Algorithmic trading
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Project

Next I give a description of two suitable projects so those of you who do not know what to do, may choose. Those of you who already have an idea please send a small proposal before the 21st of October 2022 so I can have a look. **Remark.** Everyone has to send an email to hugoedu.ramirez@urosario.edu.co stating the proposed (preferred) project.

1. **Trading options with volatility. (Ideas from Quantopian)**

   The idea is to create a basic trading algorithm on options based on volatility.

   Task 1. Write a small review of the volatility and implied volatility concepts.

   Task 2. Research on the VIX Index and explain how it helps to understand the sentiment of the market. Be careful there exists VIX options and VIX futures. You may also use VXN for Nasdaq or VXD for Dow Jones.

   Task 3. To implement this trading strategy (With VIX) you would need the following information: $S\&P500$ futures, the CBOE Volatility Index - VIX. Thus research where and how to download this data.

   Task 4. Create a strategy that follows the following logic: To buy $S\&P500$ if VIX crosses a predetermined threshold, usually < 30 (> 30 High uncertainty and fear) and > 20 (< 20 calm market, rally market due to greed); and Take Profit if $S\&P500$ increases 5%, or Stop Loss if $S\&P500$ decreases 5%.

   Task 5. Backtest your strategy by calculating the returns and cumulative returns of your strategy and bring some conclusions.

2. **Trading with crypto currencies.**

   Task 1. The first thing to do is download the data from some website, ideally this has to be automated by using some `API`. One option is to use the `BINANCE API`, you can find more information at `https://www.binance.com/en/binance-api`.

   Task 2. Using daily data of different coins, use correlation and/or co-integration analysis, as seen in class, to create a pairs trading strategy in crypto-currencies.

   Task 3. Select four of the currencies to create a portfolio. Find the portfolio configuration with the highest Sharpe ratio. This could be done by iterating over all possible portfolio's up to certain error tolerance or by running a big number of random strategies (called Monte-Carlo simulation).

   Task 4. Backtest your strategies by calculating the returns and cumulative returns of your strategies.

   Task 4. Improve your strategy to make it intra-day, clearly justify why and how it changes from daily. Test your strategy and bring some conclusions.

3. **Cryptocurrency trading using machine learning**

   Task 1. The first thing to do is download the data from some website, ideally this has to be automated by using some `API`. One option is to use the `BINANCE API`, you can find more information at `https://www.binance.com/en/binance-api`.

Task 2. Select four of the currencies for this project and use daily data. Make an initial EDA.

Task 3. Define your target and compute your dependent variable (the goal is to generate positive returns with your ML-bassed trading strategy).

Task 4. Compute different technical indicators and perform feature engineering to generate data to train the classification model in the following steps.

Task 5. Train different clasiffication models and choose one of them. Justify your decision with the different classification performance metrics.

Task 6. Backtest your strategies by calculating the returns and cumulative returns of your strategies.

Write a report including the development of your project, no more than $5 \pm \epsilon$ pages long, with letter no less than $11pt$. Do not forget to include codes, graphs and explanations in your report. Submit only a single file in pdf format, with the tailored name "Proj_yourname.pdf" (for example in my case would be Proj_HugoRamirez.pdf). The deadline is the 18th of November 2022, demonstrations 21th of November 2022.