MERGERS AND ACQUISITIONS IN THE LITHIUM INDUSTRY. A FRACTIONAL INTEGRATION ANALYSIS

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- Data
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Introduction

- The concerns about the mineral resources has increased significantly during the last years.
- Concerns about climate and environmental concerns.
- Lithium and clean technologies.
- Rechargeable lithium-ion batteries (car industry) · Problem of storage.
- Petroleum is losing importance (change in the next 10-25 years).

Introduction

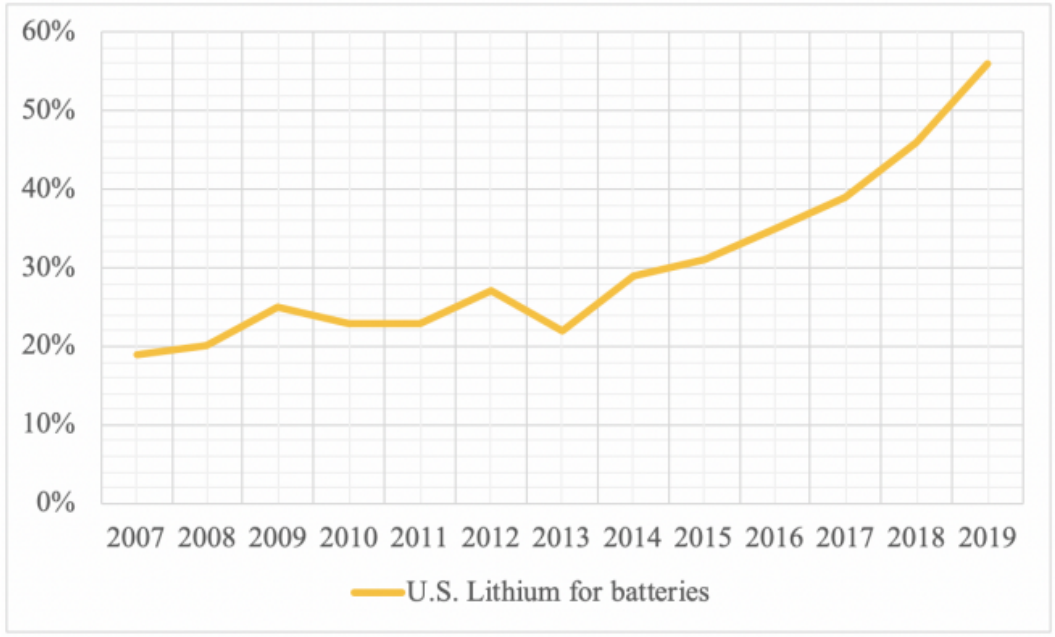

Figure: Percentage of the global lithium markets for batteries. Jaskula (2019)

Introduction

- Gort (1969) and Coase (2009) argue that economic and industry shocks produce a reallocation of assets through mergers and acquisitions.
- Oil companies located in China and Saudi Arabia are investing in renewable energy sources through external M&A activity.
- Brealey and Richard (1995) and Gregoriou and Renneboog (2007) affirm that M&A activities generate efficiency gains.
- M&A give us information regarding future expectations on energy prices dynamics (Bos et al., 2018).

Introduction

- **FUNDAMENTAL LITERATURE REVIEW**
  - There are several papers dealing with merger waves including, among others, Nelson (1995), Golbe and White (1988, 1993), Mitchel and Mulherin (1996), Andrade et al. (2001), Harford (2005), Ravenscraft (1987), Shleifer and Vishny (1990), Holmstrom and Kaplan (2001).
  - Town (1992) and Resende (1999) used switching models to model the merger series.
  - Monge and Gil-Alana (2018) use methodologies based on Continuous Wavelet Transform (CWT) and Vector AutoRegressive Models (VAR) to study the dynamics of the lithium industry and mergers and acquisitions in the U.S. oil and gas industry.

Introduction

In this paper, we analyze the influence of mergers and acquisitions (M&A) in the behavior of the lithium sector by applying statistical methods based on two methodologies:

- **Long memory**
- **Fractional integration models**

Data

- The data used in this research paper correspond to the mergers and acquisitions in lithium industry all over the world from May 1985 to January 2019.
- It is obtained from Thomson Reuters Eikon database.
- The research uses daily number of mergers and acquisitions in the lithium industry to form the aggregate monthly series.
- We observe that the mergers and acquisitions in the lithium industry substantially increased after the Global Financial Crisis in 2008.

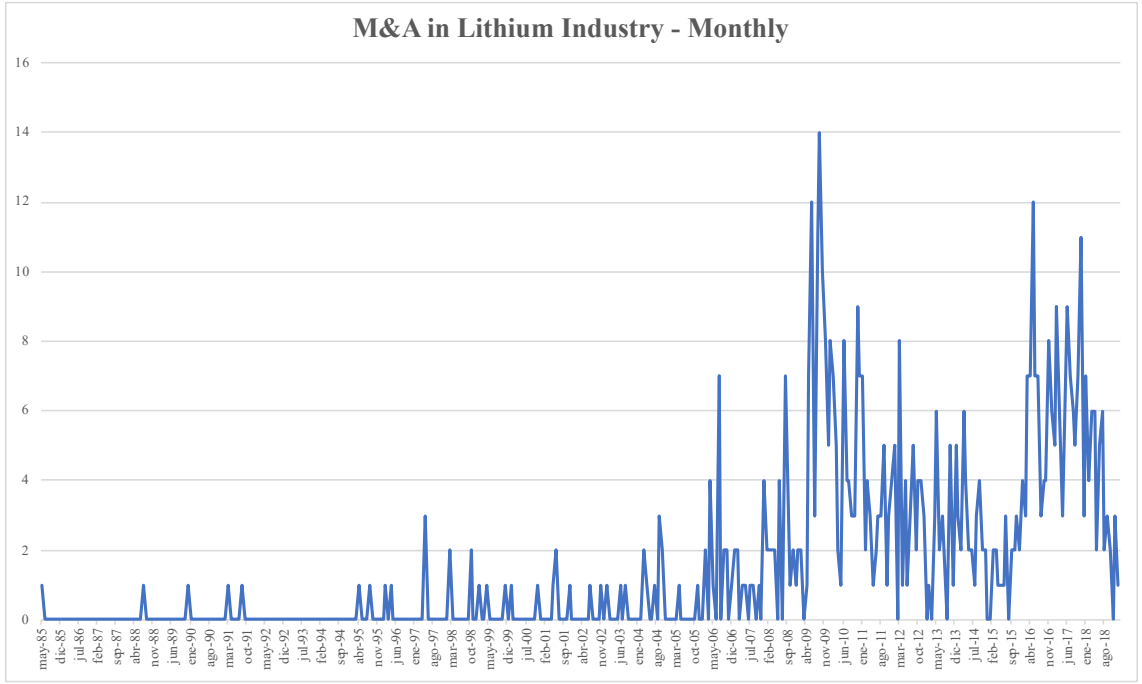

Figure 1. Mergers and Acquisitions (M&A) in Lithium Industry.

Methodology

Fractional Integration

- Fractional integration is a time series technique that allows for a fractional degree of differentiation.
- Given a time series, (xt), t = 1, 2, · · · , we say that it is integrated of order d, and denoted by I(d) if its d-differences are stationary I(0).
- See Monge and Gil-Alana (2020); Monge and Gil-Alana (2021), among others.

Results

Estimates of d under three different specifications

Disturbances	No terms	An intercept	A linear time trend
White noise	0.39 (0.35, 0.45)	0.41 (0.37, 0.46)	**0.36** **(0.31, 0.42)**
Autocorrelation	0.57 (0.47, 0.69)	**0.59** **(0.49, 0.72)**	0.55 (0.42, 0.71)

Table 2.

Estimated coefficients in the selected specification

Disturbances	No terms	An intercept	A linear time trend
White noise	**0.36** **(0.31, 0.42)**	-0.5106 (-1.93)	0.0109 (3.64)
Autocorrelation	**0.59** **(0.49, 0.72)**	0.2473 (1.98)	---

Results

Estimates of d based on a semiparametric method

Bandwidth	Estimate of d	Bandwidth	Estimate of d
11	0.666	21	0.727
12	0.721	22	0.722
13	0.767	23	0.736
14	0.816	24	0.719
15	0.829	25	0.685
16	0.801	26	0.669
17	0.787	27	0.664
18	0.812	28	0.674
19	0.838	29	0.669
20	0.768	30	0.641

Results

- Our results suggest that the time series is fractionally integrated and mean reverting, as the estimated value of d is lower than 1 both for the white noise and imposing autocorrelation.

- Nevertheless, it seems to be stationary under the white noise specification for the error term while nonstationary under autocorrelated disturbances.

- Performing a semiparametric approach the latter specifications seems to be preferred since the estimated value of d ranges then in the interval (0.5, 1). Therefore, we observe mean reversion (d < 1), implying transitory shocks albeit with long lasting effects.

Conclusions

- We have examined the influence of the mergers and acquisitions (M&A) in the behavior of lithium sector applying statistical methods based on long memory and fractional integration models.

- As far as we are concerned there are no previous econometric Works relating to the M&A in the lithium industry using these methodologies.

- The time series is fractionally integrated and mean reverting, as the estimated value of d is lower than 1 both for the white noise and imposing autocorrelation.

- Hence, we can conclude that the impacts for the lithium industry due to M&A will be transient and are expected to disappear on their own in the long term.

If you any questions, please let me know

THANK YOU