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ADAPTIVE TRADING STRATEGIES FOR CRYPTOCUR-RENCIES
ADAPTIVNÍ OBCHODNÍ STRATEGIE PRO KRYPTOMĚNY

BACHELOR'S THESIS
BAKALÁŘSKÁ PRÁCE

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Bachelor's Thesis Specification

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Student:	**Filip Marek**
Programme:	Information Technology
Title:	**Adaptive Trading Strategies for Cryptocurrencies**
Category:	Modelling and Simulation

Assignment:

1. Study existing trading strategies for cryptocurrencies and other instruments, including rebalance and HODL. Analyze achieved results of the studied strategies and their assumptions.
2. Study existing simulation tools suitable for testing trading strategies.
3. Analyze the backlog of cryptocurrency trading data provided by the supervisor and summarize observed events.
4. Propose several (adaptive) trading strategies assuming the backlog.
5. Implement and evaluate proposed strategies vs. traditional approaches such as HODL and rebalance.
6. Discuss further improvements and limitations of the practical deployment.

Recommended literature:

- Bankless: "How to make money trading stablecoins", https://newsletter.banklesshq.com/p/how-to-make-money-trading-stablecoins
- HodlBlog: "When Does Portfolio Rebalancing Improve Returns?", https://www.hodlbot.io/blog/when-does-portfolio-rebalancing-improve-returns
- The Shrimpy Team: "What is Portfolio Rebalancing?", https://blog.shrimpy.io/blog/portfolio-rebalancing-for-cryptocurrency
- Holderlab.io: "Rebalancing Strategy For Your Crypto Portfolio", https://medium.com/coinmonks/rebalancing-strategy-for-your-crypto-portfolio-590397f2282b
- The Shrimpy Team: "Crypto Users who Diversify Perform Better", https://hackernoon.com/crypto-users-who-diversify-perform-better-new-research-ebf775d348dd
- The Shrimpy Team: "Portfolio Diversity: A Technical Analysis" https://hackernoon.com/portfolio-diversity-a-technical-analysis-c2c49f4d3a77

Requirements for the first semester:

- Items 1 to 3.

Detailed formal requirements can be found at https://www.fit.vut.cz/study/theses/

Supervisor:	**Homoliak Ivan, Ing., Ph.D.**
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Abstract

This bachelor's thesis explroes the idea of trading cryptocurrencies with strategies that adapt to the rising and falling crypto markets. There are many successful trading stategies, none of which gurantees profit in both rising and falling markets. I try to deal with this problem by creating the aforementioned adaptive trading strategy.

Abstrakt

Tato baklářská práce se zabývá možností obchodovat s kryptoměny adaptivní strategií, která se přizpůsobuje na klesající a stoupající trh. Existuje řada úspěšných obchodních strategií, žádna z nich ale nedokáže zajistit zisk v klesájícím i stoupajícím trhu zároveň. S tímto problémem se snažím vypořádat vytvořením již zmíněné adaptivní obchodní strategie.

Keywords

cryptocurrency, trading, investing, trading strategies, simulation, adaptive trading strategy, simulation tool

Klíčová slova

kryptoměny, obchodování, investování, obchodní strategie, simulace, adaptivní obchodní strategie, simulační nástroj

Reference

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Adaptive Trading Strategies for Cryptocurrencies

Declaration

I hereby declare that this Bachelor's thesis was prepared as an original work by the author under the supervision of Ing. Ivan Homoliak Phd. The supplementary information was provided by Mr. Y (TODO) I have listed all the literary sources, publications and other sources, which were used during the preparation of this thesis.

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Marek Filip
January 16, 2022

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Contents

Chapter 1

Introduction

When we look at cryptocurrencies, there is a very lucrative market. That is why people have always found new ways to make money from trading cryptocurrencies. There are many trading strategies for cryptocurrencies available, but no such strategy survives both rising (bull) and falling (bear) market. That is why there is a need for adaptive strategies that can prosper through both of them.

I will explore the idea of the adaptive trading strategies for cryptocurrencies in this thesis. Firstly we need to find a way how to predict if the market will go up or down. Then we need to apply sufficient trading strategies regarding the percentage probability of market going up or down. That is the basic idea.

To get to this point I will explore the current trading strategies that are used for trading cryptocurrencies. Analyze current simulation tools available today and analyze the historic trading data to find some patterns. Looking at current state of adaptive strategies for cryptocurrencies is also necessary.

Organization

The rest of this work is divided into several chapters.

Firstly, there is the chapter 2, which gives the reader a sufficient theoretical background that is required to understand the later chapters of the thesis. In the chapter 3 I look at the existing trading strategies and analyze their effectiveness. In the chapter 4 several existing simulation tools are explored and compared. I also analyze the backlog of cryptocurrency trading data provided by the supervisor and summarize the important events.

Chapter 2

Background

There are some prerequisites that the reader must be familiarized with in order to understand the thesis. The basic knowledge of what a cryptocurrency is must be explained. As well as clear understanding of some terms that are regularly used in the thesis.

List of terms generally used in the thesis and among crypto investors

- Best strategy = A strategy that yields the most money – has the best profit.

- Bear market = A market in which prices are falling, encouraging selling.

- Bull market = A market in which prices are rising, encouraging buying.

- FOMO = Fear of missing out.

- FUD = Fear, uncertainty, doubt.

- Fiat currency = Government-issued money.

- ROI = Return of investment.

- spread = Difference between buy and sell value of an asset.

2.1   What is a cryptocurrency?

Cryptocurrency is a digital currency that is secured by cryptography [12]. There are algorithms in place that make it nearly impossible to counterfeit or double-spend the currency. Cryptocurrencies are based on a decentralized networks based on the blockchain (see 2.1) technology. Because of this the cryptocurrencies are not issued by any central authority (unlike conventional currency). This makes them theoretically immune to government interference or manipulation.

Types of Cryptocurrency

Bitcoin is the original and to this day the most popular and valuable cryptocurrency. It was invented by an anonymous person called *Satoshi Nakamoto* in 2008 via a white paper [19]. As of 12th January 2022, there are over 18.9 million bitcoins in circulation with a total market capitalization of around $810 million [8], making it roughly 40% of the total cryptocurrency market.

Each new cryptocurrency claims to have different function and specification. New cryptocurrencies are created daily. Most are not lucrative to investors at all while others surprise the market with their new innovations. For example, Ethereum's *ether* markets itself as a gas for their underlying smart contract[1] platform. Another example is Ripple's *XRP* which aims to facilitate international bank transfers. New cryptocurrencies started to rise due to bitcoin's many unsuitable aspects.

A *stablecoin* is another important type of cryptocurrency. It aims to offer price stability and is backed by a reverse asset[2] like the US dollar. They attempt to offer the best of both worlds—the instant processing and security of privacy payments of cryptocurrencies, and the non-volatile character of fiat currencies [15].

What is FIAT money?

Fiat money or currency is money that is issued by the government and is not backed by any gold or other physical commodity. Its value is derived between the relationship of supply and demand and the stability of the government that issued it [6]. It represents today's currencies of the world. Many crypto enthusiasts believe that cryptocurrencies will replace fiat currencies in the future.

Blockchain

Blockchain or a distributed ledger[3] is a digital database that is shared and synchronized across a distributed network consisting of very large number of computers [16]. Distributed networks eliminate the need for central authority to keep a check against manipulation. You can see the blockchain's basic structure in figure 2.1.

2.2   What are bear and bull markets?

While you may know that the bear and bull markets stand for falling and rising markets, there is more to these terms that must be explained. The origin of the terms themselves is believed to be tied to the way the two animals attack their opponents. A bull thrusts its horns up, while a bear swipes its pawns downwards [14]. Herd behavior is important to consider when talking about the terms.

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[1]https://www.investopedia.com/terms/s/smart-contracts.asp

[2]https://www.investopedia.com/terms/r/reserve-assets.asp

[3]https://www.investopedia.com/terms/d/distributed-ledger-technology-dlt.asp
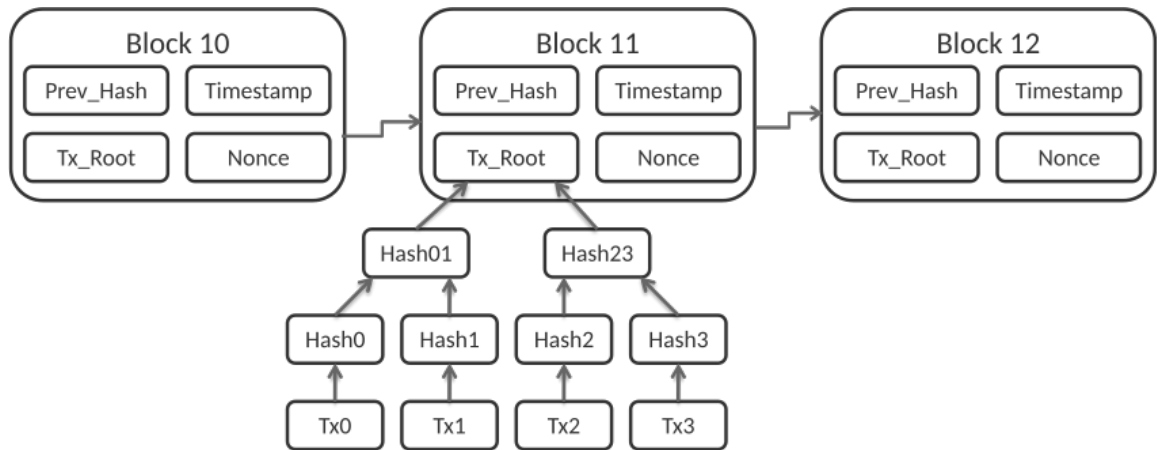
Figure 2.1: Blockchain structure, attribution: Wikimedia

Bear Market

As growth prospects wane and expectations are unmet, prices decline [4]. Bear markets are viewed as pessimistic with investors scared to open new positions. But to talk about bear or bull market we usually ascribe longer time periods than the usual and always present volatility of the crypto market. For example when China declared all of the cryptocurrency transactions illegal [2], a fall of crypto markets quickly ensued.

A bearish investor or bear is then a type of investor that believes that a specific coin is likely to decline in the future [5].

Bull Market

Bull markets are characterized by optimism, investor confidence and expectations in strong results that will continue for a long period of time [14]. FOMO[4] is present among investors. Both bull and bear markets are hard to define, bull market is usually specified to occur when prices rise by 20% after a previous 20% drop and before another 20% drop—these values are defined for stock markets only, so the margins should be higher for the volatile cryptocurrency market.

A bullish investor or bull is a type of investor that believes that a specific coin is likely to rise [5].

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[4]Fear of missing out.

Chapter 3

Trading Strategies for Cryptocurrencies

There are various trading strategies available regarding cryptocurrencies. In this chapter we will go through those that are considered the most well-known and consider their ups and downs.

What is a trading strategy?

3.1 HODL

This is the strategy that is one of the most prominent in the cryptocurrency market, especially by beginners to trading. It is jokingly derived from misspelling of the word „hold". The original post by the user GameKyuubi [13] containing the misspelling was originally posted on 18th December 2013, from which it quickly spread on.

HODL or „hodl on for dear life" has become a slogan among crypto enthusiasts, representing long-term approach to cryptocurrency trading. It implies that the novice traders are not successful in timing the market so they should simply hold the coin until the prices significantly rises.

Cryptocurrency maximalists keep HODLing, because they believe that cryprocurrencies will eventually replace the government-issued fiat currencies as the basis of all economic structures [11].

3.2 Rebalance

Rebalancing is the process of realigning the weightings of portfolio of assets—in our case cryptocurrencies. It involves periodically buying or selling the assets in portfolio so that the original level of asset allocation is maintained[3].

For example if we set portfolio allocation 50/50 to BTC and ETH coins. And the BTC coin rised by 20 % so that the new ratio would be 70/30, we would sell the 20 % of the BTC and for the value we got we would buy additional ETH coins, so that the ratio is again 50/50.

Rebalancing gives investors the opportunity to sell high and buy low. It takes gains from high-performing investments and reinvests them in areas that have not yet grown that much.

One study [23], conducted by the Shrimpy Team, has found that rebalancing beats hodl by a median of 64%. The analysis was performed with 1-year period real trading data.

There many types of rebalancing strategies. We will look at some of them now.

Periodic Rebalancing

This is the simplest rebalancing to use. The rebalance happens after a fixed amount of time. For cryptocurrencies it makes sense to set shorter time due to rapid price fluctuations, something like 1 day.

Threshold Rebalancing

A more interesting approach is threshold rebalancing where we set some threshold deviation. When an allocation deviates by that set threshold from the original allocation, a rebalance happens, setting all the allocations to their original values [23].

Let's say we once again have 50/50 BTC/ETH allocations. Let's set the threshold deviation to 20%. If the price of BTC or ETH reaches over 60% or under 40%, a rebalance takes place. 20% out of 50% is 10%, that is why the rebalance happens at those points. When both coins grow or decline in the same rate, no rebalance happens.

Assumptions

One study around rebalancing has been already mentioned, let's look into some of them in more detail now. The studies [22] and [21] conducted by the Shrimpy organization have found some interesting results. Both of the studies took into account only periodic rebalancing. They have found that the shorter the time period for rebalance, the better the results, maximizing them at 1 hour period. The other interesting discovery was that if the portfolio had more assets in it—was more diversified—the better were the results. The diversification really took advantage of the sell high buy low formula.

Another study [18] confirmed that a portfolio with a larger number of assets performs better. Some other interesting facts have been observed during the simulations that improve the performance of the portfolio:

- Equal weightings of the allocated assets.

- Assets that are uncorrelated or negatively correlated with each other. That means if one rises, the other should go down.

- Assets that have similar rates of return, though volatility also improves the performance.

3.3 Dollar Cost Averaging

Dollar Cost Averaging (DCA) is a strategy often recommended to the beginner investors. The investor makes periodic purchases of the asset in an effort to reduce the volatility of the market. This removes much of the detailed work needed to time the market in order to make purchases at the best price.

Through studies [7] it seems that the advantage of DCA lies more in the reduced psychological effort in order to time the market than in the actual results. Single buy-and-hold strategy seems to outperform DCA in more cases.

Sometimes DCA is used as a mean to invest into trusted assets on weekly/monthly basis—when employees get money. It is also used in some employment plans[1] across the world.

3.4 Day Trading

Day trading are the investors that buy and sell the same asset over the span of one day. They might even buy and sell the assets multiple times. They mostly use technical analysis of the market to achieve this goal. It is not recommended for beginner investors to choose this type of trading as it is much more risky than strategies described before.

3.5 Range Trading

Asset move in certain ranges, as you can see in figure 3.1. Range trading assumes that and tries to take guesses where are the limits using candlestick charts and support and resistance levels. Investors want to buy when prices reach the support level and sell when they reach the resistance level [20]. The support and resistance levels can be seen in figure 3.2/

3.6 Scalping

In scalping you try to profit from very small price movements over short periods, you might exit a trade seconds after entering it. It is best to use automated bots to increase the buying frequency. Scalpers take advantage of increased trading volume to profit. They want to exit before any news or short-term fluctuation changes the market's view of the coin [9].

It is needed to have a large bankroll to use this strategy effectively. Since the return of investment is really low, the amount gain must be significant enough. It also needs to cover trading fees.

In figure 3.3 it can be seen how scalping can take quick and short advantages of the market.

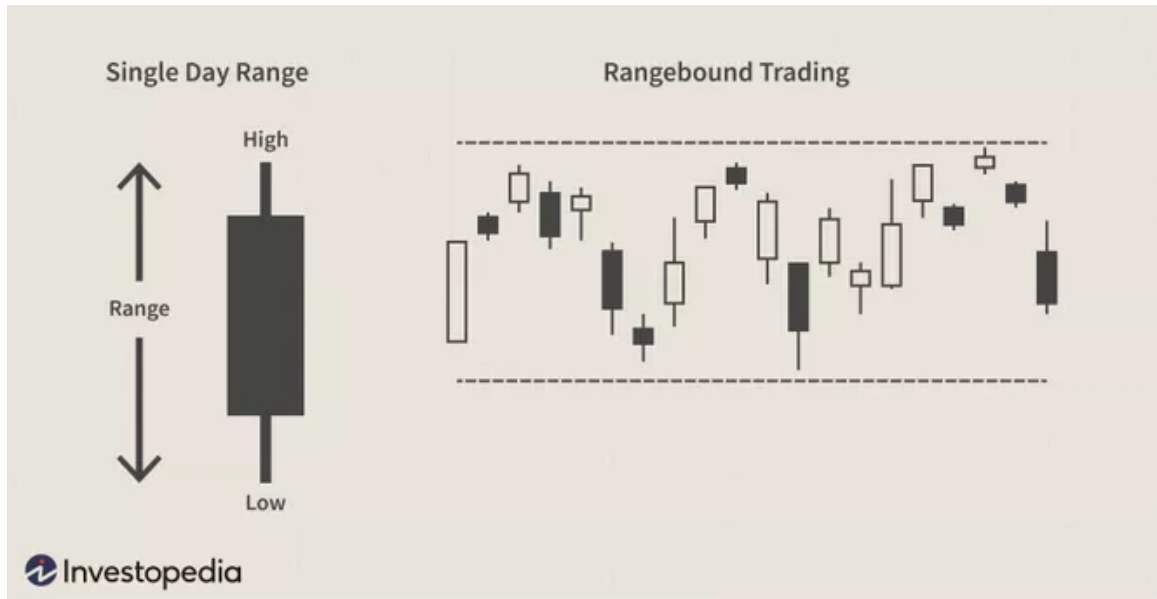[1]For example the American 401(k) plan

Figure 3.1: Trading range visualization, attribution: Investopedia

Figure 3.2: Support and resistance levels, attribution: Investopedia

3.7 Automated Trading Systems or Bots

Automated trading systems—also referred as algorithmic trading—allow investors to set specific rules for enter and exit of a trade that can be automatically executed via computer program. Some platforms claim that 70% to 80% of trading done comes from the automated systems [10].

Figure 3.3: Scalping visualization, attribution: Quora

One of the advantages is that the automated trading systems take emotions out of the trading—they only work on a specific criteria. The automated trading systems need to use software or APIs available from the broker. The outcome made in this thesis is expected to be used by some automated trading system.

Automated trading systems are one of the only options to use when considering strategies like scalping due to the ease of getting in and out of a trade in seconds without room for failure. The software also allows backtesting the chosen strategy on historical data from which it can be seen how well it does perform.

3.8   Arbitrage

Arbitrage involves buying cryptocurrency in one market and selling it for higher price in another one. Since the cryptocurrency market is usually unregulated, anyone can make an exchange. This can lead to major differences in the spread of the asset.

There are two types of arbitrage when it comes to cryptocurrencies. The first one focuses on finding prices mismatches across different trading pairs on a single exchange. The other is the one that was already described—locating significant price differences on multiple exchanges. Both types take advantage of an automated trading system that monitors the exchanges and looks for price differences. On figure 3.4 you can see how the first type can be profitable.

Regarding the second type of exchange. In January a legendary *kimchi premium*[2] happened. Bitcoin traded almost 40% higher on the Korean exchanges that the US exchanges. This lead to arbitrage investors taking advantage of this fact, buying bitcoin on US exchanges and selling it on the Korean ones for profit [17].
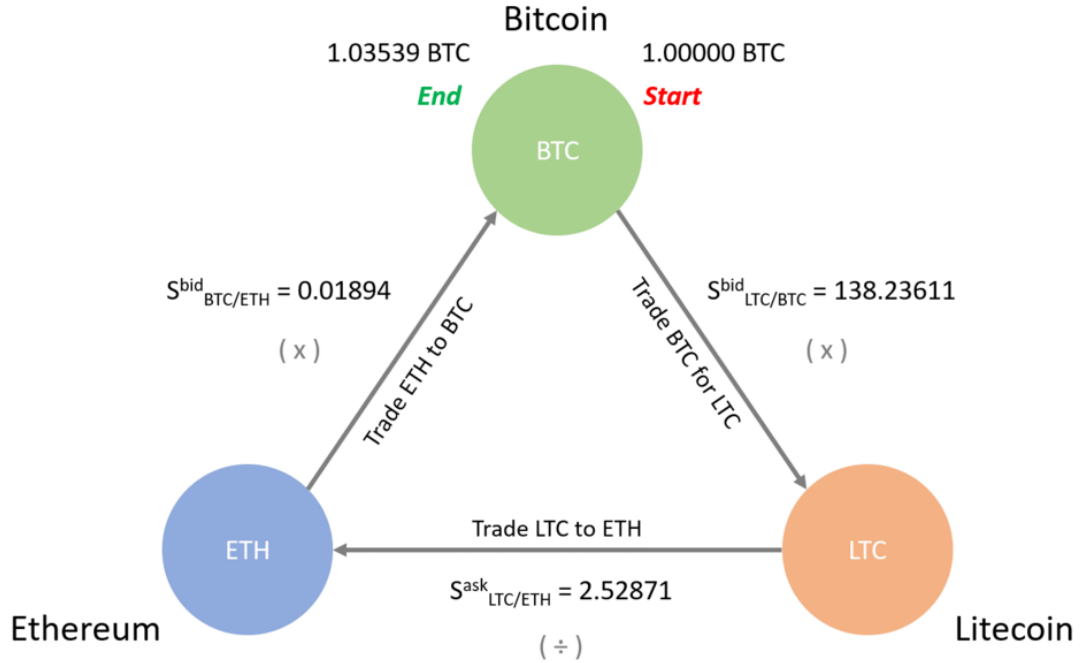

Figure 3.4: Arbitrage execution via multiple trading pairs, attribution: HodlBot

3.9 Stablecoin Trading

When talking about different trading strategies, the focus is usual on the method of the tratery, not the asset themselves. But when it comes to specific thing like stable coints, there is an opportunity to handle them in such a way to generate profits for us. The term stablecoin has already been explained in 2.1. It is a coin which has its value pegged to some external reference.

For example it was found in [1] that a de-pegging of stablecoins happens periodically often as a result of temporary shock to the crypto system. During those events profit can be made when trading pegged and de-pegged stablecoins between each other. The author chose DAI and USDC pair for their experiments. It was shown that between August 2019 and March 2020 the spread between DAI and USDC has been fluctuating between 2 to 3%. Advantage could be taken of this fact—selling DAI for USDC when the price is high and buy it back for USDC when the price returns to the peg.

One thing to remember is to only trade when the spread is sufficient so that the trading fees won't make the profit diminish.

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[2]https://www.investopedia.com/terms/k/kimchi-premium.asp

Chapter 4

Existing Simulation Tools for Testing Trading Strategies

In this chapter different simulation tools, their application, usefulness and differences, are discussed. We must distinguish few types of simulation tools when talking about them. When a novice investors first sets foot in the cryptocurrency market, they might be startled by the complexity of the market. They want to learn, but maybe they do not want to lose all their money in the process. That is the perfect opportunity for a manual simulated tool. Investors can invest fake virtual money while all of the market's trading data is accurate and up to date.

Chapter 5

Trading Data Analyzation

In this chapter the history data of cryptocurrency market will be analyzed. We will try to find trends and patterns that we can then use to our advantage when coming up with the adaptive trading strategy.

Chapter 6

Adaptive Trading Strategy Proposals

Chapter 7

Adaptive Strategy Implementation

Chapter 8

Limitations and Further Improvements of Practical Deployment

Chapter 9

Conclusion

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