Cryptocurrency Trading

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1 Introduction

This document intends to walk through the steps of building a profitable trading strategy for cryptocurrency. Backtesting would be performed on each strategy on an interval of 3, 6 & 12 months to validate the results. For research purpose the data for minute bars is extracted from Binance Exchange using the API provided by Binance. The data extracted if for **BTCUSDT** pair.

2 Rules and Assumptions

In this section we would set some rules and assumptions before entering the playing field to make better judgments on our results.

- All orders are placed using Order Cancel Order(OCO) Approach.
- We use only 90% of the available cash to open any position.
- Only a single position is taken at any given point in time. If we take a long position we do not open a new short position until and unless the long position is closed.
- Suppose we open a Limit buy order a Stop loss (Sell Order) & Take Profit (Sell order) is also opened where Limit buy order is valid up to 3 hours from execution while Stop Loss and Take profit orders are valid up to 6 hours from execution.
- As mentioned above similar case applicable when a short position is taken.
- In case of order expiry as mentioned in above two pointers all open position are liquidated at the next tick.
- Broker commission is set at 0.0750% for taking any position(maker/taker).
- Yearly backtest period: Jan'18 to Dec'18.
- Bi-annual backtest period: Jan'19 to Jun'19.
- Quarterly backtest period: Oct'17 to Dec'17.
- All tests are performed on **BTCUSDT** pair.

3 Strategy I

In this approach we would make use of Simple Moving Average (SMA) along side Williams %R to generate buy and sell signals.

- Simple moving average is computed on two windows 120 & 60 minutes referred as slow and fast respectively. As the cross over exceeds 0 as buy signal is generated and vice versa.
- William's %R a momentum indicator is used along side a cross-over strategy to confirm if there is an emerging change in trend.
- If the the William's %R value is below -70 a buy signal is generated, however a sell signal is only generated if the value is above -20.

Period	**Total Trades**	**Long Trade**	**Long Trade Won**	**Long Trade Lost**	**Short Trade**	**Short Trade Won**	**Short Trade Lost**	**Win %age**
Yearly	125	61	44	17	64	32	32	60.80%
Bi-annual	47	14	9	5	33	19	14	59.57%
Quarterly	43	11	8	3	32	15	17	53.48%

All relevant stats for each time period can found below links.

- Yearly Results & Plot
- Bi-annual Results & Plot
- Quarterly Results & Plot

4 Strategy II

In this approach we would make use of Exponential Moving Average (EMA) along side Williams %R to generate buy and sell signals. The reason to use EMA over SMA is that it gives more weightage to most recent prices.

- Exponential moving average is computed on two windows 120 & 60 minutes referred as slow and fast respectively. As the cross over exceeds 0 as buy signal is generated and vice versa.
- William's %R a momentum indicator is used along side a cross-over strategy to confirm if there is an emerging change in trend.
- If the the William's %R value is below -70 a buy signal is generated, however a sell signal is only generated if the value is above -10.
- In this scenario for short trades position is liquidated sooner, approximately if 1% profit is achieved the trade is closed.

Period	**Total Trades**	**Long Trade**	**Long Trade Won**	**Long Trade Lost**	**Short Trade**	**Short Trade Won**	**Short Trade Lost**	**Win %age**
Yearly	26	25	15	10	1	0	1	57.69%
Bi-annual	10	7	3	4	3	2	1	50%
Quarterly	10	8	3	5	2	1	1	40%

All relevant stats for each time period can found below links.

- Yearly Results & Plot
- Bi-annual Results & Plot
- Quarterly Results & Plot

5 Strategy III

In this approach we would make use of Exponential Moving Average (EMA) along side Volume Weighted Average Price (VWAP) to generate buy and sell signals. The reason to include VWAP is to give weightages to price based on the traded volume.

- Exponential moving average is computed on two windows 120 & 60 minutes referred as slow and fast respectively. As the cross over exceeds 0 as buy signal is generated and vice versa.
- Volume Weighted Average Price is computed on two windows 30 & 15 minutes referred as slow and fast respectively. As the cross over exceeds 0 as buy signal is generated and vice versa.
- In this scenario for short trades position is liquidated sooner, approximately if 1% profit is achieved the trade is closed.

Period	**Total Trades**	**Long Trade**	**Long Trade Won**	**Long Trade Lost**	**Short Trade**	**Short Trade Won**	**Short Trade Lost**	**Win %age**
Yearly	63	38	16	22	25	4	21	31.74%
Bi-annual	29	13	7	6	16	2	14	31.03%
Quarterly	13	9	5	4	4	2	2	53.84%

All relevant stats for each time period can found below links.

- Yearly Results & Plot
- Bi-annual Results & Plot
- Quarterly Results & Plot

6 Conclusion

Below table represents the actual returns against strategy returns for each time period.

Period	Returns	Strategy I	Strategy II	Strategy III
Yearly	-72.31%	9.14%	-13.58%	-45.12
Bi-annual	227.75%	-7.95%	-0.66%	-9.24%
Quarterly	193.48%	-15.97%	4.09%	16.08%

There are a lot of areas of for improvement in above strategies. Below is the list of few areas where improvements can be made.

- Bet Sizing needs to be tweaked in order to get better results.
- ML based approaches alongside technical indicators might be helpful in achieving good results.
- Trailing order types can be used to tweak stop loss and avoid unnecessary loss in unrealized profits.

References

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[2] Backtrader - www.backtrader.com

[3] Investopedia - www.investopedia.com

[4] TA-Lib - mrjbq7.github.io/ta-lib