FTEC 5530 Project 1 Report

Study the Effectiveness of technical analysis indicator in Cryptocurrencies

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1. Introduction

Technical indicators are heuristic or mathematical calculations based on the price, volume, or open interest of a security or contract used by traders who follow technical analysis. It is a trading discipline employed to evaluate investments and identify trading opportunities by analyzing statistical trends gathered from trading activity, such as price movement and volume. Unlike fundamental analysis who attempt to evaluate a security's intrinsic value based on financial or economic data, technical analysis focus on patterns of price movements, trading signals, and various other analytical charting tools to evaluate a security's strength or weakness.

Technical analysis can be used on any security with historical trading data. This includes stocks, futures, commodities, fixed-income, currencies, and other securities. As quantitative and algorithmic trading is becoming popular, more and more investors start to use technical analysis to help them make the decision. With the development of blockchain technology, cryptocurrency market grows rapidly, institutions and investors start to invest on cryptocurrency market, also try to use technical method to help them make the profit.

In this report, we Apply two types of technical indicators (EMA and MACD) to carry out research of the effectiveness. We focus on two type of cryptocurrencies (‘BTC/USDT’ and ‘ETH/USDT’) and their daily as well as hourly data. In Section 2, we will discuss 2 different technical indicators. In Section 3, we will go through the data and data processing. In Section 4, result of different parameters will be shown. And at last, we will make the conclusion.

2. Methodology

2.1 Exponential Moving Average

An exponential moving average (EMA) is a type of moving average (MA) that places a greater weight and significance on the most recent data points. The exponential moving average is also referred to as the exponentially weighted moving average. [1] An exponentially weighted moving average reacts more significantly to recent price changes than a simple moving average (SMA), which applies an equal weight to all observations in the period.

◆EMA – Exponential Moving Average

$$EMA = a * P(t) + (1 - a) * EMA(t - 1)$$

The weight a is not easy to remembered, people prefer to use something like SMA to remember the lookback windows:

$$a = \frac{2}{1 + \mathrm{n}}$$

$$EMA(n) = \frac{2}{1 + \mathrm{n}} * P(t) + \left(1 - \frac{2}{1 + \mathrm{n}}\right) * EMA(t - 1)$$

Figure1: math formula of EMA

The EMA gives a higher weight to recent prices, while the SMA assigns equal weight to all values. The weighting given to the most recent price is greater for a shorter-period EMA than for a longer-period EMA.

2.2 Moving Average Convergence Divergence

Moving average convergence divergence (MACD) is a trend-following momentum indicator that shows the relationship between two moving averages of a security's price. For example, The MACD is calculated by subtracting the 26-period exponential moving average (EMA) from the 12-

period EMA. The result of that calculation is the MACD line. A nine-day EMA of the MACD called the "signal line," is then plotted on top of the MACD line, which can function as a trigger for buy and sell signals.[2] However, the Default parameters (12,26,9) is changeable when facing the different situation and different stocks. Moving average convergence divergence (MACD) indicators can be interpreted in several ways, but the more common methods are crossovers, divergences, and rapid rises/falls.

3. Data and data processing

3.1 Cryptocurrency Exchange Trading Library

CCXT (CryptoCurrency eXchange Trading Library) is a JavaScript / Python / PHP library for cryptocurrency trading and e-commerce with support for many bitcoin/ether/altcoin exchange markets and merchant APIs. The CCXT library is used to connect and trade with cryptocurrency exchanges and payment processing services worldwide. It provides quick access to market data for storage, analysis, visualization, indicator development, algorithmic trading, strategy backtesting, bot programming, and related software engineering. It is intended to be used by coders, developers, technically-skilled traders, data-scientists and financial analysts for building trading algorithms.

The period of the time is as bellowed:

(1) Hourly data starts from 00:00 2020-1-1 to 23:00 2021-3-4

(2) Daily data starts from 00:00 2017-8-17 to 00:00 2021-3-29

```python
import time
import ccxt
import pandas as pd
exchange = ccxt.binance()
def get_bar_from_to(ex, symbol, period, start_time, end_time, length=2000, maxLoop=20):
    data = []
    stime = ex.parse8601(start_time)  # ISO8601 is the format of time
    etime = ex.parse8601(end_time)
    loop_i = 0
    if ex.has['fetchOHLCV']:
        while stime < etime and loop_i < maxLoop:
            loop_i += 1
            try:
                ohlcvs = ex.fetch_ohlcv(symbol, period, stime, limit=length)
                print(ex.iso8601(ex.milliseconds()), 'loop_i=', loop_i, ' ,Fetched', len(ohlcvs), 'candles')
                if len(ohlcvs) > 1:
                    first = ohlcvs[0][0]
                    last = ohlcvs[-1][0]
                    print('[', ex.iso8601(first), '--', ex.iso8601(last), ']')
                    stime = int(last + (last - first) / (len(ohlcvs) - 1))
                    data += ohlcvs
                    time.sleep(1)
                else:
                    return data
            except Exception as e:
                print(str(e))
    return data
# Let's have an example
start_time = '2020-01-01 00:00:00'
end_time = '2021-03-05 23:00:00'
symbol = 'ETH/USDT'
period = '1h'_# '1d', '1m', '5m'
```

Figure2: using CCXT api to get the data

3.2 data processing

After changing the parameters on settings of the api we will get 4 different csv files: BTC-daily, BTC-hourly, ETH-daily, ETH-hourly.

The following figures show how the data is like after using EMA and MACD. (we only take BTC-daily as an example)

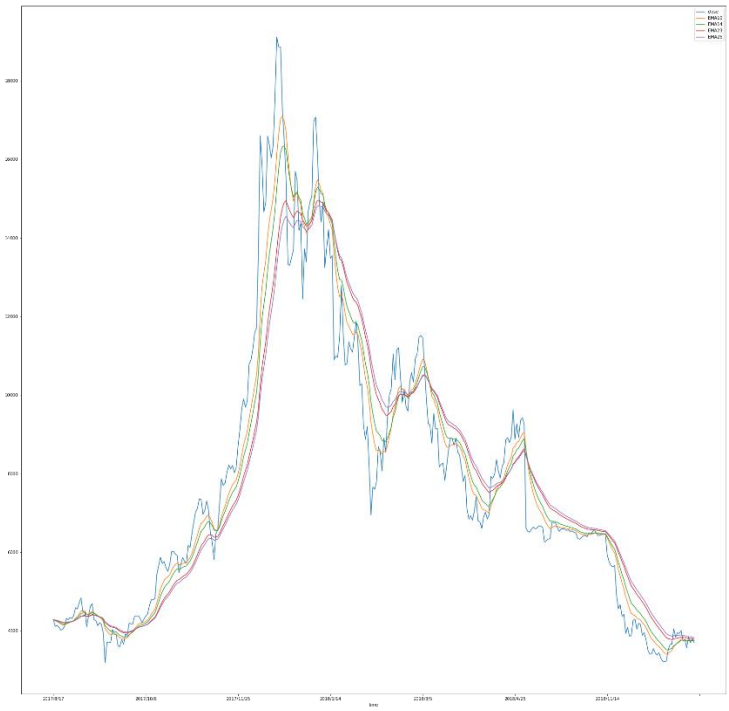

Figure3 EMA-BTC-Daily (parameter is 10,14, 23, 26) from 2017/8/17 to 2018/4/9

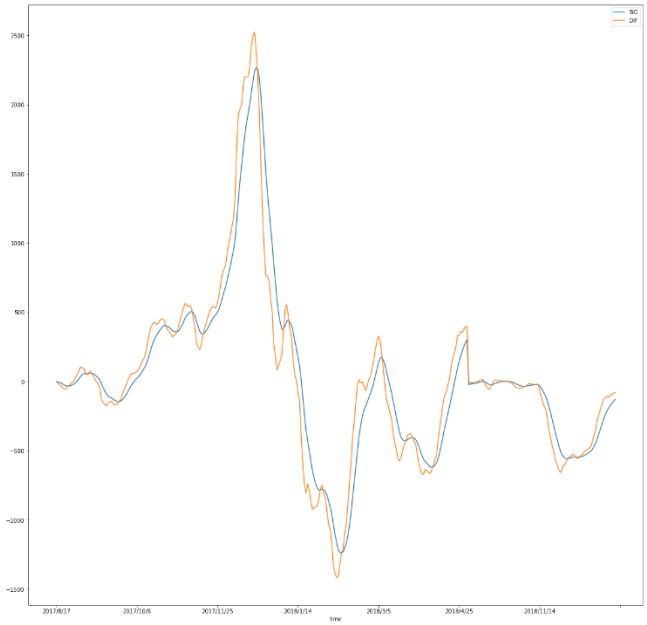

Figure 4: the DIF line(orange) is set by (12,26), SIG(blue) is set by 9(MACD-BTC-Daily)

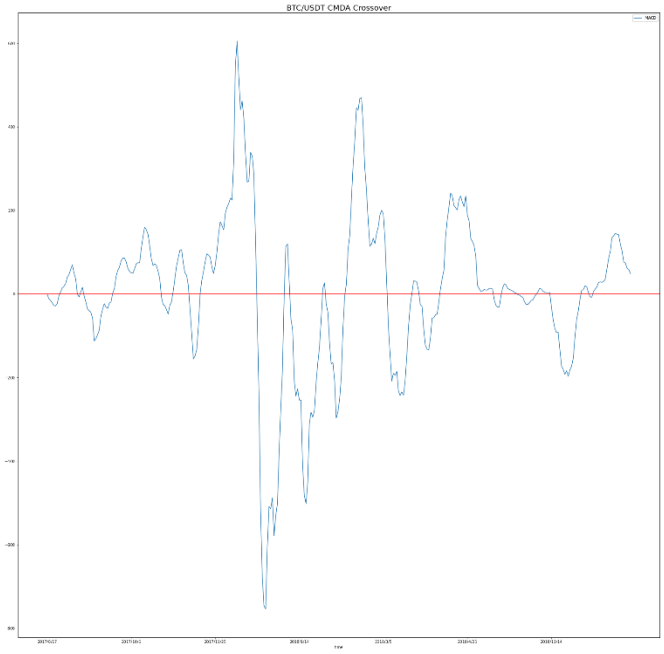

Figure 5: the MACD line which is MACD=DIF-SIG *(MACD-BTC-Daily)*

Based on the data from CCXT, we make the different Performance analysis at different parameters: average return per trade, accumulated return, win ratio, max win/loss percentage. Figure 6 will show how the sample result and

the performance.

	short term parameter	long term parameter	average return	accumulated return	win ratio	max	min
2	1	21	0.065253678	20.75284116	0.2985075	1.061032	-0.10074
3	1	22	0.066125241	21.27303521	0.3030303	1.061032	-0.10074
4	1	23	0.064233281	17.4519515	0.2923077	1.061032	-0.11191
5	1	24	0.068222706	18.5040349	0.3064516	1.061032	-0.11191
6	1	25	0.061187606	16.27801305	0.2686567	1.061032	-0.11191
7	1	26	0.076423172	19.0316792	0.2741935	1.823663	-0.11191
8	1	27	0.073025087	15.33081617	0.2741935	1.823663	-0.13484
9	1	28	0.072775841	15.08434234	0.2741935	1.823663	-0.13484
10	1	29	0.069504936	11.31186098	0.2459016	1.823663	-0.13484
11	1	30	0.069063159	10.50109927	0.2333333	1.823663	-0.20709
12	1	31	0.066799177	9.709936354	0.2295082	1.823663	-0.20709
13	1	32	0.072078855	10.90138663	0.2413793	1.823663	-0.20709
14	1	33	0.076448391	9.860836074	0.2280702	1.823663	-0.12909
15	1	34	0.078819353	9.004631558	0.2222222	1.823663	-0.12909
16	1	35	0.072711189	7.90307439	0.2105263	1.823663	-0.12909
17	1	36	0.074574647	7.640841342	0.2181818	1.823663	-0.12909
18	1	37	0.07768826	7.714428991	0.2307692	1.823663	-0.12909
19	1	38	0.08249873	8.345876545	0.22	1.823663	-0.12909
20	1	39	0.085105137	8.8281032	0.2244898	1.823663	-0.12909
21	1	40	0.089753129	9.349115252	0.2340426	1.823663	-0.12909
22	1	41	0.088098517	9.792134104	0.2291667	1.779365	-0.12909
23	1	42	0.089015525	9.288643427	0.2340426	1.779365	-0.12909
24	1	43	0.090836638	9.250486349	0.2391304	1.779365	-0.12909
25	1	44	0.089051715	8.442553111	0.2173913	1.779365	-0.12909
26	1	45	0.087627908	7.931521314	0.2173913	1.779365	-0.12909
27	1	46	0.090816849	7.913339931	0.2093023	1.779365	-0.09249
28	1	47	0.05251435	2.484423265	0.1904762	1.446929	-0.09249
29	1	48	0.051437762	2.519953082	0.1860465	1.446929	-0.09249
30	1	49	0.070709966	2.757760691	0.15	1.966852	-0.09249
31	1	50	0.069051632	2.512116207	0.125	1.966852	-0.09249

Figure 6: EMA-BTC-daily result for parameters (1,21) to (1,50)

4. Result

4.1 EMA

In order to find the best parameters pair for different dataset, a For loop method is used to get all different data. For EMA we set the short-term parameter from 1-20, and 20-80 is assigned to the long-term parameter. And after processing all the data, we screened the result.

For btc-daily, the result is as followed:

	A	B	C	D	E	F	G
1	short term parameter	long term parameter	average return	accumulated return	win ratio	max	min
2	1	22	0.066125241	21.27303521	0.30303	1.06103	-0.1007
3	1	24	0.068222706	18.5040349	0.30645	1.06103	-0.1119
4	2	21	0.086715653	18.08440752	0.3125	1.02686	-0.1007
5	9	26	0.260558051	13.93041901	0.35	2.13265	-0.1401
6	10	24	0.273416849	13.67456563	0.36842	2.13265	-0.1727
7	9	25	0.256489341	13.17280599	0.35	2.13265	-0.1401
8	8	28	0.233863202	12.90679575	0.31818	2.13265	-0.1401
9	8	29	0.240804443	12.48320422	0.33333	2.05583	-0.1308
10	11	22	0.269268003	12.46693388	0.36842	2.13265	-0.1727
11	4	21	0.102356103	12.45071802	0.30952	1.82366	-0.1341
12	8	27	0.231214475	12.40623716	0.31818	2.13265	-0.1401
13	9	23	0.226655279	12.39969868	0.31818	1.97172	-0.1727
14	8	24	0.220435583	12.39829876	0.30435	1.97986	-0.1209
15	9	22	0.219819939	12.38512804	0.30435	1.97986	-0.1209
16	7	29	0.234094844	12.38397181	0.31818	2.2856	-0.1308
17	7	30	0.228481455	12.32856879	0.31818	2.05583	-0.1308
18	9	24	0.241407679	12.25221434	0.35	1.84115	-0.1727
19	12	21	0.268217789	12.23793605	0.36842	2.13265	-0.1727
20	10	23	0.256175169	12.19599464	0.36842	1.84115	-0.1727
21	8	25	0.219640791	12.05791602	0.30435	1.97986	-0.1401
22	11	23	0.267691673	12.04991574	0.36842	2.13265	-0.1727
23	12	22	0.267587411	12.01498373	0.36842	2.13265	-0.1762
24	10	22	0.224182671	11.91917809	0.31818	1.93809	-0.1727
25	13	21	0.263925027	11.79128551	0.36842	2.05583	-0.1762
26	10	25	0.250118941	11.73196494	0.35	2.05583	-0.1401
27	9	27	0.237584217	11.51999787	0.33333	2.05583	-0.1401
28	11	24	0.246853509	10.83881535	0.35	2.05583	-0.1438
29	11	21	0.226240679	10.64188103	0.33333	1.84115	-0.1727
30	8	26	0.213359995	10.42598212	0.31818	1.84115	-0.1401
31	3	25	0.097842184	10.36682996	0.30952	1.82366	-0.2071
32	10	21	0.219024914	10.00027861	0.31818	1.97172	-0.2194

the filter is set as average return>0.06, accumulated return>10, win ratio>0.3. and it is in a descending order based on accumulated return

From the table we could easily see that, when the parameters are (1,22) the accumulated return is the biggest. However, this is not the best parameter, when the short-term parameter is set as 1, which means we use today's value to make a prediction, this doesn't make sense, what's more, if the short-term parameter is too small, may lead to a lot of crossing, that may be the reason why the accumulated return is high. Each trade may have a cost, so actually the return may not be that high. Therefore, the set of parameters may select as (9,26) or (10,24).

For btc-hourly, the result is as followed:

	A	B	C	D	E	F	G
1	short term parameter	long term parameter	average return	accumulated return	win ratio	max	min
2	10	65	0.020482293	5.51696668	0.352941	0.306802	-0.06304
3	10	66	0.021045858	5.506049442	0.363636	0.306802	-0.06304
4	11	65	0.021659425	5.467466033	0.375	0.327033	-0.06304
5	8	79	0.021038659	5.451795064	0.353535	0.335443	-0.06149
6	10	67	0.020709589	5.43035968	0.36	0.306802	-0.06304
7	10	64	0.020288141	5.402326576	0.352941	0.306802	-0.06304
8	8	76	0.020394985	5.342305211	0.346535	0.318689	-0.05929
9	8	77	0.020578623	5.326000505	0.36	0.318689	-0.05929
10	11	64	0.021398298	5.324993927	0.375	0.327033	-0.06304
11	17	48	0.022049068	5.312066408	0.387097	0.316647	-0.06106
12	8	78	0.020403655	5.30309401	0.346535	0.339105	-0.06149
13	8	75	0.020017605	5.237239326	0.343137	0.318689	-0.05929
14	18	46	0.022005687	5.181633636	0.417582	0.247098	-0.06106
15	10	70	0.021359985	5.1465215	0.357895	0.327033	-0.06304
16	12	64	0.021513004	5.107340535	0.393617	0.327033	-0.06106
17	16	49	0.020367916	5.081000701	0.363636	0.333376	-0.06304
18	11	79	0.024395077	5.071134553	0.360465	0.559899	-0.06149
19	10	69	0.02096474	5.048509764	0.354167	0.327033	-0.06304
20	11	72	0.022146559	5.044948043	0.362637	0.331339	-0.05878
21	9	73	0.02029957	5.02262125	0.363636	0.327033	-0.06304
22	10	68	0.020500571	5.02238277	0.346939	0.327033	-0.06304
23	13	62	0.021340954	5.016116152	0.382979	0.334726	-0.06106
24	9	74	0.020260554	5.006197665	0.343434	0.327033	-0.05929
25	11	74	0.021790924	5.001922474	0.369565	0.318751	-0.05634

the filter is set as average return>0.02, accumulated return>5, win ratio>0.3. and it is in a descending order based on accumulated return

From the table, it is obvious that the performance is similar even though the parameters are different. Therefore, the one with highest accumulated return will be selected, which is (10,65)

Also, when compared to the daily data, the overall performance is not as good as daily one. So maybe it could show that, EMA method has a better performance on long term trading compared to a short-term trading.

For ETH-daily:

	A	B	C	D	E	F	G
1	short term parameter	long term parameter	average return	accumulated retur	win ratio	max	min
2	10	21	0.417584979	41.2248823	0.5	2.86089	-0.1587
3	9	24	0.444620956	40.90908681	0.533333333	2.86089	-0.1444
4	9	22	0.392345462	40.50967092	0.470588235	2.86089	-0.1509
5	7	25	0.412120112	40.01728003	0.5	2.86089	-0.1509
6	7	24	0.381836769	39.95779627	0.470588235	2.86089	-0.1509
7	9	23	0.44203663	39.00876507	0.533333333	2.86089	-0.1509
8	10	22	0.440634126	38.37170807	0.533333333	2.86089	-0.1587
9	6	25	0.384131622	37.93081424	0.470588235	2.99911	-0.1509
10	7	26	0.407953229	37.7768796	0.5	2.86089	-0.1509
11	7	23	0.361332013	37.64433388	0.444444444	2.9602	-0.1509
12	9	25	0.436636697	37.20531293	0.533333333	2.86089	-0.1444
13	8	22	0.377817622	37.16112019	0.470588235	2.86089	-0.1509
14	10	24	0.442660247	36.98759219	0.533333333	2.89708	-0.1587
15	8	23	0.36512306	36.96944681	0.444444444	2.86089	-0.1509
16	8	25	0.438029589	36.76831515	0.533333333	2.86089	-0.1729
17	10	23	0.43447998	35.82414448	0.533333333	2.86089	-0.1587
18	8	24	0.383996071	35.71058049	0.470588235	2.86089	-0.1509
19	11	22	0.437937541	35.67641293	0.533333333	2.89708	-0.1587
20	12	21	0.432741832	35.05082339	0.533333333	2.77255	-0.1587
21	9	21	0.356304111	35.00373329	0.444444444	2.86089	-0.1509
22	11	21	0.433782158	34.57741483	0.533333333	2.86089	-0.1587
23	6	27	0.357927646	33.80702249	0.444444444	2.86089	-0.1593
24	6	26	0.355581941	33.22540813	0.444444444	2.9602	-0.1593
25	8	21	0.302775443	32.90325566	0.428571429	2.9602	-0.1509
26	7	21	0.30163661	32.57588804	0.476190476	2.99911	-0.1509
27	5	31	0.356865745	32.44287607	0.444444444	2.86089	-0.1856
28	5	30	0.338226096	31.6730416	0.421052632	2.89882	-0.1856
29	5	29	0.335914461	31.60726353	0.421052632	2.99911	-0.1856
30	7	22	0.300808794	30.96088391	0.428571429	2.99911	-0.1509
31	6	29	0.373669185	30.76232226	0.470588235	2.86089	-0.1856
32	6	28	0.352462466	30.69441117	0.444444444	2.86089	-0.1856
33	8	26	0.401082143	30.68183538	0.5	2.86089	-0.1729
34	5	28	0.333770382	30.62377543	0.421052632	2.99911	-0.1856
35	5	27	0.314121422	30.15426133	0.45	2.99911	-0.1593

the filter is set as average return>0.3, accumulated return>30, win ratio>0.4. and it is in a descending order based on accumulated return

ETH-daily has a really good performance in all the different performance aspects. The average return and the accumulated return are good. Based on this, EMA has a really good performance on ETH trading (on daily). The parameter we will select (10,21)

For ETH-hourly:

	A	B	C	D	E	F	G
1	short term parameter	long term parameter	average return	accumulated return	win ratio	max	min
2	11	63	0.032809554	15.53967608	0.36	0.63465	-0.0756
3	12	61	0.034426225	15.51476453	0.36842	0.63465	-0.0756
4	12	53	0.030244832	15.34913915	0.41905	0.57648	-0.0756
5	10	64	0.031559455	15.2488082	0.38835	0.63465	-0.0756
6	11	65	0.032987817	15.20691148	0.37374	0.63465	-0.0756
7	10	69	0.03223414	15.13722368	0.36634	0.63465	-0.0756
8	12	54	0.030777565	15.05721418	0.4	0.63631	-0.0756
9	11	62	0.031745568	14.96908337	0.36275	0.63465	-0.0756
10	10	67	0.032397751	14.8693109	0.37	0.63465	-0.0756
11	11	61	0.031287594	14.74779985	0.35922	0.63465	-0.0756
12	10	65	0.031932012	14.69068536	0.37624	0.63465	-0.0756
13	18	52	0.036419987	14.65367611	0.43678	0.63631	-0.0952
14	12	60	0.033037758	14.52952457	0.36082	0.63465	-0.0756
15	12	58	0.031358861	14.44890842	0.36275	0.63631	-0.0756
16	11	64	0.032429828	14.43276895	0.37374	0.63465	-0.0756
17	10	63	0.031331166	14.38886506	0.38235	0.63465	-0.0756
18	12	67	0.033980534	14.36799418	0.3871	0.63465	-0.0952
19	10	66	0.031368368	14.30996301	0.37255	0.63465	-0.0756
20	18	53	0.037586678	14.30818666	0.42857	0.63631	-0.0952
21	12	59	0.032933625	14.30451435	0.36082	0.63631	-0.0756
22	13	65	0.034979581	14.22833425	0.42222	0.63465	-0.0952
23	16	56	0.036669768	14.22421504	0.4186	0.63631	-0.0952
24	11	60	0.030304849	14.16468117	0.37143	0.63631	-0.0756
25	15	57	0.035877444	14.16129743	0.40909	0.63631	-0.0952
26	10	62	0.031484224	14.14050354	0.39604	0.63465	-0.0756
27	10	68	0.031258803	14.12941888	0.36275	0.63465	-0.0756
28	19	50	0.035598259	14.11336224	0.43182	0.63569	-0.0952
29	17	54	0.03656167	14.09356868	0.4186	0.63631	-0.0952
30	15	65	0.038297013	14.09125976	0.43902	0.63711	-0.0952
31	13	53	0.031723209	14.03991003	0.39	0.63631	-0.0756
32	12	56	0.030160269	14.03804748	0.37143	0.63631	-0.0756
33	16	62	0.038250742	14.01868405	0.43902	0.63711	-0.0952

the filter is set as average return>0.03, accumulated return>13, win ratio>0.3. and it is in a descending order based on accumulated return

As the table suggests, the selected parameter pair will be (11,63), as it has the highest accumulated return and the other performance is good.

4.2 MACD

Similarly, to EMA, in order to find the best parameters for different dataset, a For loop method is used to get all different data. For EMA we set the short-term parameter from 1-20, and 20-80 is assigned to the long-term parameter. While for the signal line we set it from 2-15. And after processing all the data, we screened the result.

For BTC-daily:

	A	B	C	D	E	F	G	H
1	short term parameter	long term parameter	signal parameter	average return	accumulated return	win ratio	max	min
2	12	24	14	0.138172221	40.5812528	0.542857	1.012243	-0.10597
3	14	24	12	0.138172221	40.5812528	0.542857	1.012243	-0.10597
4	18	22	10	0.133818081	40.03210229	0.527778	1.012243	-0.10597
5	17	21	11	0.140857804	39.53308919	0.558824	1.012243	-0.10597
6	19	21	10	0.132463183	38.12387331	0.527778	1.012243	-0.10597
7	14	22	13	0.138911716	38.07954152	0.558824	1.012243	-0.10597
8	13	22	14	0.138911716	38.07954152	0.558824	1.012243	-0.10597
9	15	21	13	0.145882994	38.00989886	0.59375	1.012243	-0.10597
10	13	24	13	0.135017552	37.91527062	0.542857	1.012243	-0.10597
11	13	26	12	0.128379848	37.37140308	0.513514	1.012243	-0.10597
12	12	26	13	0.128379848	37.37140308	0.513514	1.012243	-0.10597
13	15	24	11	0.127933948	37.25046483	0.513514	1.012243	-0.10597
14	15	22	12	0.137610351	36.93431002	0.558824	1.012243	-0.10597
15	16	21	11	0.137630905	35.9744534	0.558824	1.012243	-0.12696
16	13	22	13	0.137630905	35.9744534	0.558824	1.012243	-0.12696
17	14	21	14	0.143759028	35.96622218	0.59375	1.012243	-0.10597
18	15	21	12	0.133218406	35.48030502	0.542857	1.012243	-0.10918
19	16	22	11	0.129752252	35.36233548	0.527778	1.012243	-0.10918
20	17	24	10	0.129394992	35.32849042	0.527778	1.012243	-0.10597
21	16	21	12	0.135621672	35.18422562	0.558824	1.012243	-0.10597
22	13	27	12	0.129219785	35.09814531	0.527778	1.012243	-0.10597
23	12	27	13	0.129219785	35.09814531	0.527778	1.012243	-0.10597

the filter is set as average return>0.03, accumulated return>13, win ratio>0.3. and it is in a descending order based on accumulated return

From the table, we could find that for BTC-daily MACD has a really good performance, and the parameters make sense. Overall, the average return is better compared to EMA method. The win ratio is larger than 0.5, which means most of the time, the profit is positive. The parameter we select is (12,24,14). MACD method is based on EMA, and do another time with the MACD signal. Therefore the signal from this method is smoother, and can

reduce the influence on some of the situation (for example a rapid rise, or a rapid decline).

For BTC-hourly:

	A	B	C	D	E	F	G	H
1	short term parameter	long term parameter	signal parameter	average return	accumulated return	win ratio	max	min
2	20	40	14	0.010907927	8.052386106	0.447964	0.229541	-0.1037
3	20	39	14	0.010682097	7.693268427	0.441441	0.229541	-0.1037
4	20	41	14	0.010688774	7.672445385	0.447964	0.229541	-0.1037
5	20	38	14	0.010499548	7.64477624	0.44	0.224675	-0.1037
6	19	42	14	0.010590126	7.611062917	0.44843	0.229541	-0.1037
7	19	41	14	0.010346381	7.393018503	0.438053	0.229541	-0.1037
8	19	39	14	0.010087307	7.192932322	0.427948	0.224675	-0.1037
9	19	40	14	0.010046056	7.191237231	0.434783	0.224675	-0.1037
10	19	43	14	0.010381588	7.183745322	0.445946	0.229541	-0.1037
11	20	37	14	0.010065234	7.152365977	0.436681	0.224675	-0.1037
12	18	43	14	0.010127595	7.104360237	0.440529	0.229541	-0.1037
13	19	45	14	0.010559207	7.096290276	0.453704	0.191079	-0.1037
14	20	46	13	0.010385494	7.055553393	0.442922	0.191079	-0.1037
15	18	44	14	0.010023015	7.049805181	0.432314	0.229541	-0.1037
16	18	48	14	0.010361197	6.988133937	0.442922	0.18728	-0.1037
17	20	43	13	0.010060714	6.951003353	0.436123	0.229541	-0.1037
18	19	44	14	0.010345246	6.823778794	0.456221	0.18728	-0.1037
19	20	43	14	0.010455922	6.75865932	0.439252	0.191079	-0.1037
20	20	42	14	0.010317775	6.69902171	0.449074	0.18728	-0.1037
21	20	45	13	0.010025842	6.600750414	0.452489	0.18728	-0.1037
22	20	47	13	0.010060932	6.500011489	0.43379	0.191079	-0.1037
23	19	46	14	0.010101283	6.421150463	0.442396	0.191079	-0.1037
24	19	48	14	0.010189314	6.411627837	0.418605	0.191079	-0.1037
25	19	47	14	0.010100375	6.359105221	0.435185	0.191079	-0.1037
26	20	45	14	0.010138311	6.323248546	0.423256	0.191079	-0.1037
27	20	44	14	0.010072179	6.311866925	0.435185	0.191079	-0.1037
28	20	47	14	0.010126754	6.213363855	0.392523	0.183369	-0.1037

the filter is set as average return>0.01, accumulated return>6, win ratio>0.3. and it is in a descending order based on accumulated return

Compared to EMA method, MACD on BTC-hourly has better performance on accumulated return, but not good on average return. The best parameter will be (20,40,14)

For ETH-daily:

	A	B	C	D	E	F	G	H
1	short term parameter	long term parameter	signal parameter	average return	accumulated return	win ratio	max	min
2	18	71	12	0.236851607	49.63580718	0.576923	2.248183	-0.25374
3	20	68	11	0.226755438	48.37584614	0.555556	2.248183	-0.25374
4	18	70	12	0.234599585	48.16960548	0.576923	2.248183	-0.25374
5	15	74	14	0.226599859	48.12450849	0.555556	2.248183	-0.25374
6	17	63	14	0.220650055	47.92502955	0.555556	2.248183	-0.25374
7	20	63	12	0.254112642	47.79278365	0.583333	2.248183	-0.25374
8	16	73	13	0.234542485	47.54272274	0.576923	2.248183	-0.25374
9	18	72	12	0.226543479	47.53604893	0.555556	2.248183	-0.25374
10	16	74	13	0.234481811	47.46882188	0.576923	2.248183	-0.25374
11	18	66	13	0.243472333	47.21483161	0.56	2.248183	-0.25374
12	16	71	13	0.219569353	47.18013913	0.592593	2.248183	-0.25374
13	16	77	14	0.242515888	46.80887062	0.538462	2.626483	-0.24189
14	15	73	14	0.225248689	46.75014418	0.555556	2.248183	-0.25374
15	15	70	14	0.217465001	46.53864741	0.592593	2.248183	-0.25374
16	15	75	14	0.22448448	45.82790872	0.555556	2.248183	-0.25374
17	16	72	13	0.218379311	45.82284896	0.592593	2.248183	-0.25374
18	15	72	14	0.218320884	45.75156642	0.592593	2.248183	-0.25374

the filter is set as average return>0.2, accumulated return>45, win ratio>0.4. and it is in a descending order based on accumulated return

According to the table, MACD has good performance on ETH-daily, and compared to EMA method, MACD has better performance in all different aspects. The average return, the accumulated return and the win ratio are all good. The best parameter is (18,71,12)

For ETH-hourly:

	A	B	C	D	E	F	G	H
1	short term parameter	long term parameter	signal parameter	average return	accumulated return	win ratio	max	min
2	20	34	14	0.012492948	14.05832796	0.4625	0.325301	-0.09248
3	20	40	12	0.012570917	13.92113006	0.462185	0.325301	-0.09248
4	19	39	13	0.012480279	13.79102279	0.456067	0.325301	-0.09248
5	18	41	13	0.01233871	13.70695264	0.452282	0.325301	-0.09248
6	19	35	14	0.01214484	13.63501758	0.453061	0.325301	-0.09248
7	16	43	14	0.01219299	13.54322183	0.44856	0.325301	-0.09248
8	20	36	13	0.012147805	13.48759911	0.454918	0.325301	-0.09248
9	17	41	14	0.012261234	13.38714434	0.452282	0.325301	-0.09248
10	18	39	14	0.012397562	13.35704193	0.457983	0.325301	-0.09248
11	20	38	13	0.012493902	13.35009366	0.461864	0.328763	-0.09248
12	19	40	13	0.012395049	13.34385215	0.457983	0.328763	-0.09248
13	20	35	14	0.012317297	13.32102645	0.464435	0.325301	-0.09248
14	17	40	14	0.012188321	13.31886059	0.450413	0.325301	-0.09248
15	19	36	14	0.012122617	13.25217973	0.45679	0.325301	-0.09248
16	19	38	13	0.012072986	13.24967088	0.45082	0.325301	-0.09248
17	20	37	13	0.012219776	13.2414412	0.452282	0.325301	-0.09248
18	18	38	14	0.012167434	13.23776651	0.454545	0.325301	-0.09248
19	19	37	14	0.012332751	13.15482879	0.457983	0.328763	-0.09248
20	18	42	13	0.012295091	13.1440839	0.460251	0.338632	-0.09248
21	18	37	14	0.011942535	13.10793968	0.45122	0.325301	-0.09248
22	19	42	12	0.01213037	13.08719213	0.454545	0.338632	-0.09248
23	17	44	13	0.012108677	13.01861963	0.454545	0.338632	-0.08335

the filter is set as average return>0.01, accumulated return>13, win ratio>0.3. and it is in a descending order based on accumulated return

we will select (20,34,14). It could be shown as the performance is not as good as ETH-daily. And has similar performance with EMA.

5. Conclusion

The following chart shows the conlusion:

24	**EMA:**						
25	**data set**	**parameter :**	**average return**	**accumulated return**	**win ratio**	**max**	**min**
26	BTC-daily	(9,26)	0.260558	13.93041	0.35	2.13265	-0.1401
27	BTC-hourly	(10,65)	0.020482	5.516966	0.352941	0.306802	-0.063
28	ETH-daily	(10,21)	0.417584	41.22488	0.5	2.86089	-0.1587
29	ETH-hourly	(11,63)	0.032809	15.539676	0.36	0.63465	-0.0756
30							
31	**MACD**						
32	**data set**	**parameter :**	**average return**	**accumulated return**	**win ratio**	**max**	**min**
33	BTC-daily	(12,24,14)	0.13817	40.58125	0.542857	1.012243	-0.10597
34	BTC-hourly	(20,40,14)	0.0109079	8.052386	0.447964	0.229541	-0.1037
35	ETH-daily	(18,71,12)	0.236851	49.6358	0.576923	2.248183	-0.25374
36	ETH-hourly	(20,34,14)	0.0124929	14.05832	0.4625	0.325301	-0.09248

We have analyzed the performance of EMA and MACD strategies on ETH/USDT and BTC/USDT. In most cases, both crypto pairs tend to have an adequate performance on a larger period scale.

Overall, MACD has a better performance on predicting the price of Cryptocurrencies. Therefore, MACD may be a better technical analysis indicator in this situation. Besides, all the daily data set has better performance to the hourly data set. Therefore, EMA and MACD may be better at predicting a long-term price changing. For the type of cryptocurrencies, ETH has a better performance on the both technical analysis indicator. In the future, I think we could add on some trade cost when considering the different strategies. As discussed before, the cost may influence the accumulated return.

Refernce

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