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RESEARCH ARTICLE

AN ALGORITHMIC TRADING APPLICATION IN CRYPTO EXCHANGE

KRİPTO PARA BORSALARINDA BİR ALGORİTMİK TİCARET UYGULAMASI

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ABSTRACT

In crypto money exchanges, buy and sell transactions can be made using the program in the computer environment using api. These applications are called robots or algorithms. In this study, algorithmic trading of Etherium, Cardano and Bitcoin crypto assets in the period of May, June and July 2021 was evaluated through backtests with the software developed. Due to the decline in the market between these dates, it was thought that it would be more suitable for testing the algorithm. Because in the rising periods, indicator or code-based algorithms give successful results to a large extent. In the trading environment, Matriks IQ and C# programs are used, and SMI indicator is used in technical analysis. With the algorithm developed according to the results of the study, it provides a gain between 27% and 37%. The algorithm can also make profit-making buy and sell transactions during the downturns of the market. In the 4-month period, the period without treatment is between 4 and 7 days.

Keywords: Crypto Currencies, Bitcoin, Matriks IQ, E-Money Stock Exchange, Digital Currencies, MADC, Distributed Ledger, Blockchain, SMI, Bitcoin Algorithm, Algorithmic trading.

ÖZET

Kripto para borsalarında api kullanarak al – sat işlemleri bilgisayar ortamında çeşitli programlar ile yapılabilmektedir. Bu uygulamalar robot veya algoritma olarak adlandırılmaktadır. Bu çalışmada Etherium, Cardano ve Bitcoin kripto varlıklarının Mayıs, Haziran ve Temmuz 2021 döneminde, geliştirilen yazılım ile algoritmik ticaretleri backtest'leri üzerinden değerlendirilmiştir. Bu tarihler arasında piyasanın düşüş yaşaması nedeniyle algoritmanın test edilmesi için daha uygun olacağı düşünülmüştür. Zira yükseliş dönemlerinde zaten indikatör veya kod temelli algoritmalar büyük oranda başarılı sonuçlar vermektedir. Trading ortamında Matriks IQ ve C# programları teknik analizlerde ise SMI indikatörü kullanılmıştır. Çalışma sonucuna göre geliştirilen algoritma ile %27-%37 arasında kazanç sağlamaktadır. Algoritma piyasanın düşüş dönemlerinde de kar bırakan al-sat işlemleri yapabilmektedir. 4 aylık peryotta işlemsiz geçen süre 4-7 gün arasındadır.

Anahtar Kelimeler: Sanal Para Birimleri, Bitcoin, Matriks IQ, E-Para Borsa, Dijital Para Birimleri, MADC, Dağıtık Defter-i Kebir, Blok Zincir, SMI, Bitcoin Algoritması, Algoritmik ticaret.

1. INTRODUCTION

The widespread use of the Internet has given people the feeling of being able to go beyond borders; Many applications have been developed as a reflection of this. Various forums, social media accounts, messaging applications increased people's interaction, and this interaction turned into synergy over time; transcending borders, independent of the central authority; impressive, gripping currents began to form. In fact, the idea that tried to develop an alternative payment tool because there was no money to buy pizza spread through the internet, increased its awareness, and started to become a global financial power focus. This power, which is discussed and mentioned in the article, is "Cryptocurrencies." In its current state, crypto money markets have attracted the attention of central authorities, and they have faced the obligation to develop policies in this regard (1-2).

Currently, "Crypto Money Markets" are updated with the coming of new ideas and projects, increasing their spread and expanding its global trading volume day by day. Defi projects, fan tokens, and even non-project, jokingly structured coins contribute to this expansion. As the crypto money market expands and its effects on the individual and society increase, some central authorities look at this market positively; some of them approach the market with a prohibitive, obstructive reflex. One of the important factors underlying these reactions is the desire to provide legal assurance to the markets. It is observed that the "volatility" in the crypto money markets, that is, the unpredictable volatility, is different from the characteristic features of the markets under the control of the central authority. Basically, central authorities manipulate money markets by using various financial instruments such as printing money, playing with interest rates; however, it is not possible for the central authority to direct the crypto money markets yet. As the internet and digital environments accelerate the flow of life, global-scale transactions tend to be independent from the central

authority. As a matter of fact, in the classical sense, financial markets have a structure indexed to the dollar and the smallest financial transaction has to be realized with the knowledge of the Federal Reserve.

Today, developing e-commerce offers a global shopping experience independent of time and place. Since the beginning of the Covid 19 epidemic, e-commerce has become more functional; has begun to evolve into a global experience. Again, due to the necessities of the epidemic period, social life was limited to staying at home; The search for individuals on the internet and digital media has expanded. As a result, the number of individuals meeting with Cryptocurrencies and the impact of the markets on society have increased; On the other hand, it has been stated that cryptocurrencies can have a facilitating effect on global trade and new searches have come to the fore. Even Central authorities have been talking about "Central Cryptocurrency".

Considering the current effects of cryptocurrencies, it is possible to say that its use is limited, but it has a tendency to become widespread. Although cryptocurrencies are limited to the markets exchanged among themselves, the trading of crypto assets carries great risks. As a result, great losses and gains can occur. For this reason, it is necessary to determine the stop loss levels well, to catch the falling signals of the market well, and to read the relationship between price and volume balance when trading on crypto currency exchanges. In addition, it is impossible to constantly monitor the screen, since crypto currency exchanges are active 24 hours a day. In this case, it is ensured that the investors who make medium and short-term transactions can secure their assets with software and algorithms that evaluate instant market data and even profit from hourly price fluctuations. In this study, it is aimed to develop a buy and sell strategy in the Matriks IQ environment to meet this need (3).

2. MATERIAL AND METHODS

In the study, hourly price closing data of Bitcoin, Etherium and Cardano assets obtained from cryptocurrency exchanges between May 24, 2021 and September 24, 2021 were used. The obtained data were processed on the trial version platform, which is the version of Martiks IQ commercial stock market software adapted to crypto money markets. In the Martiks IQ environment, a buy and sell strategy was created based on the Stochastic Momentum Index indicator. This software is also a C# programming compiler in itself. Buy and sell strategies can be developed with the codes written in the C# programming language. In addition to the strategy created, the Stochastic Momentum Index buy and sell strategy has been strengthened by adding the C# programming option of the software. The Stochastic Momentum Index indicator developed by William Blau, which uses the distance of the closing price of the crypto asset to the mid-point of the daily low-high in the selected period, was used. This indicator gives signals according to the intersections that will occur with its own moving average (Trigger).

In this study, as the al formula: Cross (STOCHMOMENTUM (4,3,3), MOV (STOCHMOMENTUM (4,3,3),3)) is used. The step-by-step calculation of the SMI indicator is as follows. (M – midpoint price of the highest high and the lowest low in the selected range) : M = (HighMAX + LowMIN) /2. where, HighMAX = the highest high in the range. LowMIN = the lowest low in the range. (D – the difference of bar's closing price from the midpoint of the range) : D = Close – M. Ds – double Exponential Moving Average (EMA) applied to D values calculated : Ds = EMA (EMA(D)). Dhl – double EMA applied to the difference between highest high and lowest low in the selected period applied to Dhl values calculated : DHL = EMA (EMA ((HighMAX – LowMIN))). Stochastic Momentum Index (SMI) as ratio between Ds and Dhl : SMI = 100 * (Ds / Dhl). This calculation is also the same as with Stochastics Oscillator, additional Signal Line is calculated as EMA applied to the SMI.

3. FINDINGS

According to the backtest results of the Bitcoin hourly price closing data between May 24, 2021 and September 22, 2021; A gain of $ 15,149 was obtained from 1 bitcoin, which was $ 38,722. The price of 1 bitcoin on September 22 is around $43,330. Between May 24, 2021 and September 22, 2021, Bitcoin fell to the level of $ 28,000 (Fig.1.a)

Between these dates, thanks to the strategy created, regular profits were achieved, including fluctuation periods. If the money loaded into the system and the earnings are calculated together, the final balance including commissions is $53,871. A total of 32 buy and sell orders have been sent. The average return per order is $488.6. The longest period of no action is 5 days (Fig.1.a-b).

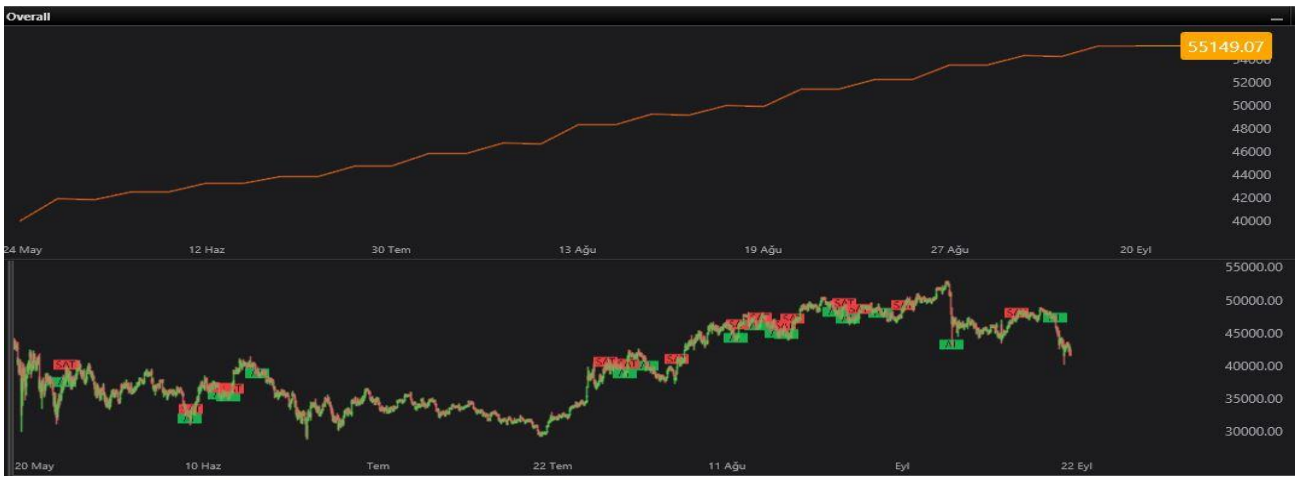

Fig. 1 a. BTC May 24, 2021 – September 22, 2021 earnings chart, b. BTC hourly market close data.

Backtest was performed on Etherium using the same algorithm in the Matrix IQ environment. In terms of consistency in the results, the simulation was carried out with a balance close to 40 thousand dollars. Accordingly, according to the backtest results of the Etherium hourly price closing data between May 24, 2021 – September 22, 2021; 10,998 dollars were gained from 10 Etheriums with a total price of 26,380 dollars. The price of 10 Ethereums on September 22 is around $30,780. Between May 24, 2021 – September 22, 2021, Etherium fell to $ 1,690.

Fig. 2 a. ETH May 24, 2021 – September 22, 2021 earnings chart, b. ETH hourly market closing data.

Between these dates, thanks to the strategy created, regular profits were achieved, including fluctuation periods. If the money loaded into the system and the earnings are calculated together, the final balance including commissions is $37,378. A total of 32 buy and sell orders have been sent. The average return per order is $354.7. The longest period of no action is 7 days (Fig 2).

Fig. 3 a. ADA 24 May 2021 – 22 September 2021 earnings graph, b. ADA hourly market closing data.

The same back test was applied on Cardano. Accordingly, according to the backtest results of the Cardano hourly price closing data between May 24, 2021 and September 22, 2021; A profit of 14,748 dollars was obtained from 2000 Cardano with a total price of 31,180 dollars. The price of 2000 Cardano on September 22 is around 31,180 dollars. Between May 24, 2021 – September 22, 2021, Cardano dropped to the level of 1 dollar.

If the money uploaded to the system and the earnings are calculated together, the final balance including commissions is 45,928 dollars. A total of 24 buy and sell orders have been sent. The average return per order is $641.2. The longest period of no action is 4 days (Fig 3) .

4. DISCUSSION

The way to profit in the crypto money markets; Predicting which direction the market will go. The direction of the market is towards three sides. The market either rises or falls or moves horizontally. The probability of each direction is the same. By a rough estimate, each of these probabilities equals 33%. Fundamental analysis, technical analysis, and the experience of the person trading in the stock market increase this possibility. In this study, technical analysis based on price is used to increase the probability of predicting the direction of movement in the stock market. There are many studies in the literature comparing the predictive power of stock market indicators. RSI, MACD, CCI, SMI are the most known of them. No technical or fundamental analysis can predict the stock market's direction of movement one hundred percent. They only help to increase the probability of correct prediction. To give an example of current studies on this subject; Colianni et al. (2015) aimed to predict stock market movements using Twitter data in their study. By evaluating Twitter data by machine learning, Naive Bayes and support vector machines methods, they increased the probability of prediction by 25% (4). Vo & Yost-Bremm (2020) compared two different machine learning algorithms in their study and demonstrated the effectiveness of their methods (5). Again, a similar study was carried out by the team of Alessandretti et al.(2018). According to the results of this study. They analyzed daily data for 1,681 cryptocurrencies for the period from November 2015 to April 2018. They stated that simple trading strategies powered by state-of-the-art machine learning algorithms outperform standard benchmarks. According to the result obtained; trivial but ultimately simple algorithmic mechanisms have shown that the cryptocurrency market works better in the short run (6). Ślepaczuk & Zenkova (2018), using support vector machines, %ARC (the annualized rate of change), %ASD (the annualized standard deviation of daily returns), MDD (the maximum drawdown coefficient), IR1, IR2 (the information ratio coefficients) They compared the parameters (7). Stuerner (2019), on the other hand, examined whether profitable algorithmic cryptocurrency trading is possible in his doctoral thesis. In his research, he created an algorithmic trading system that he developed, consisting of three strategies that invest according to the principles of trend tracking and technical analysis. According to the results of the study, he applied the algorithmic crypto money trading method, as he achieved a net return of 27.8%. However, the researcher states that not all strategies can win, meaning that an automated investment approach involves a high risk of loss. In our study, it has been shown that a profit between 27% and 37% can be obtained in the strategy used. In addition, according to our findings, there was no case of not being able to trade for a long time due to high price purchases in the 4-month period (8). Miura et al. (2019). Multiple machine learning methods, ANN (MLP, GRU, LSTM), SVM and Ridge Regression, Realized Volatility (HARRV) model with optimized lag parameters, and HARRV, using the Actual volatility (RV) time series of Bitcoin market data, compared to Heterogeneous Auto-Regressive tested the models. stated that Ridge Regression showed the best performance. Miura et al. (2019), SVM shows the worst performance (9). Spörer (2020), Goudjil & Iania (2019), Ward (2018) ve Gilboa (2015) found that MLP outperforms both SVM and LSTM in predicting directional cryptocurrency price movements. The highest forecasting performances were obtained with the combination of trading indicators. Similarly, in this study, it can be said that the parameters of the classical trading indicators and the algorithm we developed were optimized with the Bayesian approach. In this way, the developed algorithm gave the highest performance (10 -13).

5. CONCLUSION

If the crypto money applications will bring the promised or hoped innovations, this will cause great convenience and developments in the future. But today, the use of cryptocurrencies is very limited. However, there are quite a number of cryptocurrencies available. Cryptocurrency market volume exceeds 2 trillion dollars in total according to current data. This value is approximately one percent of the financial assets in the whole world. As a result, it can be said that the world economy is at the beginning of the road to transition to crypto money. Cryptocurrency exchanges have played a major role in the transition. Cryptocurrency exchanges have high financial risks due to volatility and speculation, but investors using

appropriate strategies can make high profits. In this study, the possibility of making profits even in the falling times of the market is shown with the algorithmic buy and sell strategy. The software's management of buy and sell transactions can leave more than 30% profit to the investor in the long run. The high profit depends on the indicator used, the software developed and the number of buy and sell orders. Because trading commissions on cryptocurrency exchanges are quite high. In this way, investors will avoid possible risks by using robot applications. The market history of the asset to be traded on the algorithm to be used should be well analyzed. In addition, the optimization of the parameters of the strategy to be used in environments such as Matriks IQ should be provided quickly with the Bayesian method. With the optimal parameters obtained, backtests should be made on the asset and the strategy should be run when the successful result is sure.

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