Applied Data Science in Fintech

{'Summer School 2024': 'Trading-Bot Workshop'}

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Program for today

Program: Trading-Bot Workshop
Introduction, installation of software, brainstorming-sessions
Working in groups on the tasks; technical sessions
Break*
Working in groups on the tasks; technical sessions
Presentation of results

*additional breaks are included as needed

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Workshop procedure and philosophy

Image Credit: https://revistaempresarial.com

- No continuous presentations by the lecturer

- Group work (2 students per group)

- The groups are mixed (BSc/MSc OR beginners/professionals)

- Each "expert group" is responsible for one "topic"

- Methods are explained in detail in "technical sessions"

- Students ask the members of the "expert groups" for help

- The more experienced students help the others

- At the end of the day, the groups present their results

- The presentations are graded pass/fail.

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Prerequisites

Software:

- GitHub Codespaces (https://github.com/mario-gellrich-zhaw/Summerschool_FS2024)

    - Python 3.10

    - Jupyter Notebook

    - Visual Studio Code

Accounts:

- Coinbase Pro (regular account allowing to work with the public sandbox environment)
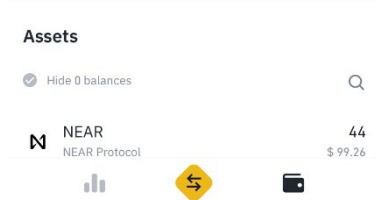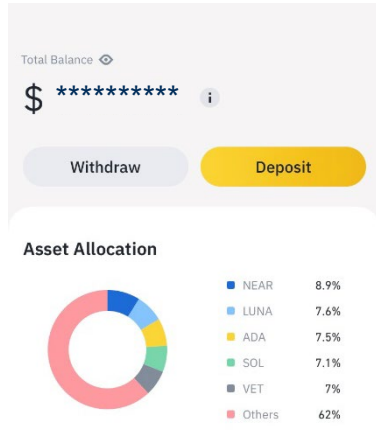
    Link: https://public.sandbox.pro.coinbase.com/trade

Material for exercises

- Jupyter-Notebooks (will be used to guide the exercises)

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Motivation

Self-Experiment using Binance (exchange) and Cryptohopper (commercial trading bot)

Motivation

Self-Experiment using Binance (exchange) and Cryptohopper (commercial trading bot)

Findings:

- Setting up Binance (online wallet) is simple.

- Setting up Cryptohopper is more complex.

- Cryptohopper works well but has some limitations.

- Limitations have been noted with the short functionality, for example.

- Very volatile market in both directions (-30% to +30% per day observed)

- The market is under pressure (e.g. due to regulations)

- The price development of different coins seems to be "linked".

- The prices of different coins seem to rise and fall in "waves".

- The number of coins on the market is increasing (e.g. meme coins).

Image Credit: https://www.coingecko.com

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Motivation

Although prices are very volatile, there are also opportunities. For example, the price of BTC and ETH increased by 105% and 79% respectively between July 2023 and July 2024.

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Technical Analysis (TA)

Example trading chart from Coinbase Pro (showing BTC-USD prices)

"Technical analysis is a trading discipline employed to evaluate investments and identify trading opportunities by analyzing statistical trends <u>gathered from trading activity</u>, such as price movement and volume."

https://www.investopedia.com

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Technical Analysis (TA)
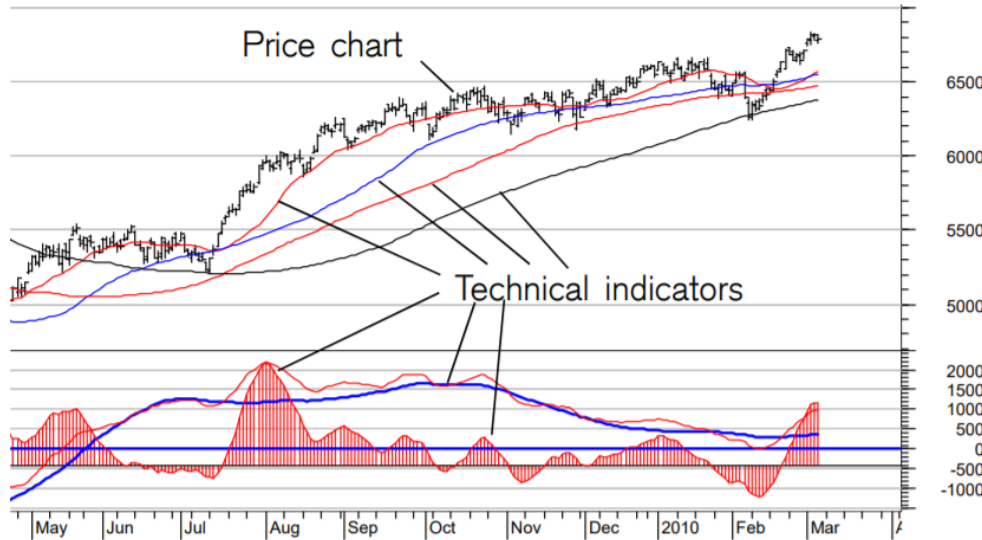
Image Credit: Credit Suisse (n.d.) Technical Analysis Explained

Unlike **Fundamental Analysis,** which is a practice of analyzing securities by determining the intrinsic value of the stock, the **Technical Analysis** is a method of determining the future price of the stock using charts to identify the patterns and trends.

Source: https://keydifferences.com/difference-between-fundamental-and-technical-analysis.html

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Technical Analysis (TA)
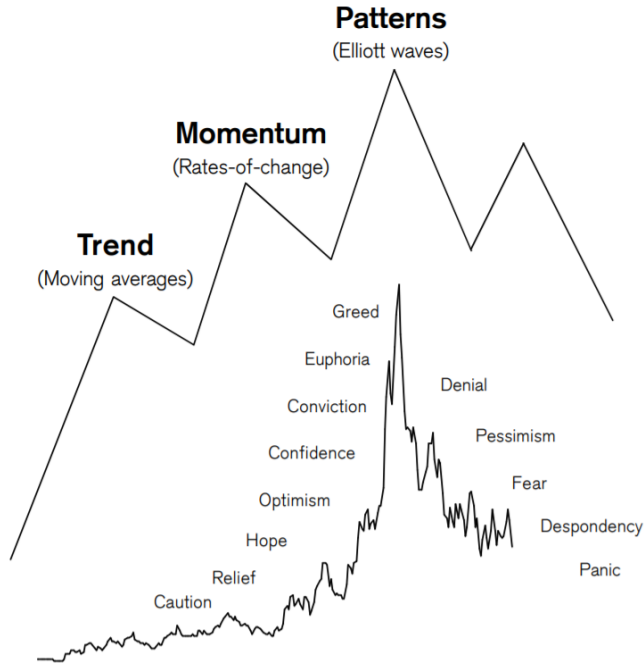
Image Credit: Credit Suisse (n.d.) Technical Analysis Explained

Optimism, pessimism, greed and fear …
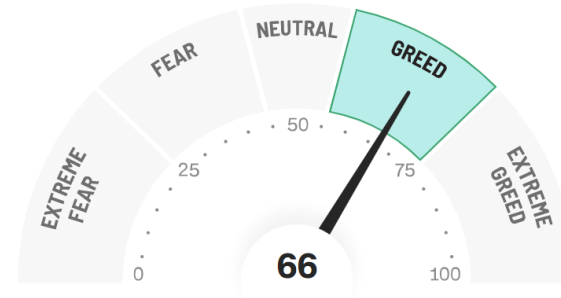

Image credit: https://edition.cnn.com/markets/fear-and-greed

Technical Analysis (TA)

Trend indicators

- SMA (Simple Moving Average)

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Oscillators

- RSI (Relative Strength Index)

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Trading Strategies

Image Credit: https://www.ig.com/en-ch/trading-strategies

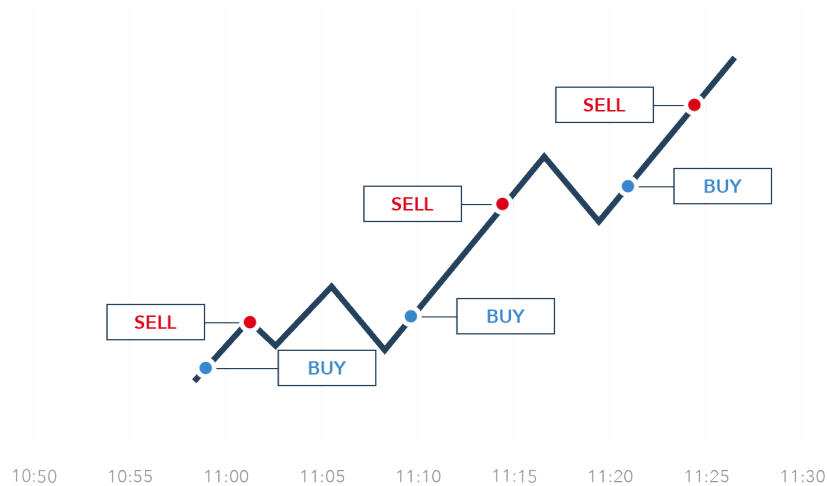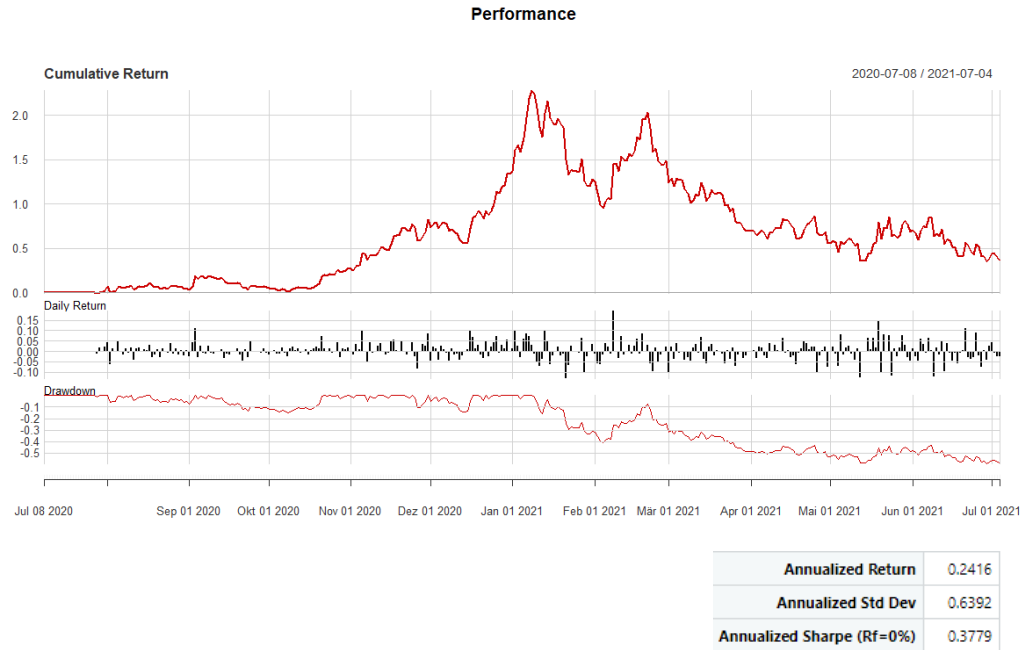*"In finance, a trading strategy is a fixed plan that is designed to achieve a profitable return by going long or short in markets. The main reasons that a properly researched trading strategy helps are its verifiability, quantifiability, consistency, and objectivity. For every trading strategy one needs to define assets to trade, entry/exit points and money management rules."*

Wikipedia

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Backtesting a trading strategy

Performance

Cumulative Return — 2020-07-08 / 2021-07-04

Daily Return

Drawdown

Annualized Return	0.2416
Annualized Std Dev	0.6392
Annualized Sharpe (Rf=0%)	0.3779

*"**Backtesting** is the general method for seeing how well a **strategy** or model would have done **ex-post**. Backtesting assesses the viability of a trading strategy by discovering how it would play out using historical data. If backtesting works, traders and analysts may have the confidence to employ it going forward."*

https://www.investopedia.com

Keyword pinboard (basis to define group tasks)

(Topic 1) Introduction Trading Bots & stock market
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(Topic 2) Python library vectorbt (functionality)
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(Topic 3) Getting and exploring data from exchanges
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(Topic 4) Technical analysis (TA)
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Keyword pinboard (basis to define group tasks)

(Topic 5) Defining a trading strategy
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(Topic 6) Backtesting the trading strategy
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(Topic 7) Programming the trading-bot
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(Topic 8) Performance analysis
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Keyword pinboard (basis to define group tasks)

MG What is technical analysis when talking about stock trading?

Technical analysis is a method used in stock trading to evaluate and predict future price movements of stocks, currencies, or other financial instruments. It relies on analyzing historical price and volume data to identify patterns, trends, and signals that can guide investment decisions.

The underlying principle of technical analysis is that historical price data can provide insights into the psychology of market participants and help predict future price movements. Technical analysts believe that market trends and patterns tend to repeat themselves, and by studying these patterns, they can make informed trading decisions.

MG Write Python code to get historical BTC/EUR data from Coinbase Pro. Use the public client of the Python library coinbasepro. Do not use the Python library cbpro.

Certainly! Here's the Python code to fetch historical BTC/EUR data from Coinbase Pro using the `coinbasepro` library's public client:

```python
import coinbasepro

# Create a public client
public_client = coinbasepro.PublicClient()

# Set the product pair
product = 'BTC-EUR'

# Set the start and end dates for the historical data
start_date = '2022-01-01'
end_date = '2022-01-31'

# Get the historical data
historical_data = public_client.get_product_historic_rates(product_id=produc

# Print the historical data
for data in historical_data:
    timestamp = data[0]
    low = data[1]
    high = data[2]
```

To solve the tasks, you are encouraged to use ChatGPT. This includes explanations and Python programming. It is expected that the explanations of ChatGPT are cross-checked with independent sources, and that the Python code is tested.

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Minimal structure of the final presentation

The presentation (provided by every group at the end of the day) must have the following structure.

1. Introduction

1.1 Background

1.2 Problem

1.3 Objectives

1.4 Research question

2. Materials and Methods

2.1 Data sources, -description & -preparation

2.2 Technical Analysis

2.3 Trading Strategy & Backtesting

2.4 Programing the trading bot

2.5 Performance Analysis

3. Results & Discussion

4. Conclusions