

Applied Data Science in Fintech

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



mario.gellrich@zhaw.ch

Dr. Mario Gellrich

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

Workshop procedure and philosophy



Image Credit: <https://revistaempresarial.com>

- No permanent presentations by the lecturer
- Group work (2 students per group)
- 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 members of «expert groups» for help
- The more experienced students help the others
- At the end of the day, groups present their results
- Presentations are evaluated with pass/fail

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)

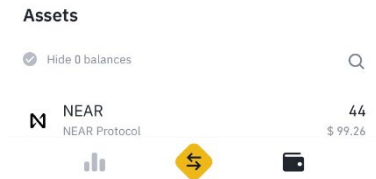
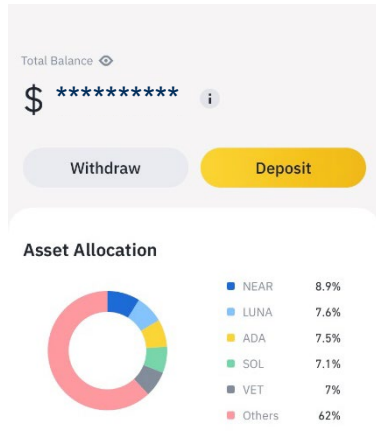
Link: <https://public.sandbox.pro.coinbase.com/trade>

Material for exercises

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

Motivation

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



CRYPTO HOPPER										330 XP to next level!
Your hoppers										
Dashboard										
Trade history										
Stats										
Charts										
Backtesting										
Strategies										
Templates										
Marketplace >										
Config >										
SOL	SOLUSDT	BUY	07.06.2021 07:47:10	2.303	43.521	0.10022886	100.23			Strategy
1INCH	1INCHUSDT	BUY	07.06.2021 07:16:15	26.12	3.8365	0.10020966	100.21			Strategy
UNI	UNIUSDT	SELL	07.06.2021 05:06:00	4.053	26.612	0.10785844	107.86	2.28%		Trailing Stop Loss
UNI	UNIUSDT	SELL	07.06.2021 03:51:34	4.07	26.361	0.10728927	107.29	2.07%		Trailing Stop Loss
DOT	DOTUSDT	SELL	07.06.2021 03:51:31	4.15	24.92	0.103418	103.42	3.26%		Trailing Stop Loss
SOL	SOLUSDT	SELL	07.06.2021 03:49:31	2.336	43.639	0.1019407	101.94	1.89%		Trailing Stop Loss
TFUEL	TFUELUSDT	BUY	07.06.2021 03:47:01	215.1	0.46579	0.10019143	100.19			Strategy
MATIC	MATICUSDT	SELL	07.06.2021 02:26:33	64.1	1.63469	0.10478363	104.78	4.89%		Trailing Stop Loss
VET	VETUSDT	BUY	07.06.2021 02:16:13	770.1	0.13013	0.10021311	100.21			Strategy
ALGO	ALGOUSDT	SELL	07.06.2021 02:04:00	113.3	1.0301	0.11670904	116.71	2.00%		Trailing Stop Loss
SOL	SOLUSDT	BUY	06.06.2021 23:01:47	2.339	42.828	0.10017469	100.17			Strategy
TFUEL	TFUELUSDT	SELL	06.06.2021 23:00:03	225.8	0.45633	0.10303931	103.04	2.99%		Trailing Stop Loss



Motivation

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

Findings:

- Setting up Binance (online wallet) is straightforward.
- Setting up the Cryptohopper is more complex.
- Cryptohopper works fine (and makes fun) but has some limitations.
- Limitations were found e.g. with the shortage functionality.
- Very volatile market in both directions (-30% to +30% per day observed)
- Current market is under pressure (e.g. due to regulations).
- Price development of different coins seems to be «linked».
- Prices of different coins seem to increase and decrease in «waves».
- Number of coins on the market is rising (e.g. on Binance ~ 350+ coins).

Dogecoin Preis-Chart (DOGE)

Zuletzt aktualisiert 12:32PM UTC. Währung in USD.

☆ Auf Beobachtungsliste setzen



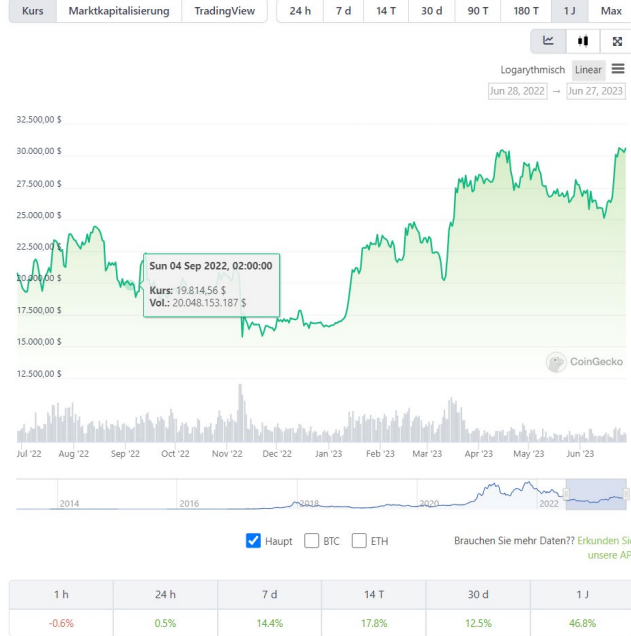
Image Credit: <https://www.coingecko.com>

Motivation

Bitcoin Preis-Chart (BTC)

Zuletzt aktualisiert 03:53PM UTC. Währung in USD.

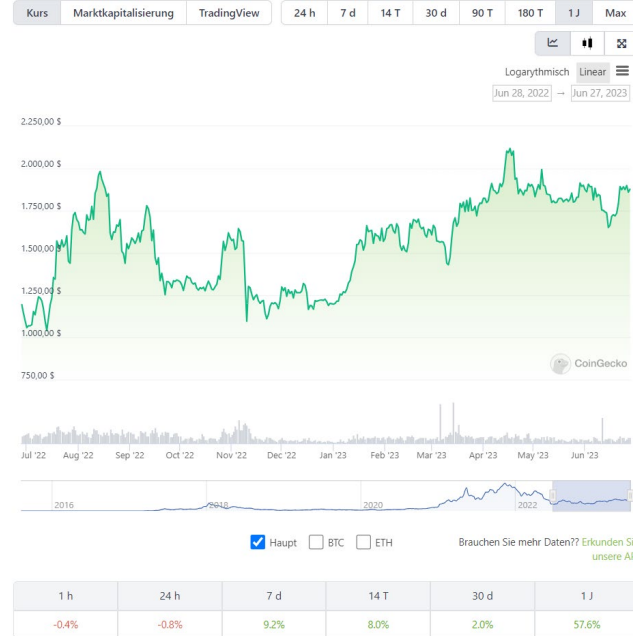
☆ Auf Beobachtungsliste setzen



Ethereum Preis-Chart (ETH)

Zuletzt aktualisiert 03:55PM UTC. Währung in USD.

☆ Auf Beobachtungsliste setzen



Although prices are very volatile, there are also opportunities. For example, the price of BTC and ETH increased by 47% and 58% respectively between June 2022 and June 2024.

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 gathered from trading activity, such as price movement and volume.”

<https://www.investopedia.com>

Technical Analysis (TA)

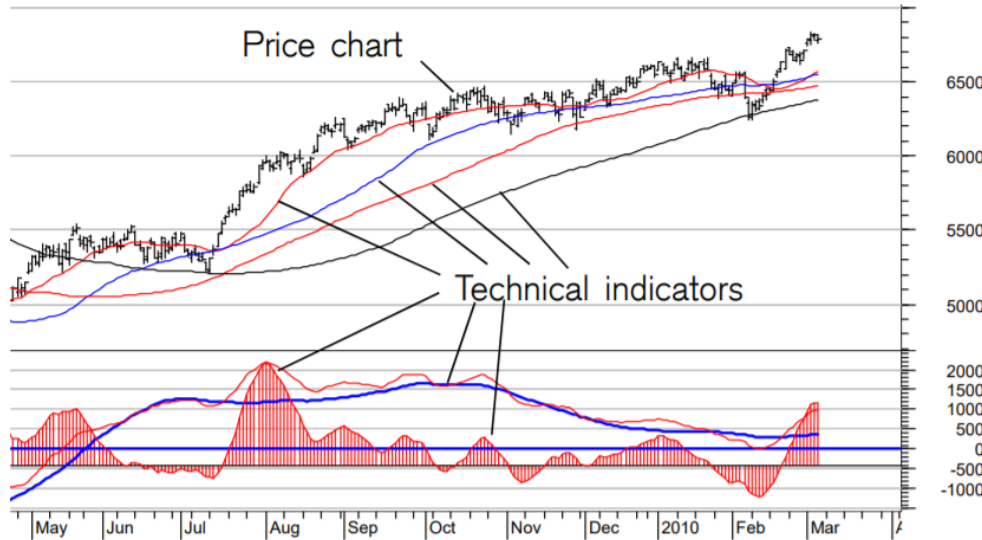


Image Credit: Credit Suisse (n.d.) Technical Analysis Explained

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>

Technical Analysis (TA)

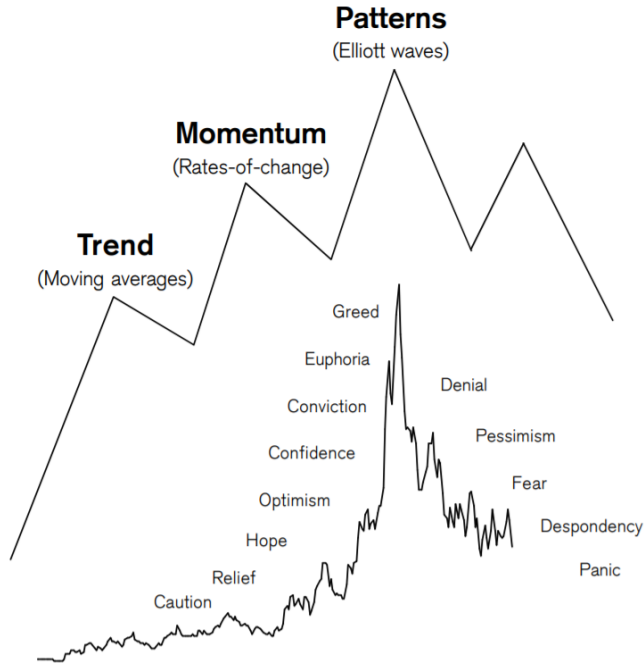


Image Credit: Credit Suisse (n.d.) Technical Analysis Explained

Optimism, pessimism, greed and fear ...

Fear & Greed Index

What emotion is driving the market now?
[Learn more about the index](#)

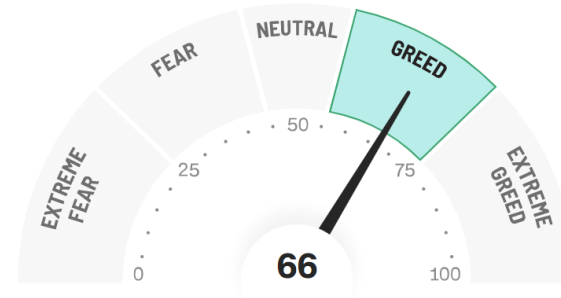


Image credit: <https://edition.cnn.com/markets/fear-and-greed>

Technical Analysis (TA)

Trend indicators

- SMA (Simple Moving Average)
- EMA (Exponential Moving Average)
- Bollinger Bands
- MACD (Moving Average Convergence/Divergence)

...

Oscillators

- RSI (Relative Strength Index)

...

Trading Strategies

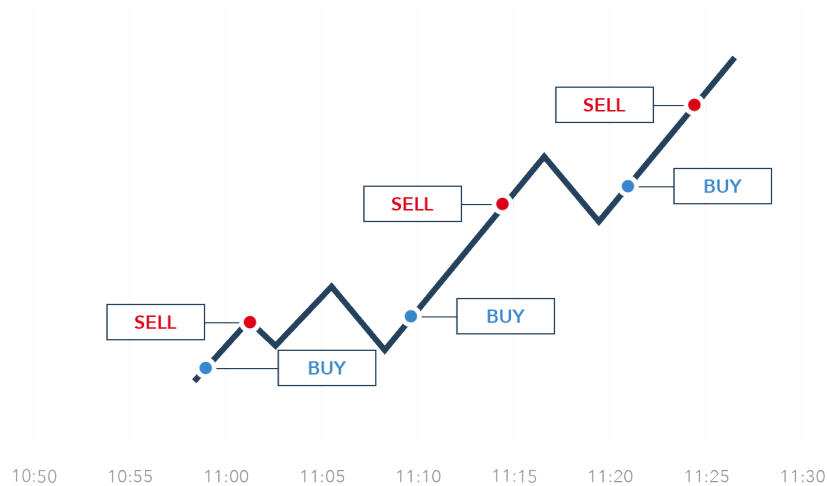


Image Credit: <https://www.ig.com/en-ch/trading-strategies>

“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.”



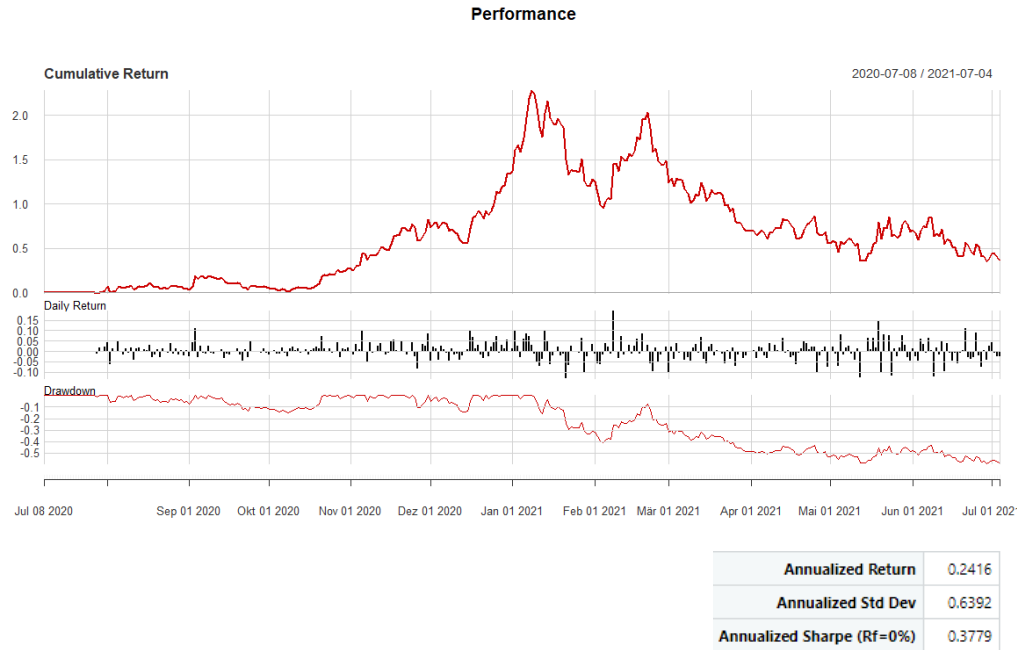
Wikipedia

Trading Strategies

Types of trading strategies

- Long/short equity
- Pairs trade
- Swing trading strategy
- Scalping trading
- Day trading
- Trading the news
- Trading signals
- Social trading

Backtesting a trading strategy



*“**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) Coinbase Pro Sandbox environment

-
-
-
-
-
-
-
-
-

(Topic 2) Python library vectorbt (functionality)

-
-
-
-
-
-
-
-
-

(Topic 3) Getting and exploring data from exchanges

-
-
-
-
-
-
-
-

(Topic 4) Technical analysis (TA)

-
-
-
-
-
-
-
-

Keyword pinboard (basis to define group tasks)

(Topic 5) Defining a trading strategy

-
-
-
-
-
-
-

(Topic 6) Backtesting the trading strategy

-
-
-
-
-
-
-
-

(Topic 7) Programing the trading-bot

-
-
-
-
-
-
-

(Topic 8) Performance analysis

-
-
-
-
-
-
-

Keyword pinboard (basis to define group tasks)



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.

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.



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 Copy code

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=product, start_date=start_date, end_date=end_date)

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

Expert groups and definition of tasks

Expert Group (X): Technical analysis (TA)

- Trend indicators & oscillators
- Simple Moving Average (SMA)
- Exponential Moving Average (EMA)
- Relative Strength Indicator (RSI)
- Dual Moving Average Crossover (DMAC)
- Candle Stick Chart
- Bollinger Bands (BB)

Example!

Recommended structure of the «expert» sessions

Questions which help to explain the software, functions, methods, etc. by each expert group

Q1: What is ...?

Q2: What problem is solved with ...?

Q3: How does ... work?

Q4: What are the applications for ...?

Minimal structure of the final presentation

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