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

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About me

Economist, entrepreneur and investor, researcher

- Degree in Economics

- Master in Economics and Finance

- PhD in Economics and Business, University of Navarra

- Empirics of Management program at LSE London

- Finance and Managerial Development Programs at IESE Business School

o Panel methods to analyze the effects of terrorism on tourism.

o I have focused on issues of energy economy, energy transformation and climate change, applying advanced econometric techniques for time-frequency analysis such as WCT or fractional integration and co-integration techniques.

o I have also been part of the "Energy Economics Research Group" (UFV, Madrid).

   In the last year, I have published in prestigious international journals such as Review of Development Finance (Q1) or Review of Economics and Finance (Q4). I am also a reviewer for journals of considerable impact such as "Applied Economics" (Q2 Economics & Econometrics).

o I am currently an associate professor at the University of Navarra and IUNIT Business School (Madrid)

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Outline

- Introduction

- Data

- Methodology

- Results

- Conclusions

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

Introduction

- The concerns about the mineral resources has increased significantly during the last years.

- Concerns about climate and environmental concerns during the last 20 years ➡ clean energies

- Lithium has a strategic role as a natural resource as more and more clean technologies emerge.

- Rechargeable lithium-ion batteries (car industry) ➡ Problem of storage.

- Petroleum is losing importance especially in transport

- Change in the next 10-25 years ➡ Changes in the clean component markets
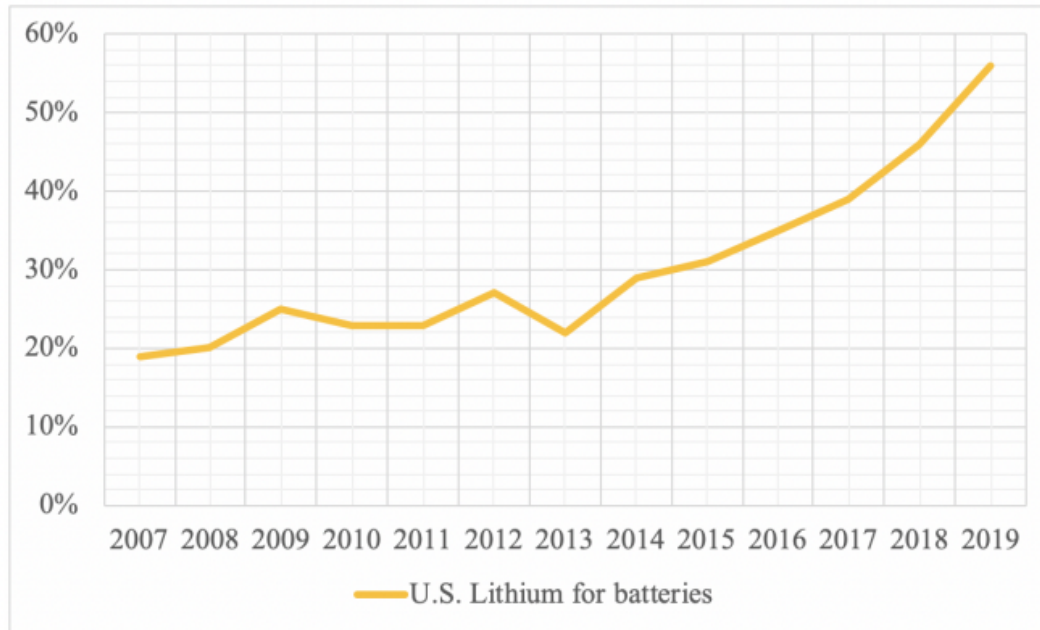
Introduction

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

Literature review

- 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. Mergers and acquisitions carry valuable and fundamental information regarding future expectations on energy prices dynamics and should be taken into account in forecasting exercises.

- Harford (2005): economic, technological and regulatory shocks provide the fundamental reasons for M&A.

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

- **FUNDAMENTAL LITERATURE REVIEW**

  - Bos et al. (2018) provide a novel perspective to the oil-stock market nexus by examining the predictive ability of mergers and acquisitions over West Texas Intermediate (WTI) oil returns and volatility using a nonparametric quantile-based methodology.

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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**

There are no previous econometric works relating to the M&A in lithium industry using long memory

and fractional integration methods.

MERGERS AND ACQUISITIONS IN THE LITHIUM
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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.
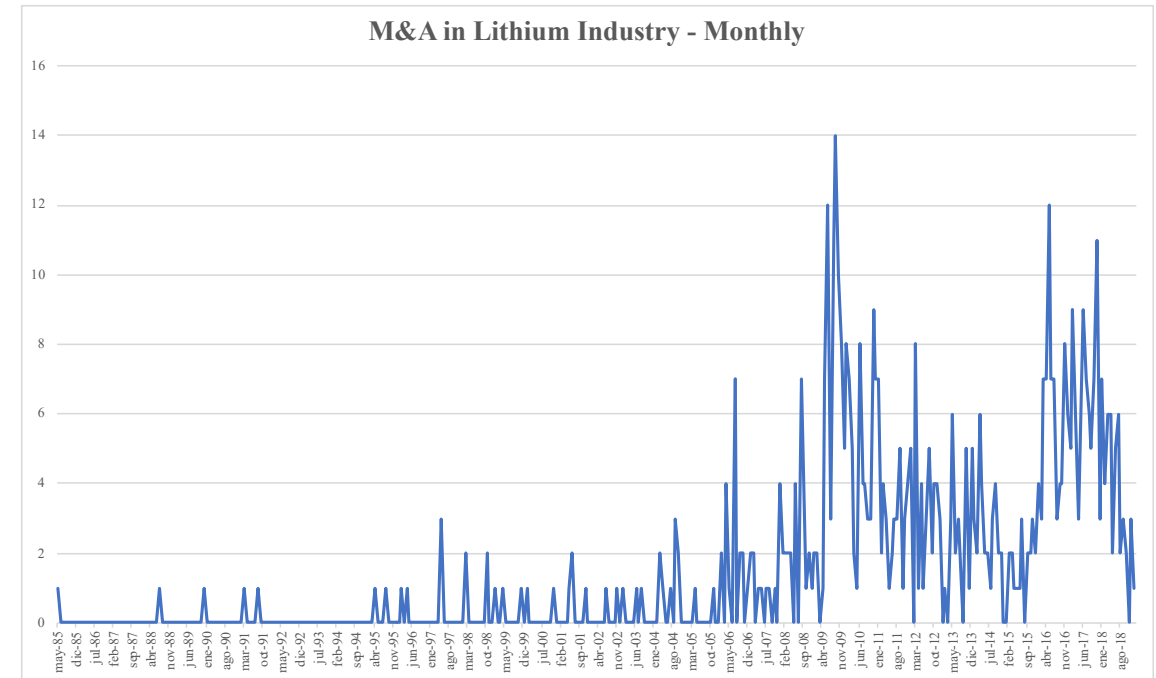
M&A in Lithium Industry - Monthly

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

Methodology

▶ We use techniques based on long memory and fractional integration.

▶ Follow my co-authors: Luis Alberiko-Gil Alana and Manuel Monge

Methodology

▶ We estimate the differencing parameter d by using both parametric and semiparametric techniques. As long as d is smaller than 0.5, while it is nonstationary for d ≥ 0.5

- If d is smaller than 1, shocks will have a transitory nature and their effects will disappear by themselves in the long run.

- If d ≥ 1 where shocks are not mean reverting and their effects will persist forever. Thus, d can be viewed as an indicator of the degree of persistence, the higher its value is, the higher the degree of persistence is in the data.

▶ 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)	---

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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

- White parametric approach: value of d is lower tan 0.5 (0.36) meaning that the time series is stationary.

- If we impose autocorrelation: vale of d is higher tan 0.5 (0.59) implying that transitory shock though woth long lasting effects.

- The results based on this parametric approach produce some confronting results.

- Under autocorrelation, which apparently might be a more realistic approach, the estimated value of d is much larger and above 0.5 implying a nonstationary pattern.

- From table 3 (semiparametric methods), we observe that all them are once more in the interval (0, 1) supporting fractional integration and also above 0.5 implying nonstationarity though mean reverting behavior.

Conclusions

▻ 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.

▻ 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

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