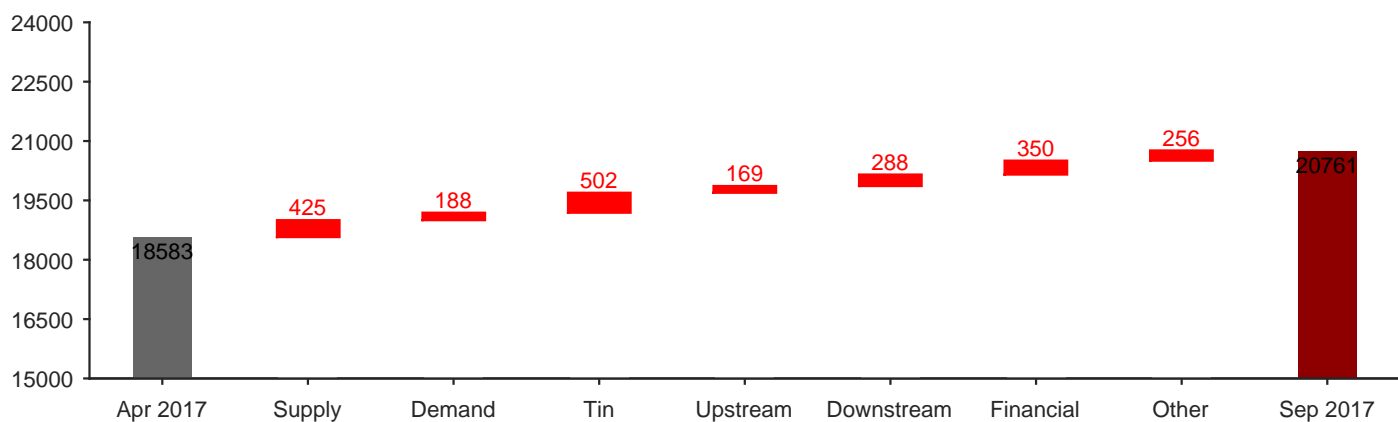
Forecasting the Price of Tin

Impact Analysis: Five Months Forecast



Our algorithm forecasts a higher price of Tin in five months: it is expectable that the price increases 11.72% from 18583€ to 20761€ until the beginning of September.

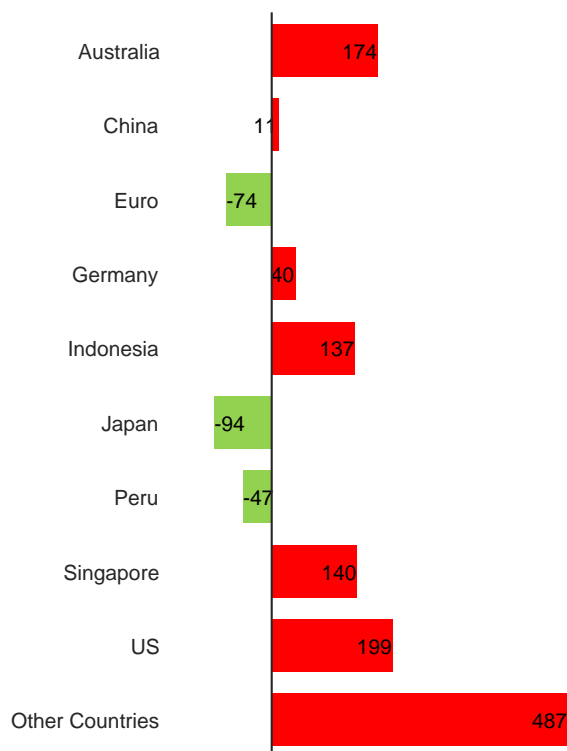
Indices of Factors



Interpretation

- **Considerable 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 Tin**
- Positive pressure of the index of variables representing the market upstream
- **Considerably positive pressure of the index of variables representing the market downstream**
- **Considerably positive pressure of the financial index**
- **Considerably positive pressure of other commodities and other factors**
- Focus on US, Thailand, and Australia

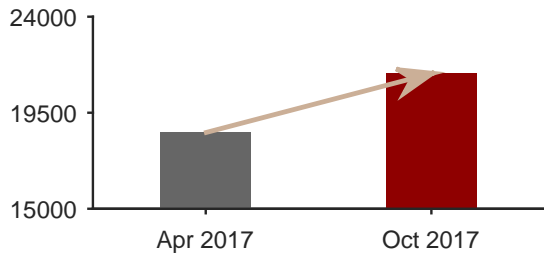
Impact per Country



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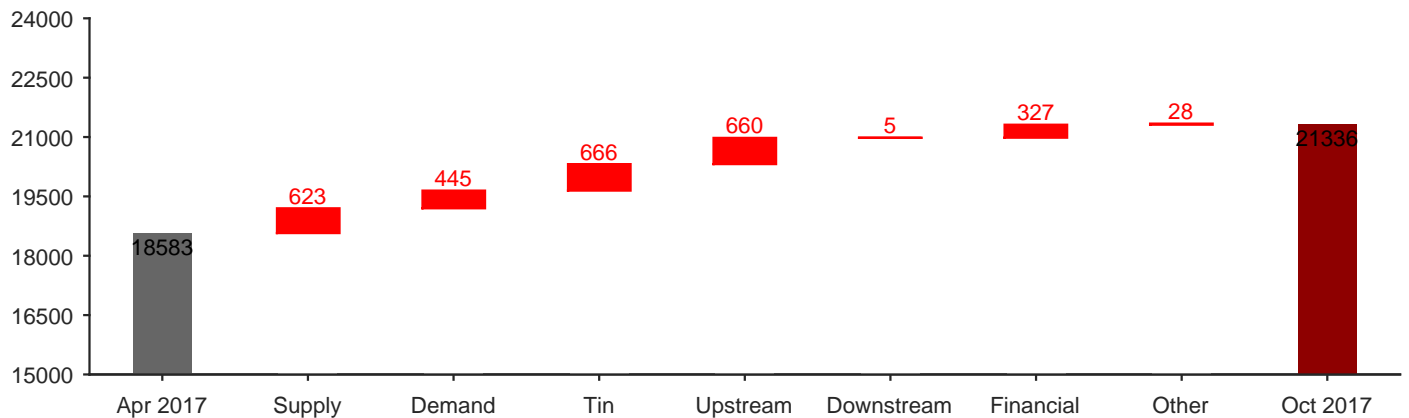
Forecasting the Price of Tin

Impact Analysis: Six Months Forecast



Our algorithm forecasts a higher price of Tin in six months: it is expectable that the price increases 14.81% from 18583€ to 21336€ until the beginning of October.

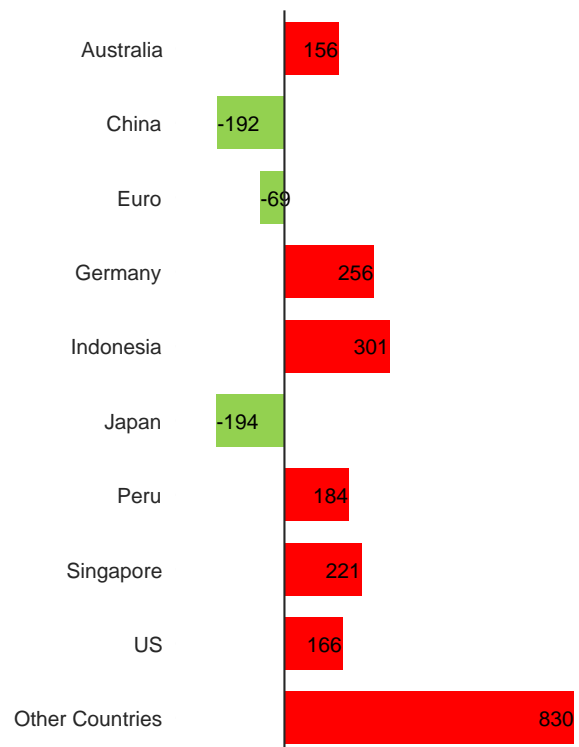
Indices of Factors



Interpretation

- **Considerable decrease of Supply:** Positive pressure of the Supply index
- **Considerable increase of Demand:** Positive pressure of the Demand index
- **Considerably positive pressure of the index of Tin**
- **Considerably 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**
- Slightly positive pressure of other commodities and other factors
- Focus on Nigeria, Indonesia, and Germany

Impact per Country



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Forecasting the Price of Tin

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;

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

Downstream index: composed of variables related to downstream industries, such as Packaging and Electronics. 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 Tin;

Forecasting the Price of Tin

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 Tin. It also includes financial indices related to this sector. For example, a positive change in the share price of a producer of Tin 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 Tin;

Other Variables Index: composed of variables related to other metals (e.g., Iron Ore and Aluminium), Oil and Coal. 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 Tin, and thus, of the price of Tin.

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 Tin.

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.