



MERCURIA

EPFL MASTER PROJECTS

**INTERNSHIPS 2018
STUDENTS' TESTIMONIES**



Mercuria is one of the largest global energy and commodity trading and investment groups, with operations in over 50 countries and more than USD 100 billion in gross turnover. The group trades gas and electricity, and more than 2.2 million barrels of crude oil and petroleum products every day. The company operates throughout the commodity value chain and focuses on the three key areas of asset development, structured commercial finance solutions, and physical commodities trading.



The objective of the internship / master project is to give students the opportunity to carry out a project in a challenging, innovative and fast paced professional environment. Our students will put into practice the methodological and technical competencies acquired during their studies and show their ability to work independently. The internship / master project offers students professional work experience and the opportunity to familiarize themselves with the way our Company operates and insights into our main processes.



MERCURIA





MERCURIA

Intern's name	Adrien Theler	EPFL section	Physics
Intern's name	Fahd Zarg El Ayoun	EPFL section	Communication Systems
Job Title	Finance & IT Intern	Project	VAT Compliance Validation in Commodities Trading
Department	Technology	Location	Geneva

Project description:

Within a cross-functional team in charge of continuous process improvement from back to end, Adrien and Fahd were involved in a project focusing on the automation of trading invoice payments. The goal was to build a VAT decision prediction / validation proof of concept.

Intern's role and objectives:

In that context and using theories such as the probability theory, the decision theory and the information theory, Adrien and Fahd analyzed data from various systems. They designed a pattern recognition tool in order to express uncertainty in a precise and quantitative manner and to exploit this probabilistic representation of the flow in order to make prediction on the invoice pattern category between invoices subject to different VAT treatment.

More precisely the model ultimately needed to run on near real-time, covering 15'000+ invoices paid per month.

The tasks involved the following elements:

- In collaboration with content experts and leveraging on historical data, identifying features and techniques to be used;
- Sourcing the necessary data and setting the feature calculations and the ML algorithms in the research environment;
- Running back tests and reports on the results;



MERCURIA

Result of the project and impact:

The project successfully met the business' expectations and was commissioned to be put in production. The developed solution will be generalized to other companies of MERCURIA Group.

Intern's testimony:



"Globally, old technologies are still being used a lot in the commodity industry. At Mercuria, the management is convinced that new ideas and technologies can bring a great benefit to the business. As a Data Science intern, I worked on the development of a Machine Learning solution to help the Tax department to validate the decision regarding the VAT taxation of trading transactions. The close collaboration with the business teams was really rewarding and I also felt a lot of support from my direct manager. We had the opportunity to present the project to the CEO of the company, and I received a very positive feedback. I was also involved in the discussion of the possible future projects for the Data Science team at Mercuria, and the opportunities seem to be limitless. The working atmosphere at Mercuria is casual and dynamic, and overall I really enjoyed my internship at Mercuria."

Adrien Theler



"During my internship at Mercuria and as a Data Scientist intern, I did my master project about the validation of VAT decision in trading transactions using Machine Learning.

We had the chance to present the project to the CEO of the company. It allowed us to show how the project can add value to the company and how technologies can change the Finance world.

This internship was a great opportunity for me to discover the world of Finance and to use my knowledge in Data Science to contribute to the success of a project in a professional context. Aside from working in a multicultural and energetic environment, interacting everyday with senior managers within the organization helped me gain experience and develop my professional skills."

Fahd Zarg El Ayoun



MERCURIA

Intern's name	Anna Grigoryeva	EPFL Section	Financial Engineering
Job Title	Finance Middle Office Intern	Master Project	Allocating funding costs for OTC cash collateral margining
Department	Finance Middle Office	Location	Geneva

Project description:

The project Anna worked on is part of a larger balance sheet by portfolio project, which aimed to facilitate transparency on how Mercuria uses its debt and equity, and allocation of both costs accordingly.

Anna's responsibilities consisted in looking at Mercuria's OTC cash collateral positions and to derive an optimal method to calculate and charge or reward interests to the trading desks.

Intern's role and objectives:

The first step consisted in gaining an excellent understanding of CSA (Credit Support Annex)'s, the OTC collateral procedures, the current method used, the current processes in place and the data flows in the respective systems. With this knowledge basis, Anna ran simulations to compare numbers under the current method of reallocating OTC margining funding charges versus a full recalculation of funding charges eliminating cross subsidization under different methods applied. These included methods and ideas provided by Mercuria as well as methods and ideas derived during the project deployment. Anna compared the methods, analyzed the data, and stress tested the results in order to ensure the final method chosen was sound.

The tasks involved the following elements:

- Gaining a better understanding of the actual OTC cash collateral positions, their underlying credit risk positions, and the composition with respect to the desks that drive the cash collateral calls;
- Gaining a better understanding about data quality in the respective systems and defining the data sources to be used depending on the data quality;



MERCURIA

- Finding a method that can be applied to allow Mercuria to fairly charge and remunerate desks for their respective contribution to Mercuria overall costs/benefits coming from OTC cash collateral positions;
- Writing a specification for IT to include the method to be applied within the broader balance sheet by portfolio project;

Result of the project and impact:

Several models of funding costs allocation have been developed and tested on historical data. The best model was chosen. The funding allocation model will provide information to the traders about their usage of capital. This will allow traders to make more informed trading decisions and reduce potential funding costs.

A major part of this project was the assessment of the data quality. The data provided by the internal system were investigated, and some system issues were identified. This understanding motivated new projects aiming to improve the data recording system. The better data quality is expected to have a number of positive effects: a higher clarity of reports for the credit insurance companies, which will reduce premiums; more accurate collateral calls; correct allocation of funding costs to the trading desks.

Intern's testimony:

"The 6 month internship at Mercuria was a unique educational experience for me. I worked in the finance middle office team on a part of a big project. The outcome of this project formed the basis of my master thesis, and my supervisor at university found the project to be very interesting.

The integration with the team could not have been easier and they gave me a lot of help and support during these months. The team members were always available for discussions and teaching me about the intricacies of the company's workings, as well as about technical aspects. Among other interns, I presented my project to the CEO, which was very exciting. Moreover, there was a round table discussion, where everybody could tell about their project. This helped to learn the bigger picture, and stimulated discussion that was very helpful to facilitate the progress of my project. I would definitely recommend Mercuria as a supportive and stimulating place for work!"

Anna Grigoryeva



MERCURIA

Intern's name	Farah Abdellah	EPFL Section	Financial Engineering
Job Title	Technology Intern	Master Project	Gas Index prediction & Asset optimization
Department	Technology	Location	Geneva & Singapore

Project description:

Gas index prediction and asset optimization: The case of Russian gas supplies to Europe. Looking at Russia's gas index, create a model that fits the historical data and predicts Russia's gas future prices. Use these future prices to optimize Europe gas imports of gas from Russia.

Intern's role and objectives:

The project included principally the following components:

- Prediction of Russian natural gas price using machine learning methods (regression, Lasso, Neural Nets, etc.);
- Optimization of Europe gas imports from Russia (Monte Carlo method);
- Building of a Generic Monte Carlo framework (Longstaff-Schwartz MC, Least-Square MC, etc.);
- Using the above Monte Carlo framework to solve stochastic control problems such as gas storage stochastic optimization;

Result of the project and impact:

Farah implemented a model that is able to approximate the Russian gas index with a low error. This model can be adapted and used for other countries. She also constructed a general and flexible model to optimize gas storage (Monte Carlo model) and used this model to optimize Europe gas imports from Russia.



MERCURIA

Intern's testimony:



"During my internship at Mercuria, I was working on my master project about index prediction and asset optimization. The project involves developing machine learning models to predict natural gas prices and implementing an optimization framework for gas storage (Monte Carlo model)."

"During my internship, I was given the chance to travel 2 months to Singapore where I gained invaluable knowledge about the energy market. It was an amazing experience and the team was very welcoming and helpful. The presentation with the group CEO was a very good experience. It was a real opportunity for us to show what we are working on and to discuss how the project can add value to the company."

"I would recommend Mercuria for 3 main reasons. First, you will evolve around smart professionals and you will get the opportunity to learn from them. Secondly, despite the fact that Mercuria is one of the largest energy trading companies in the world, your innovative ideas are always welcome and you can truly see your impact within the company. Last but not least, it is an international company, people come from different countries and with different backgrounds which is a real cultural and intellectual richness."

Farah Abdellah





MERCURIA

Intern's name	Christian Adank	EPFL Section	MTE
Job Title	Operations Intern	Master Project	Performance Improvement in Commodities Trading Operations
Department	Operations	Location	Geneva

Project description:

Christian investigated different metrics used by the operations department and aimed to provide the Company's management a tool that would allow to increase transparency on the departments' operational performance and its drivers in terms chosen metrics, on a global scale.

Intern's role and objectives:

Christian's role consisted in understanding the role of an operations department in commodities trading. In the context of this project, he aimed to assess the drivers of operational performance within the operations department using different data sets.

The role included the following:

- Development of a better understanding as well as the utility of metrics and data usage in the commodities trading industry;
- Identification of operational efficiency improvements (technological: e.g. blockchain, contract reader);
- Building of a framework, which supports the Company in the analysis of future data sets;

Result of the project and impact:

The first part of the project was to analyze the core roles and processes of the operations department in order to define the most appropriate metrics which could help in the assessment of its operational performance. Following this assessment, Christian analysed the ETRM architecture to assess the data structure using RDB through MSSQL and different interviews with various positions (e.g. controlling,



MERCURIA

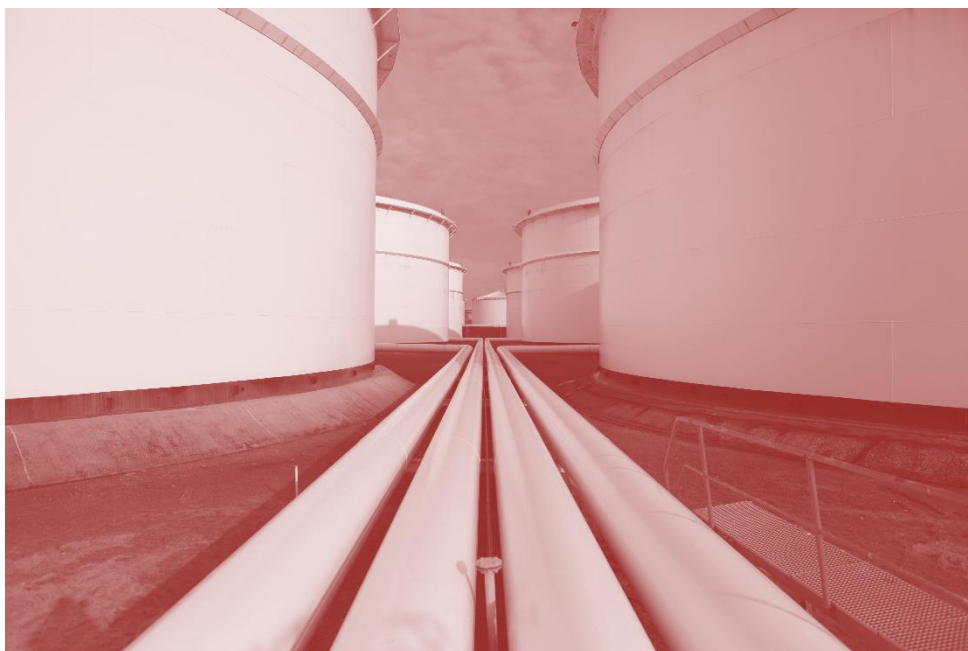
operations, trader, shipping and chartering) within the company to understand their function and needs. Finally, Christian built a management dashboard comprising selected metrics and reports, with recommendations. This approach included the integration of various sets of data in a powerful visualization tool (Tableau). This tool now allows management to visualize and interpret data, and hence brings more transparency and helps to link various data sets, for example the analysis of human resource allocation, metrics related to the quantities of trading operations within various products. Overall this tool allows to better measure the operational performance of the Company.

Intern's testimony:



"I started my internship in February 2018 in Operations at Mercuria. The reason for my decision to execute my mandatory internship at a commodity trading company were the exciting possibilities to be part of a dynamic, disrupting and still entrepreneurial industry. You receive your assignment from day one; you may have the opportunity to travel to a different entity and finally, the opportunity to present your project to the global CEO of a leading commodity trading company. You will strength your skills in managing a project in a global environment, connecting to people and, of course, improving your knowledge in commodity trading."

Christian Adank





MERCURIA

Intern's name	Loukas Charalambous	EPFL Section	Financial Engineering
Job Title	Quantitative Strategists Intern	Master Project	Pricing Model of Energy Derivatives
Department	Strategists	Location	Geneva & London

Project description:

The project was divided in two parts. The first part was to fit the volatility surface in an arbitrage-free way. The resulting surface provided the data that was used for the second part, the models calibration. The models tried to capture the dynamics of energy commodities returns. To achieve this, Loukas used among others the following features. a) Jump Processes b) Non-Gaussian distribution c) model developed using Heath-Jarrow-Morton (HJM) framework.

Intern's role and objectives:

Loukas started with the literature review for the above mentioned problems. After that, he continued with the theoretical analysis and the resulting models to be implemented in Python. The models was then calibrated and tested to market data.

Loukas gained great understanding of the dynamics of the Energy commodities returns and derivatives contracts

He also learnt how to structure, implement, and calibrate models, and finally got exposure and education on Energy commodities markets

Result of the project and impact:

Thanks to this projects, the team is now able to price more accurately illiquid European Options, complex options (f.e. Asians, Swaptions, and Digitals), and to calculating the risk of these options



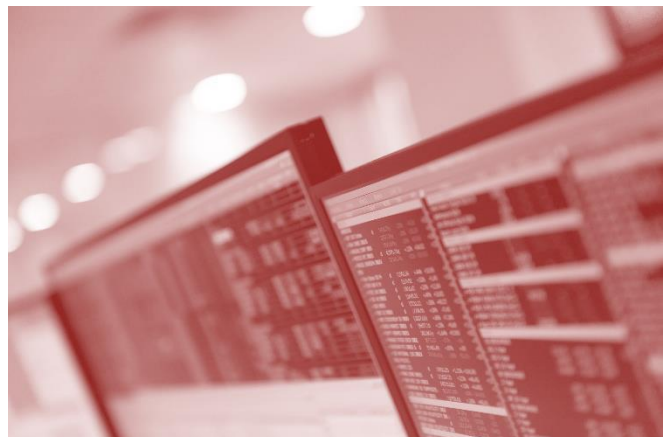
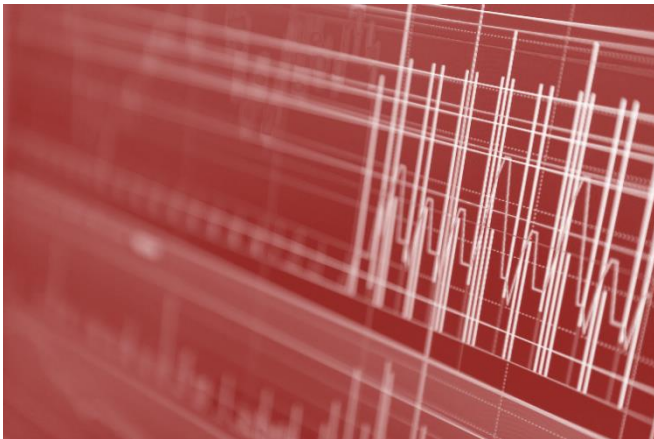
MERCURIA

Intern's testimony:



"My 6 month internship at Mercuria Energy Trading provided me all the means and support to complete my Master thesis and in the same time gave me the skills and techniques required to effectively complete tasks. I was part of an incredible team, giving me continuous support and encouragements making this a truly unique experience. I was also very lucky to have worked with other motivated, bright, and knowledgeable interns, who I learned a lot from as well. Anyone lucky enough to have an internship at Mercuria should capitalize on this great opportunity."

Loukas Charalambous





MERCURIA

Intern's name	Marcin Kuczara	EPFL Section	Financial Engineering
Job Title	Quantitative Strategist Intern	Master Project	Least Squares Monte Carlo applied to commodity derivatives pricing.
Department	Strategists	Location	Geneva

Project description:

The goal of the project was to study the Least Squares Monte Carlo in context of commodity assets and derivatives valuation. The one of particular interests was Gas Storage.

Intern's role and objectives:

Marcin had to explore the academic literature related to the LSMC and its application to the commodity industry, implement an initial basic/text book example of LSMC framework. Finally, he had to apply the technique to the specific case of gas storage.

Marcin's target was to obtain the deep understanding of the LSMC techniques as well as a clear picture of its applications. While gaining strong experience in the commodity trading industry, he confirmed his theoretical analysis through the implementation of the textbook example in the chosen programming language. Finally, the aim was also for him to be able to apply this LSMC technique to the specific case of gas storage and benchmark his results to other techniques.

Result of the project and impact:

The framework to price a gas storage using least squares Monte Carlo was constructed, which also involves the detailed modelling of physical constraints. By using such model, the Company can obtain more exact and competitive pricing of such a facility. Moreover, the trading strategy that can monetize this value is provided.



MERCURIA

Intern's testimony:



"For my internship at Mercuria, I joined the team of quantitative strategists who are using their strong mathematical background to solve the real business problems in finance. As a part of my assignment, I was supposed to develop the model to price the gas storage facility.

This proved to be an exciting and demanding project and at each step, my team shared their knowledge and experience to make it even better. Apart from that, I got a chance to support my colleagues with day-to-day tasks, which involved derivatives pricing, and risk management. During the internship, not only was I regularly presenting the project to my manager but also to the group CEO. Honestly, I doubt that in any other company, you get a chance to share your work with the higher management, so early in your career.

Finally, I would really recommend joining Mercuria as straight after university you have a chance to innovate and make an impact in a very flat and international environment. What's more, you can learn from the best people in the industry and that is exactly what you need."

Marcin Kuczara



MERCURIA