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Master Thesis: Investigating the Applications of Crude Oil Tanker Tracking Data in Financial Markets

The total amount of data created globally has increased tremendously during the last decades and experts expect that the volume of data will at least triple within the next five years according to an International Data Corporation (2018) report. The rapid increase in data attracts many researchers to explore the possibilities of applications that grow with similar speed. In recent years, several studies have successfully shown how to utilize new data sources in empirical financial market research. For instance, Katona et al. (2018) use satellite images of parking lot traffic across major U.S. retailers to predict future sales and earnings of the individual stores.

In this thesis, the student is encouraged to use automatic identification system (AIS) data that contains historical crude oil tanker movements and corresponding variables such as speed, draught, destination, etc. The goal of this thesis is to investigate appropriate applications of the crude oil tanker tracking data by using machine learning models that explain or forecast fundamental key economic variables such as spot and future crude oil prices, corresponding volatility or spreads between different types of crude oil such as Brent and West Texas Intermediate (WTI). The research question is founded on the fact that the available AIS data set allows to observe almost half of the global crude oil supply chain, since almost half of the produced crude oil is transported by sea (Dudley, 2019). In addition, the idea is supported by the recent occurrence of negative WTI future prices from April 20, 2020. On this day, the AIS data has shown a steep decrease in tankers' speed in the specific region indicating full inventories in this area and consequently, a sharp decrease in the WTI future price.

In order to address the mentioned goals, the student first needs to review common literature about the value chain and mechanisms of the global crude oil market to derive a reasonable theoretical framework for his or her empirical analysis. Afterwards, he or she may use machine learning models such as support vector machines or neural networks in order to explain or forecast common crude oil market measures such as prices, volatility or spreads. An AIS data set covering the movement of world's largest crude oil tankers between 2017 and 2018 is provided. Furthermore, the student is also encouraged to look for additional data sources that may be relevant in the empirical analysis. Regarding student's requirements, he or she should have at least basic programming skills and needs to be able to deal with large amounts of data. A basic knowledge in the field of statistical learning is a plus, too.

Supervisor: Tino Cestonaro

Literature:

- Dudley, Bob (2019). Statistical Review of World Energy 2019. *Tech. report retrieved from: <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf>*. Accessed March 29, 2020. BP.
- International Data Corporation (2018). “The Digitization of the World: From Edge to Core”. *Tech. report retrieved from: <https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-dataage-whitepaper.pdf>*. Accessed April 26, 2020.
- Katona, Zsolt, Marcus Painter, Panos N. Patatoukas, and Jean Zeng (2018). “On the Capital Market Consequences of Alternative Data: Evidence from Outer Space”. In: *Proceedings of 9th Miami Behavioral Finance Conference*. Miami, USA.
- Regli, Frederik and Nikos K. Nomikos (2019). “The Eye in the Sky – Freight Rate Effects of Tanker Supply”. In: *Transportation Research Part E: Logistics and Transportation Review* 125, pp. 402–424.