

# BACKTESTER APPLICATION

## 1 Scope

- i** Test the Moving Average Crossover Strategy to find out which set of variables maximizes profit (or PNL) for the given instrument over the specific time period.

## 2 Requirements

- i**
  - Ability to run thousands of test in under a minute
  - Ability to store, retrieve, and display the results of a particular test or set of tests
  - Ability to view an annotated chart for any particular test result

## 3 Description

- i** A moving average (or rolling mean) is the average price, given a certain period of time. A moving average helps smooth out the price action and give a better visual representation of the directional movement of an asset. The name of the moving average is abbreviated to MA and the period is the number after that, so MA3 means the moving average over the last 3 time periods.

A fast moving average, such as MA3, reacts more quickly to price changes because fewer periods are used to calculate it. A slow moving average, such as MA20, reacts more slowly to price changes because more periods are used to calculate it.

A buy signal is generated when the fast moving average crosses over (i.e. becomes greater than) the slow moving average. A trader buys (or longs) the asset as this crossover indicates that an uptrend might have begun. The trader plans to sell the asset at a higher price and pocket profit.

Conversely, a sell signal is generated when the fast moving average crosses under (i.e. becomes less than) the slow moving average. A trader sells (or shorts) the asset as this crossover indicates that a downtrend might have begun. The trader plans to buy the asset back at a lower the price and pocket the profit.

## 4 Variables

- i** 1. The stop loss defines the percentage price moves against a position before it is closed for a loss.
- 2. The take profit defines the percentage price moves in favor of a position before it is closed for a profit.
- 3. The stop loss and take profit vary between 1 and 15%.
- 4. The moving average period varies between 3 and 20 periods.
- 5. The set of variables is changed for every test to determine how to maximize profit.

## 5 Constants

- i** 1. The asset is bitcoin (XBTUSD).
- 2. The time period is from 6/1/21 to 9/1/21.
- 3. The time frame is 4 hours (4H).
- 4. The close price at the end of every 4 hour time frame interval is used to calculate the moving average as well as open and close positions.
- 5. The high and low price of every 4 hour time frame interval is used to determine whether the stop loss or take profit price is reached.

## 6 Business Rules

- i** 1. Only one position is open at a time.
- 2. When there is no open position:
  - 1. Buy the open price of the 4H time period after the fast MA crosses over the slow MA.
  - OR
  - 2. Sell the open price of the 4H time period after the fast MA crosses under the slow MA.
- 3. An open position must be closed before a new position can be opened.
- 4. If both the stop loss and take profit price occur within a 4 hour time period, the position is closed for a loss.

5. At the end of time period, an open position is closed at the last price available.
6. The fast MA period for a particular strategy must be lower than the slow MA period.
7. The take profit for a particular strategy must be greater than the stop loss.

## 7 Implementation

**i** Python 3.6.5, Flask 2.0.1, and HTML are used in the application and presentation tiers as they are cross-platform and promote faster development with a variety of packages and templates.

SQLite 3.35.5 is used as the database as it is easy to deploy, portable, light-weight, and performs well for the large number of writes needed by this application.

## 8 Disclaimer

**i** *This application is for demonstration purposes only.*

*No financial advice is given or implied.*