University of Lausanne
Faculté des hautes études commerciales (HEC)
Course: *Data Science and Advanced Programming*
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Project Proposal

Title: *Impact of Oil Prices on the Stock Performance of Fossil and Renewable Energy Sectors*

This project examines how fluctuations in crude oil prices affect the stock performance of two energy sectors: fossil fuels (XLE ETF) and renewable energy (ICLN ETF). The goal is to determine whether renewable energy stocks react differently to oil price shocks and whether they demonstrate a growing independence from fossil fuel markets.

Daily historical data will be retrieved from Yahoo Finance for the period **2018–2024** (≈1 500 trading days). Prices will be transformed into **logarithmic daily returns**, and the dataset will be enhanced with **lagged features** (t-1, t-2, t-5) and **rolling-window statistics** (e.g., 5-day moving average of oil returns) to capture delayed effects rather than only contemporaneous correlations.

Data will be split using a **chronological train/test split** (80/20), and a **walk-forward time-series validation** will be used to assess performance stability. The baseline will be a **naive forecast** ("tomorrow's return = today's return"). The project will compare two models:

1. **Multiple linear regression** (interpretable benchmark)

2. **Random Forest Regressor** (captures nonlinear relationships)

Success will be measured using **RMSE, MAE, and R^2** on the test set.

Deliverables will include time-series visualizations, a feature-importance analysis, model comparison tables, and forecast plots. The final output will quantify the sensitivity of each sector to oil price movements and evaluate whether renewable energy exhibits growing independence from fossil fuel dynamics.