Analysis of the factors influencing the price of aluminum on the world market

Analiza czynników kształtujących ceny aluminium na światowym rynku

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The article analyzes world prices on the aluminum market in the 20th and 21st centuries, with particular attention to the last five years. The factors influencing the price of this metal have been identified, as well as the factors that influence the short and long term aluminum price forecasts in the world markets, including the London Metal Exchange.

KEYWORDS: aluminium market, aluminium price, London Metal Exchange

Aluminum belongs to the group of non-ferrous metals, which are increasingly used in industry and in everyday life. The metal is mainly derived from bauxite in the process of electrolytic refining - this process is very energy intensive. The raw material obtained in the form of ingots, is called the primary.

On the world market, primary aluminum is traded (especially for the exchanges metals), which may be present in several species (depending on the composition):

- standard (minimum aluminum content is 99.5% of total weight);
- high grade (99.6÷99.7% stock quotes basis for several years);
- special grade (99.71÷99.85%);
- super pure aluminum (99.86÷99.99%).

The metal is traded on several stocks: Commodity Exchange (Comex), London Metal Exchange (LME) and Tokyo Commodity Exchange (Tocom). In Europe, aluminum prices are listed on the London Metal Exchange every day since 1978 and are denominated in dollars per ton and are sold both in the spot and futures markets (futures and option contracts).

In recent years, aluminum scrap (so-called secondary aluminum) and its alloys with other metals are also gaining importance in trade.

The use of recycled aluminum is dictated mainly by economic reasons, because it is much cheaper than the extraction of raw material in the process of electrolysis.

Key factors shaping the price of aluminum

In the first half of the twentieth century, aluminum was used mainly in the military sector, especially in aviation due to the low specific gravity of this metal at relatively high strength and elasticity. Demand of the army for the metal was so large that both during the First and Second World War, the US government launched its official price control [1].

From the beginning of the second half of the twentieth century until the mid-1970s, the price of aluminum remained stable at around 500-600 USD/t (fig. 1), so that the metal found a number of new uses. Aluminum has started to be used extensively and in large scale in automotive and civil aviation, railway and shipbuilding industries. Also the housing find many uses of this metal, for example. Joinery, roofing, insulation or heating. Over time, there were new ideas for its use, among others, in electrical, lighting, disposable or household appliances.

The situation changed drastically with the onset of the first oil crisis (1973), when the price of many commodities rose significantly, with the price of aluminum rising to 1500 USD/t in the 1980s. Much of the increase in prices was also due to the sharp rise in electricity prices. At the same time, the demand for aluminum has increased steadily, mainly in the dynamically developing automotive industry. In addition, there are additional opportunities to use this raw material in other industries, such as the packaging industry (cans, lids) [2].



Fig. 1. World aluminum prices in the spot market in 1960-2013 [3]

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The rise in aluminum prices, however, was halted by the second oil crisis (1979-1982), which resulted in the economic crisis combined with inflation and recession, and the collapse in prices of raw materials, including metals.

Another collapse in the global aluminum market was caused by the collapse of the USSR (1991), as a result of which the former federal states had opened up and joined the world aluminum market. The largest share among them was Russia. There was a sharp increase in the supply of raw material, which translated into a drop in its price (to 1100 USD/t). In the following years, the market began to rebound and prices rose, but in 1998 they were again collapsed due to the financial crisis.

In the twenty-first century, aluminum price reached the summit twice (in 2006 and 2011). The first price spike, often referred to as the "raw material boom" [5], occurred in 2006, when food and raw materials prices rose by more than 100%. Then the price of aluminum has risen to over 2000 USD/t. However, at the end of the 2007 crisis, which became the American real estate market, also he switched to material market, which resulted in a sharp decline in prices, among others, oil, copper, and aluminum. The lowest price was in 2009 - 1700 USD/t, followed by the price rebound and rebounding up to 2011, when the second price peak. Aluminum price reached 2300 USD/t. Since then, its slow decline can be observed.

This brief historical analysis gives the opportunity to pinpoint the key factors influencing the price of aluminum in the world market. It should be started with the cost of electricity, because primary aluminum is very energyintensive - around 2% of electricity produced worldwide [1].

In addition, the metal that is traded on the exchanges is physically located in warehouses in seaports. For example, the stock market has LME warehouses in ports in different parts of the world: Western Europe, Japan, Singapore, South Korea, Malaysia, as well as on the west and east coast of the United States. That is why stock exchange aluminum prices include the cost of transporting the metal to its destination.

In addition, raw material prices significantly depend on the economic conditions in the industries with which he is most strongly associated (e.g. construction, automotive, transportation). It should also be considered concurrent prices of other metals (e.g. copper), which are strongly correlated to the price of aluminum, as well as key energy resources such as oil [2]. The global economic situation is also reflected in the prices of metals by reducing aggregate demand for products produced from them. It has also been proven that exchange rate quotes are important for the aluminum market. This is primarily the case with the US dollar.

In recent years, the price of aluminum has been influenced by the growing export of raw materials from China, which has significantly increased the supply of this metal on the world market. At the same time, the increased demand for aluminum due to the economic growth of the most dynamically developing countries (e.g. India) has been noted.

An important factor is the impact of the global financial system, as evidenced by the collapse in the price of aluminum during the recent financial crisis. Predictions on the aluminum market play a role. Speculative capital is "the capital of investors focused on short-term investing in assets, which in their opinion will produce above-average profit. Placement of speculative capital, so the speculation is to formulate expectations about the future price of certain financial instruments, at the same time accepting above-average risk" [6].

It is impossible to ignore the climate changes that occur on our planet, leading to an increase in the number and magnitude of extreme natural events such as hurricanes, tsunamis, floods and landslides. They contribute to difficulties in transport of metal, and lead to disturbances in the supply of the energy required for its production.

These factors are responsible for numerous price increases and decreases in the aluminum market. However, the analysis of the data presented in fig. 1 shows a persistent long-term upward trend, largely due to the economic growth of many countries, including Asian countries.

Aluminum price analysis on the LME

Since most primary aluminum is sold through stock exchanges, it's worth looking at the price of this metal on one of the biggest ones - the London Metal Exchange. All the more so because aluminum prices quoted on London's LME are close to the Comex stock prices, which may suggest their impact on world prices. Thus, the described increases and decreases in world aluminum prices will follow a similar trend as those illustrating, for example, the sale of a particular grade of aluminum on the London Stock Exchange. The table shows the average annual aluminum price from the last fifteen years the LME listed along with the change compared to the previous year.

TABLE. Average annual aluminum prices quoted on the LME (high grade) stock exchange between 2002 and 2016

Year	Annual average	Change %
2002	1250.04	Ondrige, 70
2002	1350.24	_
2003	1431.72	6.03
2004	1715.95	19.85
2005	1898.64	10.65
2006	2569.94	35.36
2007	2637.65	2.63
2008	2571.82	-2.5
2009	1664.83	-35.27
2010	2173.12	30.53
2011	2398.29	10.36
2012	2019.47	-15.8
2013	1845.91	-8.59
2014	1865.87	1.08
2015	1661.81	-10.94
2016	1688.63	1.62

Source: own study based on LME data

In the first years of the period considered, there was a gradual increase in the price of aluminum. The rapid growth (as in the world price) occurred in 2006, when a change compared to last year amounted to more than 35%. The same has fallen in price after the financial crisis in 2009. From 2013, slow price stability is observed with a slight downward trend.

Historical analysis is very important for the economy in the context of price forecasting - both for a short and long time perspective. Forecasts, however, must be based on the analysis of daily data instead of average. Fig. 2 shows, how in the past five years have shaped the daily price of aluminum on the LME stock market, which can be used to forecast long-term (e.g. the following five years).



Fig. 2. Spot prices of aluminum in 2012-2016 on the LME stock exchange (source: own study based on LME data)

The year 2012 proved to be one of the calmer in recent years on aluminum market. Raw material price fluctuated and highly stable at around 2000 USD/t. The year 2013 is, in turn, the reduction of the value of aluminum - the average price of the metal in the said period amounted to less than 1850 USD/t. This price level was also maintained in the following year, which was characterized by big peace in both the aluminum and other raw materials listed on major stock exchanges worldwide. The situation began to change at the turn of 2014 and 2015. The price of aluminum has fallen quite sharply, the consequence of which was to raise the level of 1500 USD/t. The monthly average price in 2015. Amounted to approximately 1660 USD/t and was lower than the previous year by more than 10%.



Fig. 3. Aluminum spot prices from May 2016 to May 2017 on the LME (source: own study based on LME data)

In order to make a short-term forecast, it is worth to investigate the prices of the last year, e.g. from May 2016 to May 2017 (fig. 3). This analysis shows that last year the price of aluminum fluctuated from 1550 USD/ t (May 2016) to 1950 USD/t (March 2017), giving a significant difference of 400 USD/t or about 26%. This means that the aluminum market is still unstable, it requires urgent observation and analysis of the processes occurring on it.

Market analysis and aluminum price forecasts

Stock exchanges and investment banks' forecasts indicate that demand for aluminum will increase, although currently there is a surplus of supply demand on the global market [7]. Also current short-term forecasts are about the stabilization of the price of aluminum, but they are risky because, apart from economic phenomena, the speculative capital has been affected by it, which has also contributed to the sharp changes in aluminum prices in recent years. Therefore, the impact of this factor should be taken into account when preparing forecasts for the coming periods.

On the other hand, the long-term trends can be predicted by further stable growth of raw material prices. This may be due to the growing demand for aluminum in developing countries, increasingly widespread in the automotive, aerospace, construction, refrigeration, packaging and machinery industries. Another reason for the increase in prices may be rising production costs, including an increase in electricity prices.

On the other hand, one should consider developing more dynamically recycling aluminum, appearing more efficient methods of recovery of raw materials, increasing the production of metal in China and the increasing use of composite materials to replace aluminum.

Conclusions

Year by year, the aluminum market is becoming increasingly important in the world because of the growing demand for this material in many sectors of the economy and the dynamic development of many economies. Market analysis showed that during the 20th and 21st centuries large and sometimes violent changes occurred, caused by various factors, among others. as a result of global financial crises and political and economic changes. Taking into account the factors described, as well as the increase in the importance of metals and global economic development, it can be assumed that the price of aluminum will maintain a stable growth in the long run.

REFERENCES

- Michalski B. "Rynek aluminium". Uniwersytet Wrocławski: www.ism.uni.wroc.pl/sites/ism/art/michalski_rynek_aluminium.pdf (access: 30.05.2017).
- Waszczuk N., Wzorek A., Łamasz B. "Relationship between copper price and selected metals prices". *Key Engineering Materials*. 682 (2016): pages 336–341.
- 3. Physical Commodities Trading: http://physicaltraders.com/ (access: 30.05.2017).
- 4. London Metal Exchange: https://www.lme.com (access: 30.05.2017).
- 5. Dudziński J. "Boom surowcowy obecnej dekady. Cechy, przyczyny, skutki". Studia i Prace WNEiZ. 13 (2009).
- 6. Jajuga K., Jajuga T. "Inwestycje". Warszawa: PWN, page 328.
- 7. "Rynek aluminium w Polsce 2013/2014. Raport". Nowa Stal (2015): page 43.