Cryptocurrency Analysis for Investment

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***Abstract*— The main purpose of this paper is to analyze which cryptocurrencies to invest in. A cryptocurrency is a digital currency that is meant to function as a means of exchange via a computer network. It does not require the dependency or maintenance of any central authority, such as a government or a bank. In this paper, the authors have demonstrated the correlation between cryptos and their stability on the market. Different applications of data science were introduced to get more accurate predictions. Authors have also introduced different algorithms for prediction such as Holt-Winters Forecasting, Prophet for price prediction, Lstm algorithms. For growth Rate Analysis, Simple Moving Average were used. In this marketplace of investment, the authors tried to predict the best possible crypto to invest on, from the selected datasets.**

I. *Introduction:*

A cryptocurrency is a digital currency that functions as a medium of exchange and relies on strong cryptography to safeguard financial transactions, limit the creation of new units, and verify asset transfers. [1] . A virtual currency that uses cryptography that functions as a medium of exchange and relies on strong cryptography to safeguard financial transactions, restrict the creation of new units, and verify asset transfers. They are based on decentralized systems that use block-chain technology, which is a distributed ledger enforced by a network of computers . In 2009, Bitcoin, the very first decentralized cryptocurrency, was released as

open-source software. Around 4000 altcoins that are similar to cryptocurrencies , have been released as a result of this release. The worldwide cryptocurrency market cap is $1.28 trillion as of May 2022.[2]

Cryptocurrency price prediction can assist cryptocurrency investors in making informed investment decisions to maximize earnings, as well as policymakers and financial scholars in analyzing the behavior of cryptocurrency markets. Cryptocurrency price prediction, similar to stock price prediction, is a prevalent sort of time series problem. [3].

In this paper, we provide the crypto currency prediction method for investment by using various kind of model of data science. Firstly, In the first part of data analysis, plotting of price, correlation between the cryptos and relative standard deviation of market cap of all cryptos, were brought under observation to better understand the underlying patterns in our data. We also utilize Holt-Winters forecasting. The Holt-Winters method employs exponential flattening to encode a large lot of historical values, which are then used to forecast "typical" values in the present situation. [4] Thirdly, we work on growth rate analysis by using moving average strategy. By this method, we analysis how each crypto has perform.

Since the difficulty level to generate authentic and superlative forecasting results is very high, a regression model “Prophet” has been introduced which can be intuitively readjusted by the analysts who have expertise regarding time series. This model is vigorous to missing data, outliers and provides accurate and precise result than any other forecasting models by fitting non linear trends.
The rest of the paper as organized as follows, in section 2 discuss on some related work and in section 3 we elaborate our research methodology , in the next part we discuss about the result and output, After that we conclude our work.

Ⅱ. *Related Work:*

In this section we present a brief review of the state of the art related to cryptocurrency price prediction. Previous attempts to forecast bitcoin variations used Twitter sentiment research as a proxy for future cryptocurrency demand, resulting in rising or falling prices.[5]. The authors use a stochastic neural network model to predict the price of Cryptocurrencies in this paper.

We devised a method for adaptively learning the market's pattern. It may well be worthwhile to investigate an optimization technique for tuning the hyperparameter to find the best appropriate value. Alternate response functions can also be tested to learn the market's reaction pattern to new data. To better imitate market volatility, these functions can be stochastic in nature.[6]

RNN and LSTM deep learning models are clearly useful for Bitcoin prediction, with the LSTM being better at recognizing longer-term dependencies.

However, with such a high variance challenge, translating this into remarkable validation findings is tough. As a result, the task remains challenging. Overfitting a model and preventing it from learning properly are two different things.[7] . In this paper, we used a simple Neural Network approach called the Multilayer Perceptron with one hidden layer. Using networks with more complicated architecture, such as recurrent, self-organized, deep, and so on, should improve predicting accuracy as well.In conclusion, we emphasize that the creation of mixed Classification and Regression Tree models, as well as Neural Network models, is the perspective strategy for financial time series forecasting. [8] In a Bitcoin case study, machine learning was compared to a variety of ANN approaches.

Several research on stock or investment prediction have been conducted, but none on Bitcoin. Furthermore, this work contributed by using training time as a performance metric. [9]

Ⅱ Ⅰ. *Research Methodology:*

A. Exploratory Data Analysis

Looking at the closing price change is very important to understand how cryptocurrencies are behaving. The author plotted the closing price of all cryptos in a single graph. But, as the crypto prices can vary significantly within months, only the most recent data of 3 months are plotted for better visualization. The question may arise as, to why the authors plotted the change in closing price. Here, the “closing price” is considered the general “price” on any given day. And, considering this as the general price, it is essential to understand the fluctuations of price with each day of every cryptocurrency. This fluctuation

can aid in a better understanding, when the authors will predict the price for the future days using different algorithms in the latter part of our project.

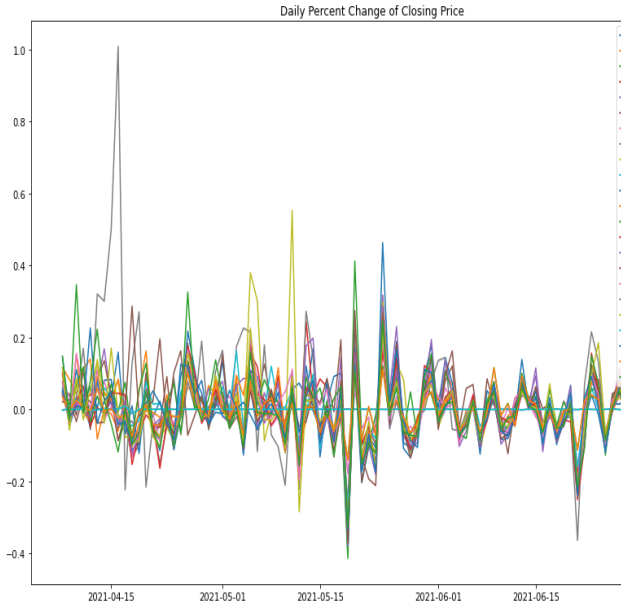


Fig 1: Daily percent change of Closing price of each crypto

The correlation which exists between cryptos is also necessary to find out, if anyone wants to invest in some cryptos. For example, suppose a person wants to invest in crypto ‘A’ because it can yield a high profit. Now, say crypto ‘A’ has a strong positive correlation with crypto ‘B’. This means that crypto ‘B’ will also possibly yield high profit alongside crypto ‘A’. That is why knowing the crypto correlation can come in very handy while making decisions about investment.

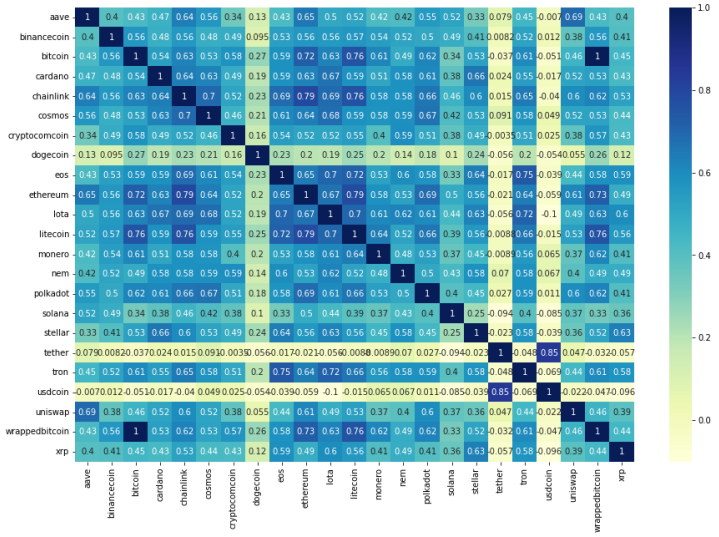


Fig 2: The existing correlation among the cryptos

There’s also a data named “Market cap” for each crypto. This is an important piece of information because by monitoring closely the market cap for crypto, the stability of crypto can be well understood. The actual formula by which the market cap is calculated is:

Market Price x Circulating Supply = Market Cap

The rise and fall of this market cap can have many factors, like how many people are actively involved in this crypto, what people think about the potential of this crypto, the value of crypto according to international standards, and so on. These factors can be a very good source of gathering information about the stability and likelihood of crypto. So, the authors deemed it important to find out the stability of this market cap data for a crypto. And the measurement which was taken to find out the stability is Standard deviation. Below is the plotting of the standard deviation of market cap data for each crypto.

Fig 3: Relative std. dev of market cap for each crypto

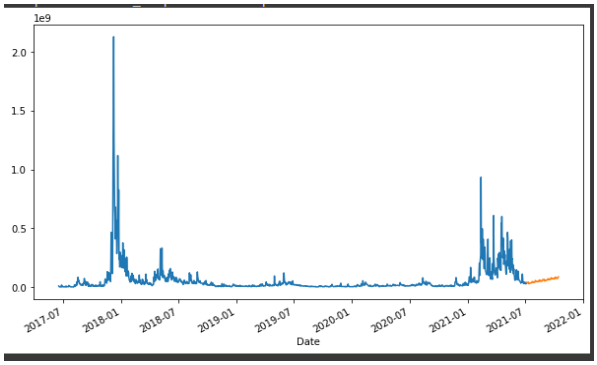


Fig 1:Coin_Iota

B. Holt Winters Forecasting

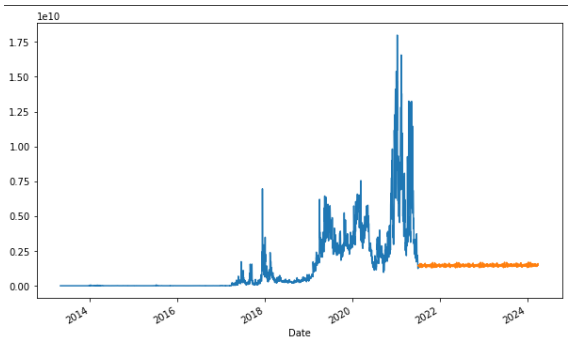
Anomaly detection in time series is a complex problem with several practical solutions. Forecasting is one of the essential elements of Anomaly detection. Holt winters forecasting is a popular and generally straightforward technique for time series forecasting. Holt-Winters is used for modeling and predicting the behavior of a sequence of values over time—a time series. The Holt-Winters approach uses exponential smoothing to encode a large number of historical values and then utilizes them to anticipate "typical" values for the present and future.

In Winter's method assumes that the time series contains a level, trend and seasonal component. Winter's exponential smoothing can be expressed as:

$$F_{tk} == L_t + k_{T_t} + S_{t+k-M}$$

Here L_t = estimate level for time,k = number of future forecast,T_t = estimate trend in t time , S_t = sessional estimate at t time ,M = number of seasons.

In this paper the author has used this holt winters approach to predict whether in future the volume rate of the newly made cryptocurrency will increase or not. Some samples using 4 different dataset are given below:



Fiq 2:coin_Litecoin

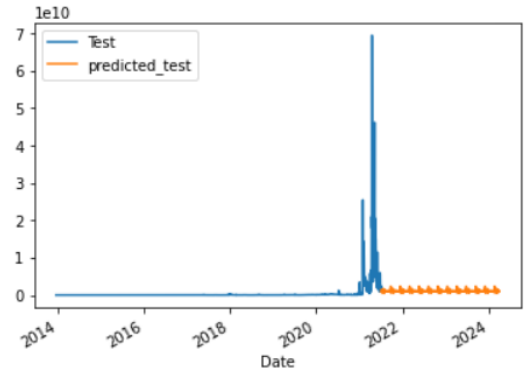


Fig3:DogeCoin

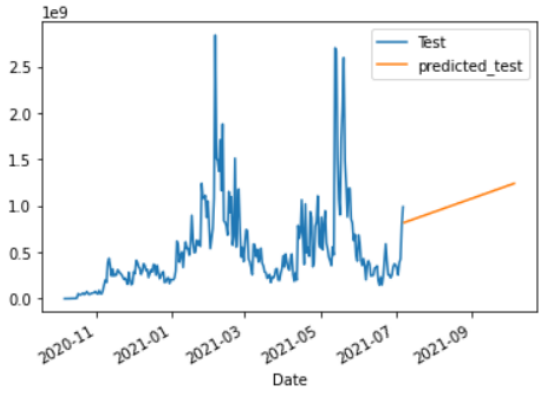


Fig4 : coin_Aave

From the above figure, it can be seen that the volume rate of coin_ave is increasing in the future on the other hand the others are showing ups and downs.

C. Growth Rate Analysis

Then we find out the growth rate of each crypto data. But for this work, the Moving Average strategy for 60 days has used. A moving average is a statistical computation that is used to examine data points by calculating the averages of different subsets of the entire data set.[10] A moving average (MA) is a stock indicator extensively employed in technical analysis in finance. For calculating, the moving average we use the MA60 shift year.

The formula of Simple Moving Average:

Simple Moving Average = $(A_1 + A_2 + \ldots\ldots + A_n) / n$

For calculating the growth rate, at first, found the moving average of 60 times of period. Then the shift year of the moving average has been deleted from the previous moving average time period. After multiplying and dividing the number by 100 growth rate can be measured.

Then we find out the log growth rate from the percentage of growth rate. From the growth rate, individual growth has been assumed and then we discovered the top 4 Crypto**.**

Fig2.1: Random Crypto with growth rate

D. LSTM model

LSTM means Long Short-Term Memory networks which can be applied to time series forecasting. There are many types of LSTM models that can be used for each specific type of time series forecasting problem. LSTM is a special kind of RNN which means a Recurrent neural network, capable of learning long-term dependencies. LSTM is the most effective solution and very well know subset, is a special type of neural network which is designed to solve sequence prediction problems or recognize patterns in a sequence of data and so on.

E. Prophet

A common data science practice is Forecasting. Forecasting helps persons or organizations to set goals, capacity planning, anomaly detection and so on. However, it is very difficult to generate reliable and top notch forecasts since in forecasting a variety of time series are related. To address all these challenges a modular regression model named "Prophet" has been introduced with interpretable parameters which can be intuitively readjusted by the analysts who have expertise regarding time series. This forecasting model fits non-linear trends with daily seasonality then weekly, yearly and can also address the holiday effects. In the majority of cases, Prophet performs fast and provides precise and accurate results than any other forecasting model. Moreover, this procedure is robust to missing data, outliers and dynamic changes in the time series. Furthermore, this model incorporates numerous opportunities for users in order to tweak and readjust as per their requirements and more improvement in the result can be made if one has the domain knowledge regarding forecast. In this paper, after scrutinizing the growth rate of the cryptocurrencies, some crypto currencies have been selected in order to predict the future price of those crypto currencies. In order to predict the future price of the top crypto currencies according to the growth rate, the Prophet forecasting model has been applied. This model provides the precise succeeding price of the crypto currencies.

IV. Results and Observations

At first, the authors noticed a good positive correlation among the following cryptos:

1. Ethereum and Bitcoin
2. Litecoin and Bitcoin
3. Litecoin and Chain-link
4. Ethereum and Chain-link
5. Ethereum and Litecoin
6. Bitcoin and Wrapped Bitcoin
7. Tron and EOS
8. Wrapped Bitcoin and Litecoin

Now, looking at the relative standard deviation graph of the market cap for each crypto, the authors canceled out the cryptos which have relative std. dev of more than 35%. Due to this, **Dogecoin, Iota, and Nem** are no longer under their observation. Because these cryptos are too volatile and thus risky for investment.

After that, the authors tried to predict the volume in the near future for all the cryptos. The cryptos which don't have a good potential volume are dropped. Because this refers that those cryptos will soon be out of the market. In this segment, the cryptos which are dropped, are **chain-link, Monaro, stellar, wrapped Bitcoin, and Xrp**. The graph tells us that these cryptos will perform very poorly in terms of transactions in the future market. On the other hand, **aave, cosmos, polkadot, solana, tron, and uniswap** have a very high potential in terms of transactions. This means that people are more likely to transact using these coins in the upcoming days.

Then, the authors considered the overall growth of all the cryptos. Growth graphs are plotted for each crypto. It can be noticed from this segment that, **tron, polkadot, cryptocomcoin, and EOS** can be discarded as the potential growth of these coins are dissatisfactory. But **tether, USDcoin, and Solana** are performing very well in terms of growth. The rest of the coins are neutral.

Lastly, the authors did the final selection using the price prediction graph. In this stage, **aave, tether, usdcoin, and uniswap** are discarded as the rise of predicted future price is not up to the mark for these cryptos.

After all the calculations, the only crypto coins which are not discarded are **bitcoin, cardano, cosmos, ethereum, litecoin, and solana.** Among these, there are strong correlations between **bitcoin, litecoin, and ethereum**. But the probability of profit after investment for these coins is around 70%. So, the authors suggest investing only in 1 of these coins. Then, this probability of profit rate is around 85% for **cardano and cosmos**. So, the authors suggest investing in both of these coins. At last, the probability of profit rate for the coin **Solana** is the highest, which is around 95%. Thus, the authors strongly recommend investing in this coin because this coin has a very good potential for return on investment.

V. Conclusion

Our work has given us a brief overview of crypto analysis in investment. For this analysis we use various data analysis and machine learning technique.

We observed our dataset very carefully. For plotting and analysis, we used data analysis, price graphing, correlation between crypto currencies, and relative standard deviation of market cap of all crypto currencies. Then we use holt winter forecasting, an anomaly detection in time series is a complex problem with several practical solutions. After that we analysis the growth rate of each cryptos. We use moving average, LSTM model here. For final prediction, we use prophet forecasting. The Prophet forecasting model was used to project the future price of the top crypto currencies based on their growth rate. This model predicts the exact price of crypto currencies in the future. From all the predictions and analysis, The authors strongly advise investing in this coin because it has a high return on investment potential.

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