

Cryptocurrency Algorithmic Trading

HKU-SCF FinTech Academy

Introduction to Cryptocurrencies and Algorithmic Trading

This chapter will give an overview of cryptocurrencies and explain the motivation behind algorithmic trading cryptocurrencies. Different types of trading, including the difference between fundamental analysis and technical analysis will also be explained.

Note that there are quite some optional external references included in this Module, feel free to go through or skip them at your own interest

Estimated Time to Finish:

1.5~2 hours (excluding optional materials).

Main Learning Objectives:

- To have a basic idea of what cryptocurrencies are.
- To understanding what is cryptocurrency trading.
- To have a basic understanding of algorithmic trading and the motivation behind it.
- To understand the current algorithmic trading landscape

Overview

1. [What is a cryptocurrency?](#)
2. [What is trading?](#)
3. [Why trade cryptocurrency?](#)
4. [Algorithmic trading](#)

1. What is a cryptocurrency?

Credit:

The tutorial about cryptocurrency is based on [Coin Bureau's](#) video

from investopedia:

A cryptocurrency is a digital or virtual currency that is secured by cryptography, which makes it nearly impossible to counterfeit or double-spend. Many cryptocurrencies are decentralized networks based on blockchain technology—a distributed ledger enforced by a disparate network of computers. A defining feature of cryptocurrencies is that they are generally not issued by any central authority, rendering them theoretically immune to government interference or manipulation.

Simply put, they are akin to regular currencies but digital. Instead of having banks or the government keep track of your wallet balance, this is done by computers that connect to a cryptocurrency network to process transactions and earn cryptocurrency (In the case of Bitcoin, it is called "mining") for doing so.

Questions About Bitcoin, Dogecoin, Ethereum etc.

According to [coingecko](#), there are currently more than 8000 cryptocurrencies out there. Broadly speaking they can be divided into two types, **coins** and **tokens**

Cryptocurrency coins belong to cryptocurrency networks that were built from the ground up.

As cryptocurrency networks are so hard to make from scratch, only a few dozen cryptocurrencies are actually coins (e.g. Bitcoin, Ethereum, Ripple, etc). The rest are **cryptocurrency tokens**.

The most important thing to remember about cryptocurrency tokens is that a lot of them are nothing more than scams. This is primarily because cryptocurrency tokens are so easy to create.

Explaining Cryptocurrency Price And Value

What makes cryptocurrencies valuable? For the case of Bitcoin (BTC), some says it has an economic profile to gold. It has a maximum supply and only a small amount of BTC is created each day, and that amount is cut in half every 4 years.

Optional esources

for learning more about different cryptocurrencies:

- [Youtube Channel: Coin Bureau](#)
- [CoinDesk](#)

For those who are interested in the technology behind cryptocurrencies, here are some extra resources which explain the technical principles in a simple way.

[How does a blockchain work - Simply Explained](#)

[But how does bitcoin actually work? - 3Blue1Brown](#)

2. What is trading?

Credit: This part is based on articles from [investopedia](#)

Trading involves frequent transactions, such as the buying and selling of stocks, commodities, currency pairs, or other instruments.

The goal is to generate returns that outperform **buy-and-hold investing** (in the crypto world, this is called [HODLing](#)). While investors may be content with annual returns of 10% to 15%, traders might seek a 10% return each month. Trading profits are generated by **buying at a lower price and selling at a higher price** within a relatively short period of time. The reverse also is true: trading profits can be made by **selling at a higher price and buying to cover at a lower price** (known as "**selling short**") to profit in falling markets.

Trading vs Investing

from [Investopedia](#),

Investing and trading are two very different methods of attempting to profit in the financial markets. Both investors and traders seek profits through market participation. In general, investors seek **larger returns over an extended period** through buying and holding. Traders, by contrast, take advantage of both rising and falling markets to **enter and exit positions over a shorter time frame, taking smaller, more frequent profits.**

Traders generally fall into these categories:

- **Fundamental Trader:**
 - Fundamentalists trade companies based on [fundamental analysis](#), which examines corporate events, particularly actual or anticipated earnings reports, stock splits, reorganizations, or acquisitions.
- **Technical Trading:**

- Technical traders focus on charts and graphs. They analyze lines on stock or index graphs for signs of convergence or divergence that might indicate buy or sell signals.

And one of these 3 categories in terms of trading frequency:

- **Swing Trader:**
 - Positions are held from **days to weeks**.
- **Day Trader:**
 - Positions are **held throughout the day** only with no overnight positions.
- **Scalp Trader:**
 - A scalper makes dozens or hundreds of trades per day in an attempt to "scalp" a small profit from each trade by exploiting the **bid-ask spread**.
 - Positions are held for **seconds to minutes** with no overnight positions.

The key takeaway is that trading involves short-term strategies to maximize returns daily, monthly, or quarterly.

Technical Analysis vs Fundamental Analysis

Technical Analysis is based on **human psychology**, namely emotions like **fear** and **greed**. It posits that these emotions are ultimately what **drive prices up or down**, and that these emotions **create visible patterns which repeat themselves**. This means that with the right methodology, the future price action of an asset can be **predicted using technical analysis**.

Technical Analysis focuses exclusively on **price** and **does not pay much attention to fundamentals**. For cryptocurrencies, fundamental factors include things like **tokenomics**, **network activity**, **the strength of the project's development team**, and **any notable partnerships** the project has. These fundamentals are often used by HODLers and more experienced traders to gauge the long-term price potential of an asset.

Given that the average cryptocurrency trader is **irrational**, many believe that technical analysis is more effective than fundamental analysis for this reason. As a rule of thumb, **technical analysis** should be **used for shorter term trading** whereas **fundamental analysis** should be used for **long term trading**. A combination of both is necessary to ensure a clear picture of the cryptocurrency you are trading.

Trading cryptocurrencies

Although the cryptocurrency market is relatively new, it has experienced significant volatility due to huge amounts of short-term speculative interest. Such volatility makes the crypto market attractive for traders so, as speculative interest.

The video below explains crypto trading in plain words.



- [Different kinds of fees](#)
- [Different order types in an exchange](#)
- [How to read price charts](#)
- [Bull vs Bear market](#)
- [Support and Resistance levels explained](#)
- [Common trading mistakes](#)

Algorithmic Trading

from [investopedia](#):

Algorithmic trading (also called automated trading, black-box trading, or algo-trading) uses a computer program that follows a defined set of instructions (an algorithm) to place a trade. The trade, in theory, can generate profits at a speed and frequency that is impossible for a human trader.

The defined sets of instructions are based on timing, price, quantity, or any mathematical model. Apart from profit opportunities for the trader, algo-trading renders markets more liquid and trading more systematic by ruling out the impact of human emotions on trading activities.

Benefits of Algorithmic Trading

from [investopedia](#):

Algotrading provides the following benefits:

- Trades are executed at the best possible prices.
- Trade order placement is instant and accurate (there is a high chance of execution at the desired levels).
- Trades are timed correctly and instantly to avoid significant price changes.
- Reduced transaction costs.
- Simultaneous automated checks on multiple market conditions.
- Reduced risk of manual errors when placing trades.
- Algo-trading can be **backtested** using available historical and real-time data to see if it is a viable trading strategy.
- Reduced the possibility of mistakes by human traders based on **emotional and psychological factors**.

This video explains algorithmic trading and outlines how to learn algorithmic trading.



- Algotrading as the interaction between trade finance, data science and programming
- 10 steps for developing trading algorithms
- where to learn more about algo trading

Extensive details about algo trading will be covered in the later parts of this tutorial series.

Next up:

You will start learning python programming in the next Module, including the basics of data science and machine learning as well.

[Module 1 - Python Basics](#)