

Automated Bitcoin Trading – Feinkonzept

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1 Research Objectives

1. Identify statistically significant signals that indicate potential price movements.
2. Convert the most promising signal(s) into an executable rule-based strategy.
3. Evaluate performance via back-testing and a four-week live test (16 Jun – 14 Jul 2025).
4. Document robustness, limitations and possible improvements.

2 Contents of Thesis

2.1 Market Mechanics

I briefly outline what Bitcoin is and what the value of Bitcoin represents. How Bitcoin works as a digital currency and why specifically I chose Bitcoin as my trading instrument.

2.2 From data analysis to trading strategy

I search for statistically significant signals that can be converted into indicators by testing ideas using methods such as conditional probability comparisons and hypothesis testing conducted in Python. One such signal is the order book delta, defined as the difference between cumulative buy and sell orders within a certain range of the current Bitcoin price. This serves as an indicator of local demand-supply imbalances. I plan to develop several such indicators and combine them into complete trading strategies. These strategies will be evaluated through back-testing on historical data as well as walk-forward analysis to assess out-of-sample performance.

***Indicator** statistics used to measure current conditions as well as to forecast financial or economic trends. **Hypothesis testing** is a statistical method used to determine if there is enough evidence to reject a null hypothesis in favor of an alternative hypothesis. **Backtesting** is a method of evaluating the performance of a trading strategy using historical data.*

2.3 Risk management

I manage risk by setting clear price levels for when to exit trades, both for protecting against losses and taking profits.

2.4 Automation and Test Run

I automate the process of calculating live signals and executing trades on the exchange. The algorithmic trading system will be written in Python and will be run on a PaaS, and includes monitoring for trades and errors with automated alerts. Finally, I run a test phase (paper trading) to make sure everything works as expected before using real money.

***PaaS** is a cloud platform as a service. It is a platform that allows you to run your own software in the cloud remotely.*

3 Project Timeline

| Phase | Weeks / Dates |
|--|---------------------------------|
| Exploratory analysis & signal ideation | KW 17 – KW 21 (24 Apr – 26 May) |
| Parameter tuning & dry-run (paper trading) | KW 22 – KW 25 (27 May – 23 Jun) |
| Live deployment (real funds) | KW 28 – KW 31 (8 Jul – 4 Aug) |
| Result analysis & thesis writing | KW 32 (5 Aug – 11 Aug) |
| Editing, final layout, submission | KW 33 – KW 35 (12 Aug – 1 Sep) |

This timeline could change and is just a rough estimate.

3 Expected Delivery

- Python code for data handling, back-testing and live execution in a GitHub repository.
- Example datasets already available at GitHub repository.
- A statistical report comparing other strategies I tested and other signals I considered.
- Final thesis detailing methodology, live results and critical reflection.