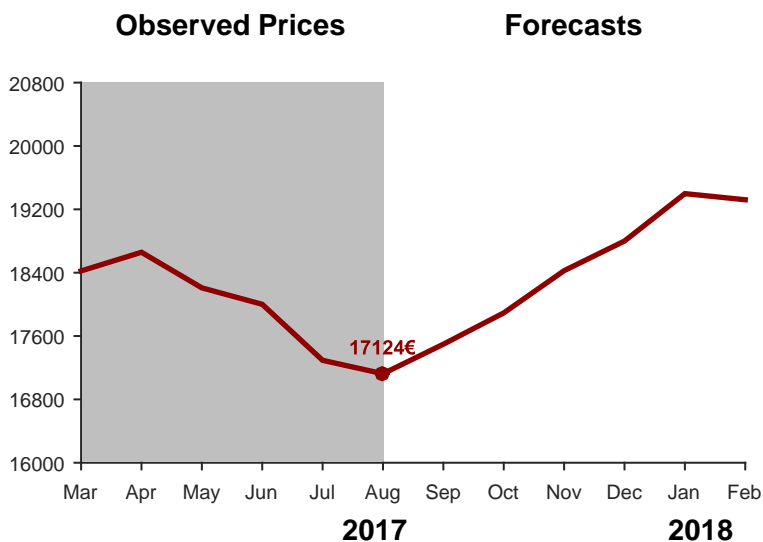


Forecasting the Price of Tin

Commodity	Tin (London Metal Exchange)
Forecast Period	September 2017 – February 2018
Currency	€
Unit	Metric Tonne
Observations	Monthly forecasts of the monthly average price



Forecasts



Month/Year	Forecast	Prob. of Raise
Sep. 2017	17497€	79 %
Oct. 2017	17892€	87 %
Nov. 2017	18425€	83 %
Dec. 2017	18800€	82 %
Jan. 2018	19398€	66 %
Feb. 2018	19321€	60 %

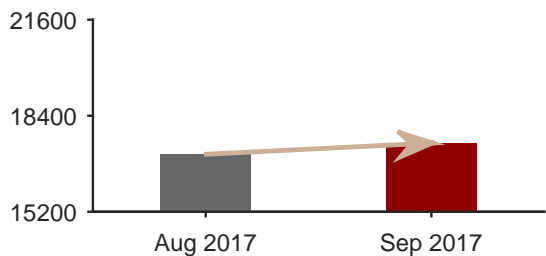
Suggested Action for Procurement

Purchase Limit Month	Suggested Action
September 2017	Buy in August at 17124€
October 2017	Buy in August at 17124€
November 2017	Buy in August at 17124€
December 2017	Buy in August at 17124€
January 2018	Buy in August at 17124€
February 2018	Buy in August at 17124€

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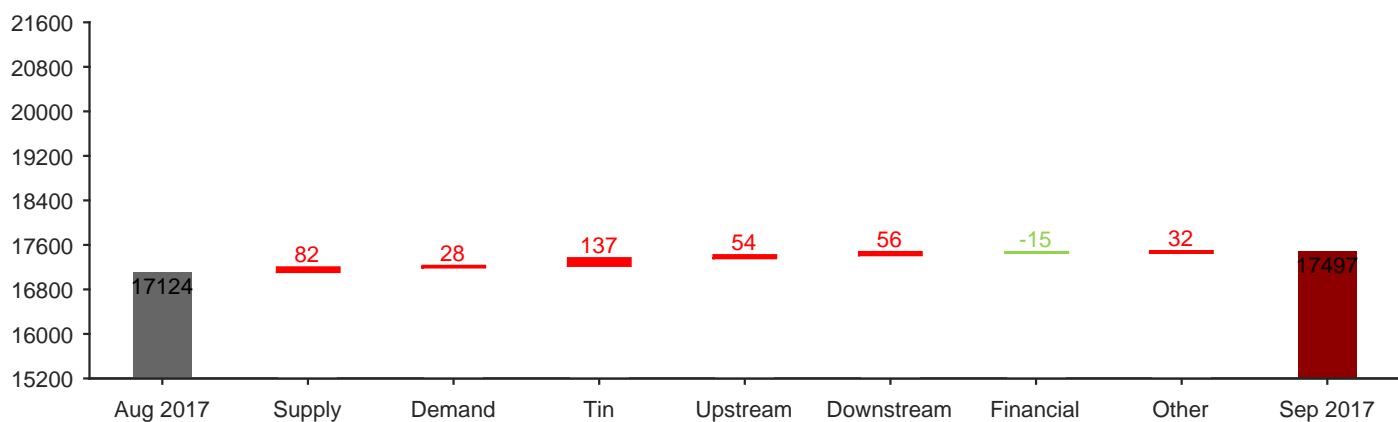
Forecasting the Price of Tin

Impact Analysis: One Month Forecast



Our algorithm forecasts a higher price of Tin in one month: it is expectable that the price increases 2.17% from 17124€ to 17497€ until the beginning of September.

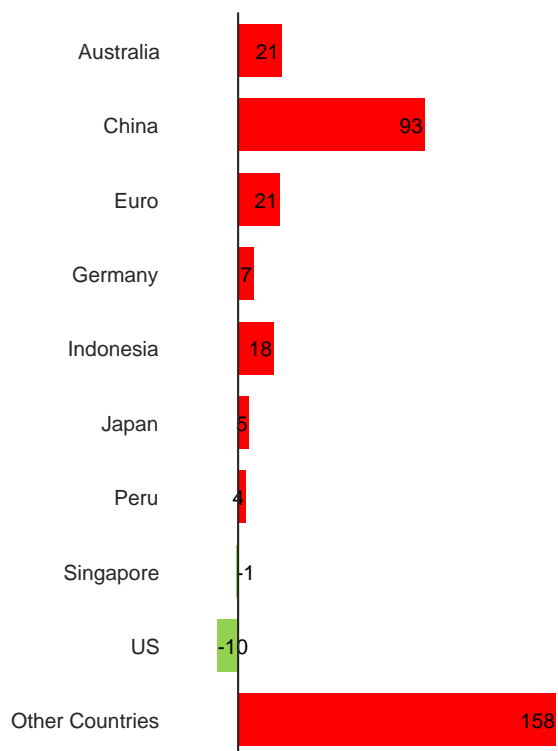
Indices of Factors



Interpretation

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

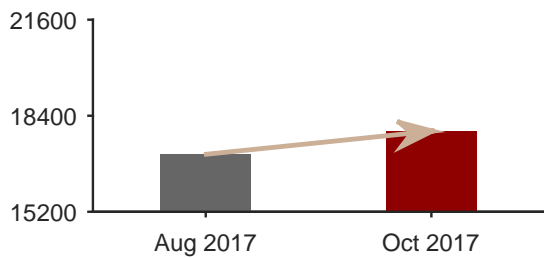
Impact per Country



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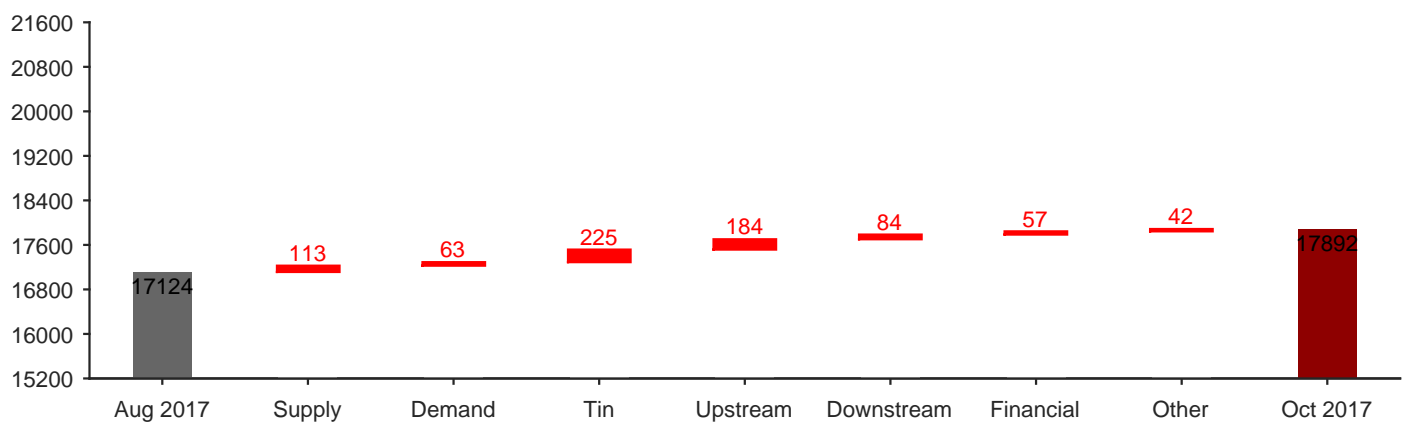
Forecasting the Price of Tin

Impact Analysis: Two Months Forecast



Our algorithm forecasts a higher price of Tin in two months: it is expectable that the price increases 4.48% from 17124€ to 17892€ until the beginning of October.

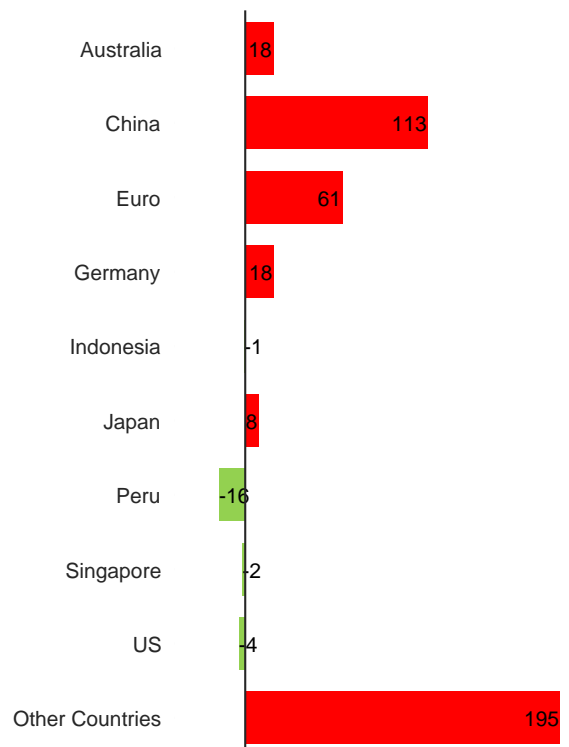
Indices of Factors



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 Tin**
- 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, Euro, and South Korea

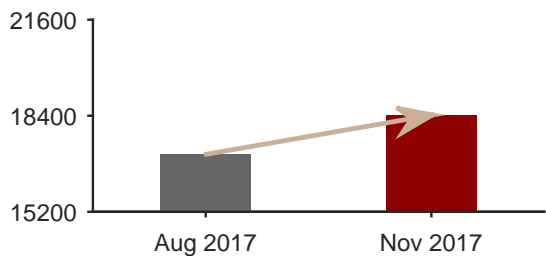
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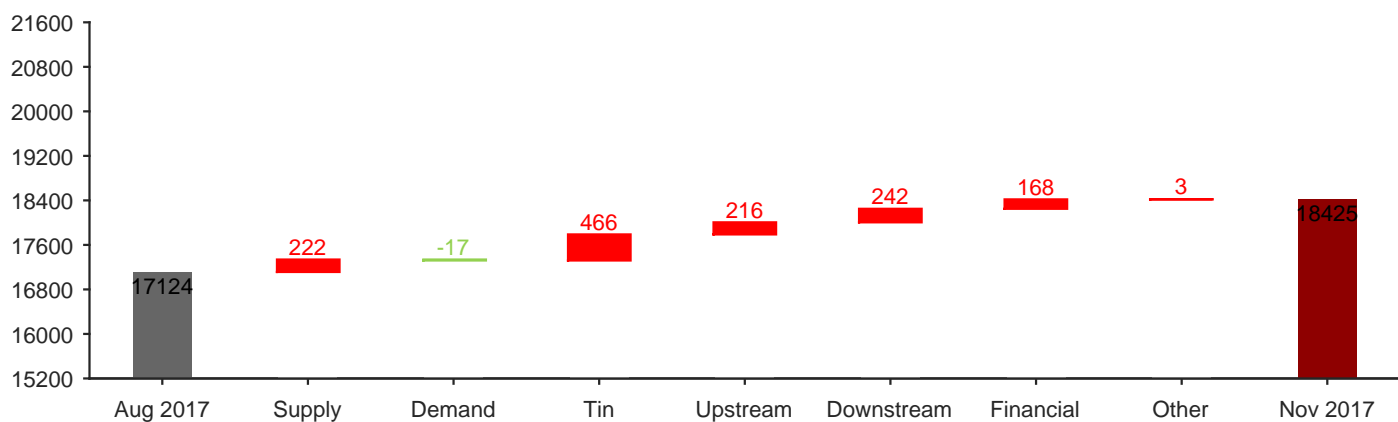
Forecasting the Price of Tin

Impact Analysis: Three Months Forecast



Our algorithm forecasts a higher price of Tin in three months: it is expectable that the price increases 7.60% from 17124€ to 18425€ until the beginning of November.

Indices of Factors



Interpretation

- **Decrease of Supply:** Positive pressure of the Supply index
- Slight decrease of Demand: Negative pressure of the Demand index
- **Considerably positive pressure of the index of Tin**
- 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 South Korea, Euro, and Nigeria

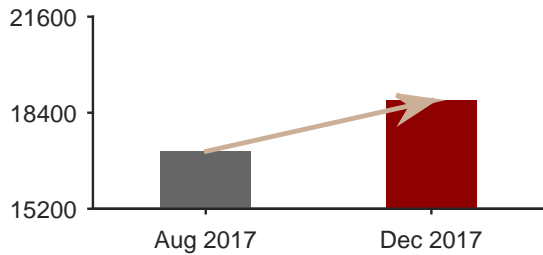
Impact per Country



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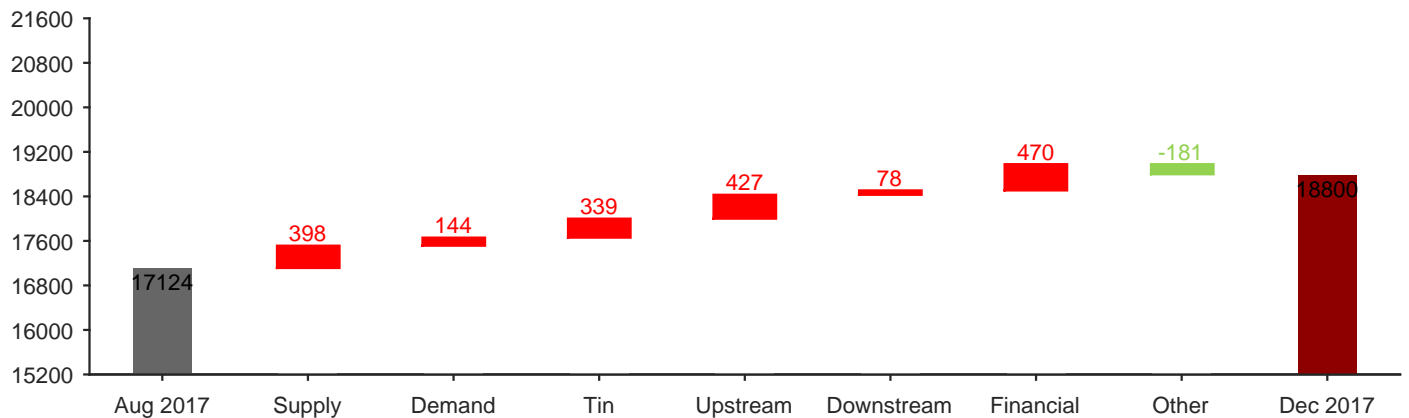
Forecasting the Price of Tin

Impact Analysis: Four Months Forecast



Our algorithm forecasts a higher price of Tin in four months: it is expectable that the price increases 9.78% from 17124€ to 18800€ until the beginning of December.

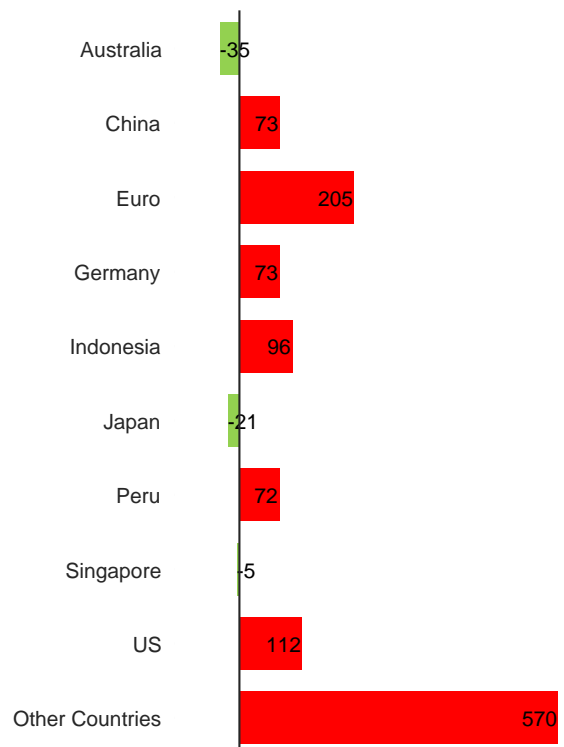
Indices of Factors



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**
- **Considerably 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 Euro, Bolivia, and US

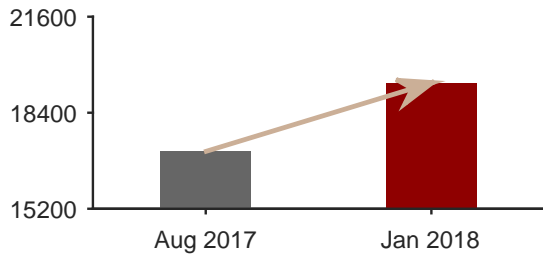
Impact per Country



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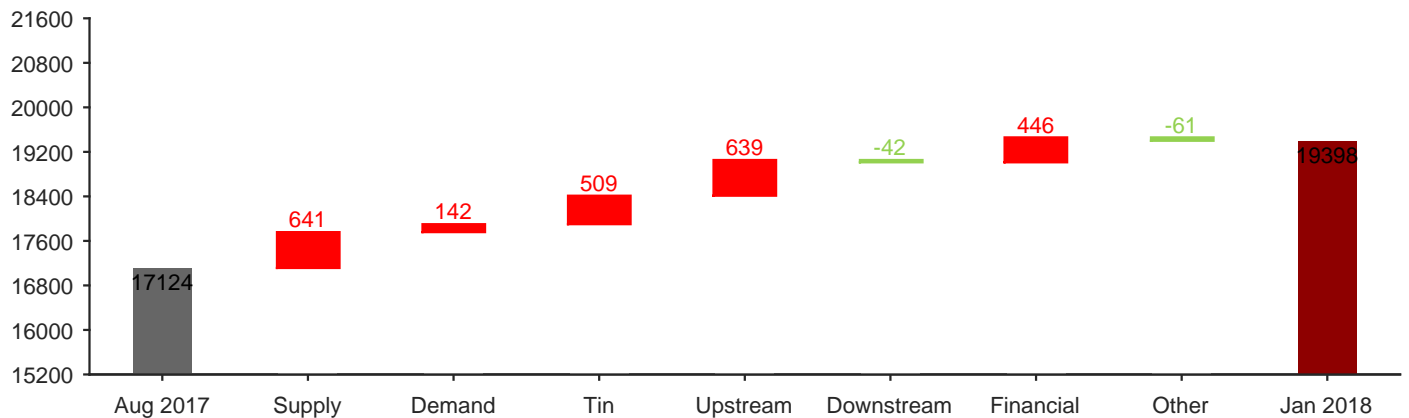
Forecasting the Price of Tin

Impact Analysis: Five Months Forecast



Our algorithm forecasts a higher price of Tin in five months: it is expectable that the price increases 13.28% from 17124€ to 19398€ until the beginning of January.

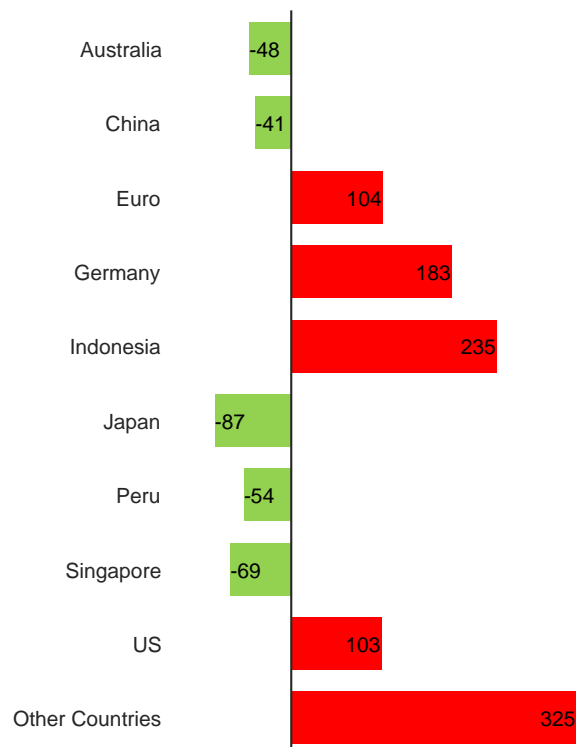
Indices of Factors



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**
- **Considerably positive 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**
- Slightly negative pressure of other commodities and other factors
- Focus on Nigeria, Indonesia, and Germany

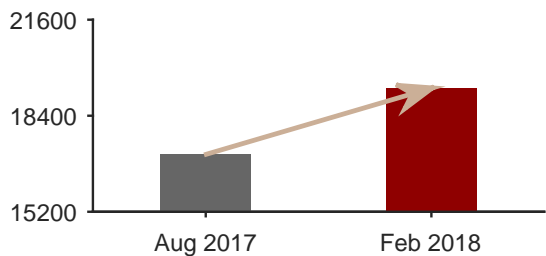
Impact per Country



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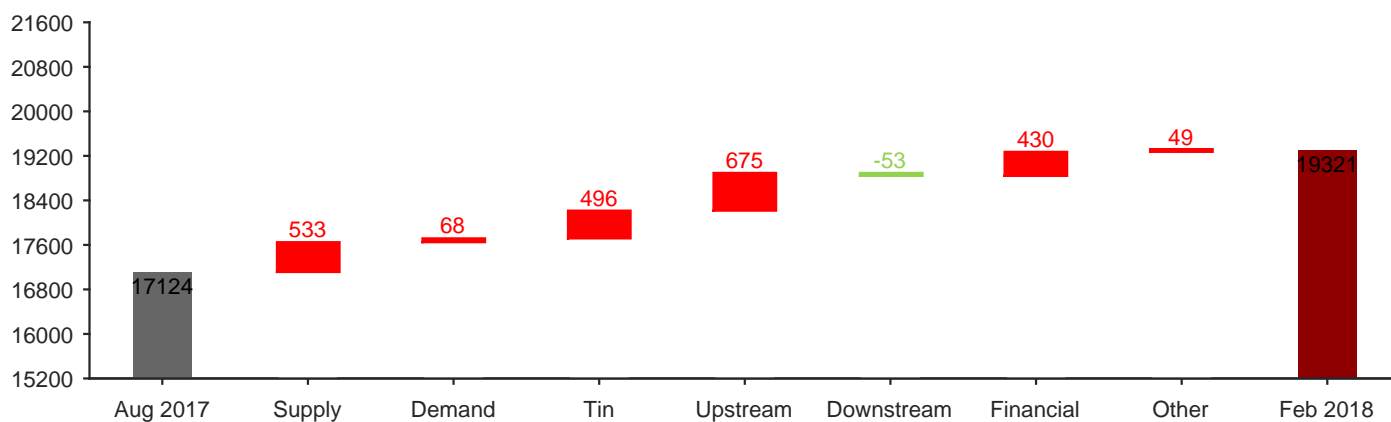
Forecasting the Price of Tin

Impact Analysis: Six Months Forecast



Our algorithm forecasts a higher price of Tin in six months: it is expectable that the price increases 12.82% from 17124€ to 19321€ until the beginning of February.

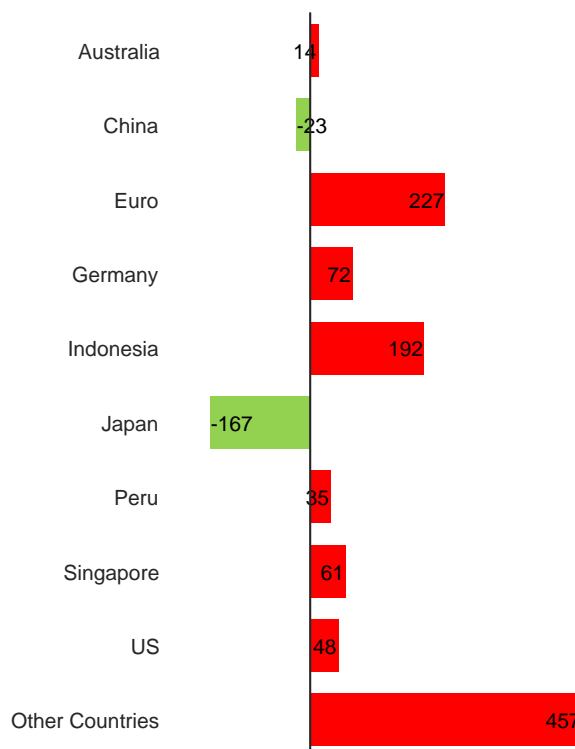
Indices of Factors



Interpretation

- **Considerable decrease of Supply:** Positive pressure of the Supply index
- Slight 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 negative 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, Euro, and Indonesia

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.