

Algorithmic Trading with Agriculture-Commodities



NCDEX



Overview of NCDEX



Launched in 2003

Now India's most vibrant platform for price discovery and risk management for agricultural commodities.



Product Offering

Trading in 20 commodities



Network

More than 300 members and 487K clients



Logistics

Approx. 500 approved warehouses

Commodity Complex



Cereals / Pulses

- Barley
- Maize Kharif
- Maize Rabi
- Wheat
- Chana
- Moong
- Paddy



Spices

- Coriander
- Jeera
- Turmeric
- Pepper



Fibres

- Kapas
- Cotton Seed Oilcake
- 29 mm Cotton



Guar Complex

- Guar Seed
- Guar Gum



Oil & Oil Seeds

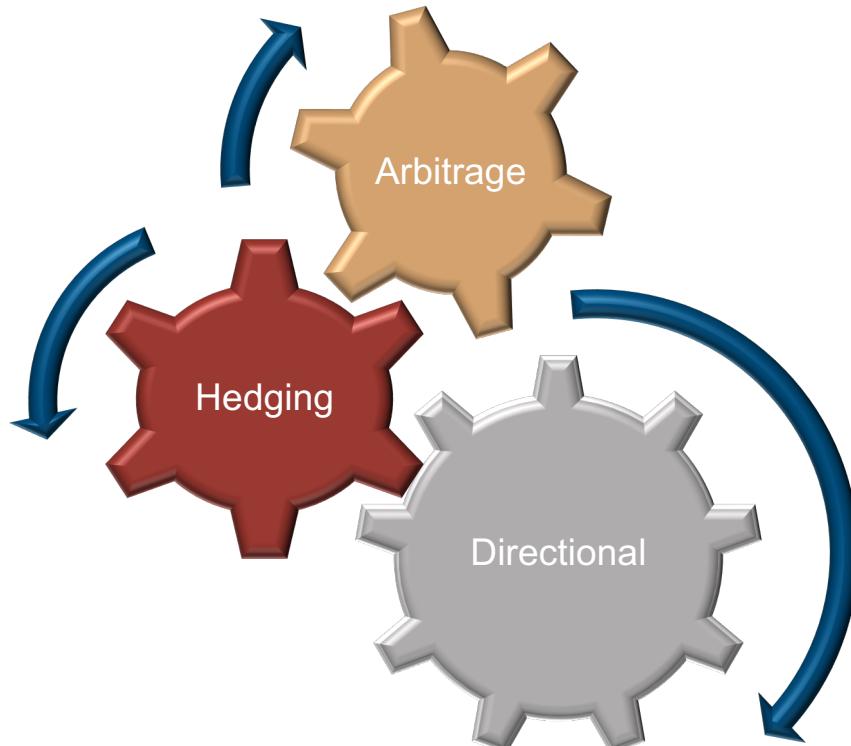
- Soybean
- Refined Soy Oil
- Degummed Soy Oil
- Mustard Seed
- Crude Palm Oil



Sweeteners

- Sugar M

Various approaches in the market



Hedging

- **What:** An investment to mitigate risk from price fluctuations in the primary investment asset.
- **Why:** To mitigate the risk on underlying asset for farmers and investors.
- **How:** Hedging between underlying asset and corresponding Futures/Options contracts.
- **Prerequisite:** High correlation is required between the hedging instruments.
- **Advantage:** Less investment for mitigation from price uncertainty.

Arbitrage

Calendar Spread:

➤ **What:** Difference between two Futures Calendar contracts.

➤ **Attributes:**

- Builds Stationary Series with hedge ratio -1.
- Mean reverting
- Lower margin requirement - requires approximately 1/4th of margin
- Less market risk and excellent profit potential

Pair Trading:

➤ **What:** Trading between two/more highly negatively/positively fundamentally correlated commodities.

➤ **Attributes:**

- Difference between two Futures Commodity contracts.(if positively correlated)
- Builds Stationary Series with hedge ratio
- Usually Mean reverting
- Less market risk and excellent profit potential

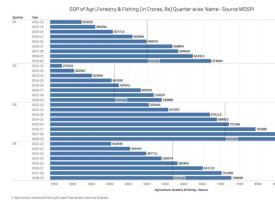
Algorithmic Trading Stages



Algo Trading Stages



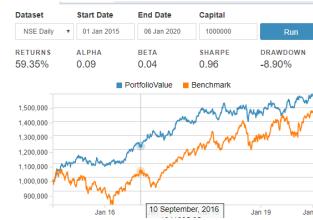
Trading Concept



Filtering Criteria



Visualize the Model



Backtesting



Optimization

Paper Trading



Go Live



Algo Trading Resources



Trading Concept



Trading Concept

Activities in Formulate the Trading Concept:

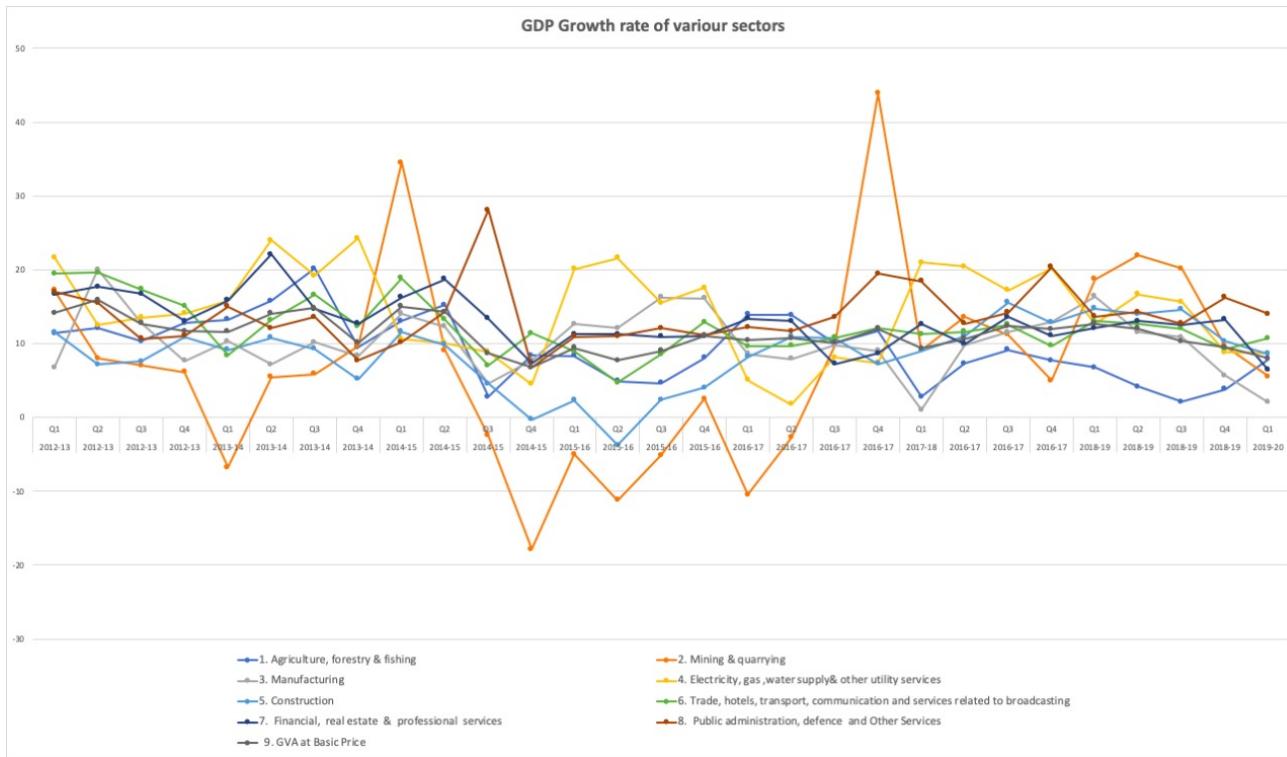
- Brainstorming ideas
- Finalize Trading logic/idea
- Frequency of trades
- Choose market segment (Equity/Commodity/FX/Crypto)
- Back testing period
- Automation tools/languages

Brainstorming ideas- Fetch the Data

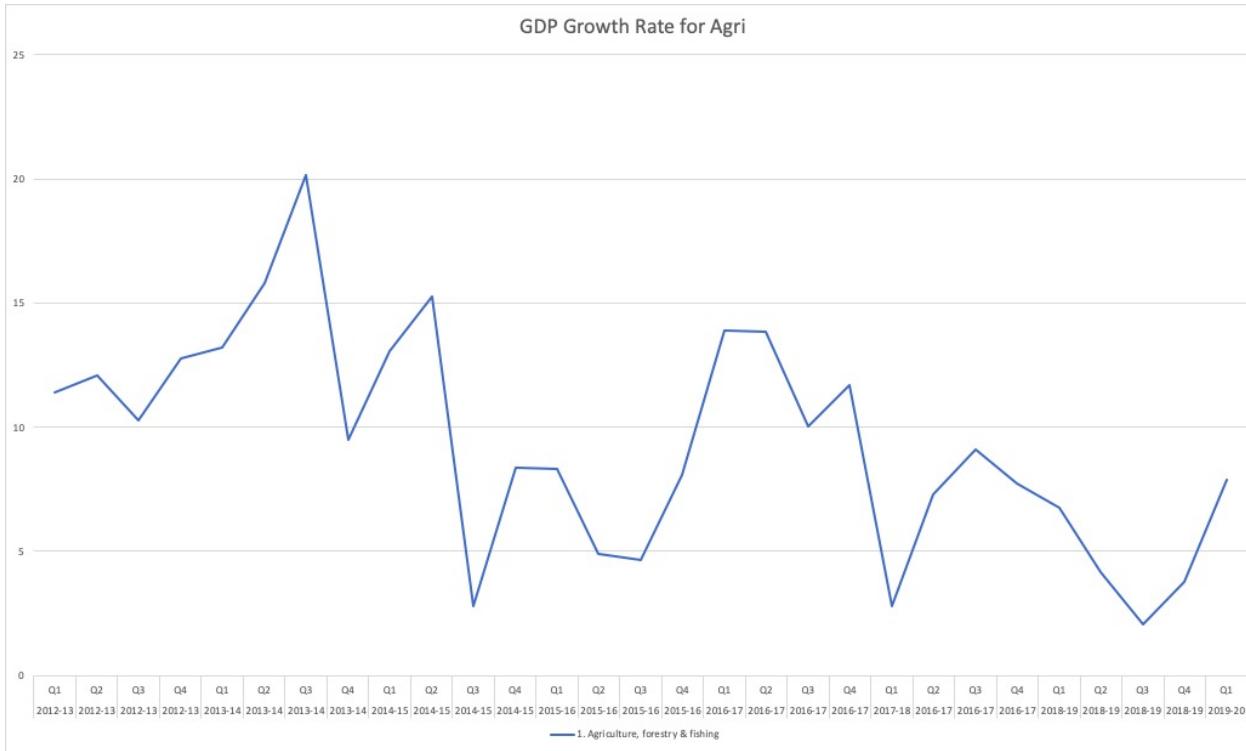
Annual and Quarterly GDP of various sectors. Source: MOSPI(<http://mospi.nic.in/data>)

GROWTH RATE (%)															Item						
2014-15			2015-16				2016-17				2017-18				2018-19				2019-20		
Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	
3.5	-3.1	-1.3	2.4	2.8	-2.2	1.2	4.6	6.0	6.7	7.4	4.2	4.5	4.6	6.5	5.1	4.9	2.8	-0.1	2.0	2.1	GVA at basic prices from
4.1	6.6	10.2	9.6	9.5	10.5	10.8	6.9	5.6	8.5	15.3	2.9	10.8	4.5	3.8	0.4	-2.2	1.8	4.2	2.7	0.1	1. Agriculture, forestry & fishing
9.3	3.4	8.6	10.4	11.6	15.5	14.8	9.8	7.7	8.3	6.2	-1.7	7.1	8.6	9.5	12.1	6.9	6.4	3.1	0.6	-1.0	2. Mining & quarrying
9.6	7.2	3.2	2.5	5.4	3.7	7.4	13.2	7.8	10.2	8.7	8.6	9.2	7.5	9.2	6.7	8.7	8.3	4.3	8.6	3.6	3. Manufacturing
5.4	4.1	2.4	4.1	0.4	4.8	5.0	7.6	8.4	7.5	0.9	3.3	4.8	8.0	6.4	9.6	8.5	9.7	7.1	5.7	3.3	4. Electricity, gas , water supply& other utility services
7.7	5.4	13.2	9.9	8.0	9.9	12.7	9.4	7.7	7.9	6.0	8.3	8.3	8.3	6.4	7.8	6.9	6.9	6.0	7.1	4.8	5. Construction
13.1	12.1	9.8	10.2	13.0	10.2	8.8	13.5	11.3	5.2	3.3	7.8	4.8	6.8	5.5	6.5	7.0	7.2	9.5	5.9	5.8	6. Trade, hotels, transport, communication and services related to broadcasting
7.6	22.3	1.5	5.4	6.4	6.7	5.9	6.6	6.5	9.0	14.7	14.8	8.8	9.2	15.2	7.5	8.6	7.5	10.7	8.5	11.6	7. Financial, real estate & professional services
8.5	6.1	6.4	7.7	8.4	7.3	8.7	9.3	8.3	7.4	6.7	5.9	6.6	7.3	7.9	7.7	6.9	6.3	5.7	4.9	4.3	8. Public administration, defence and Other Services
8.7	5.9	7.1	7.6	8.0	7.2	9.1	9.4	8.9	7.5	7.0	6.0	6.8	7.7	8.1	8.0	7.0	6.6	5.8	5.0	4.5	9. GVA at Basic Price
																					10. GDP

Brainstorming ideas- Visualize-1

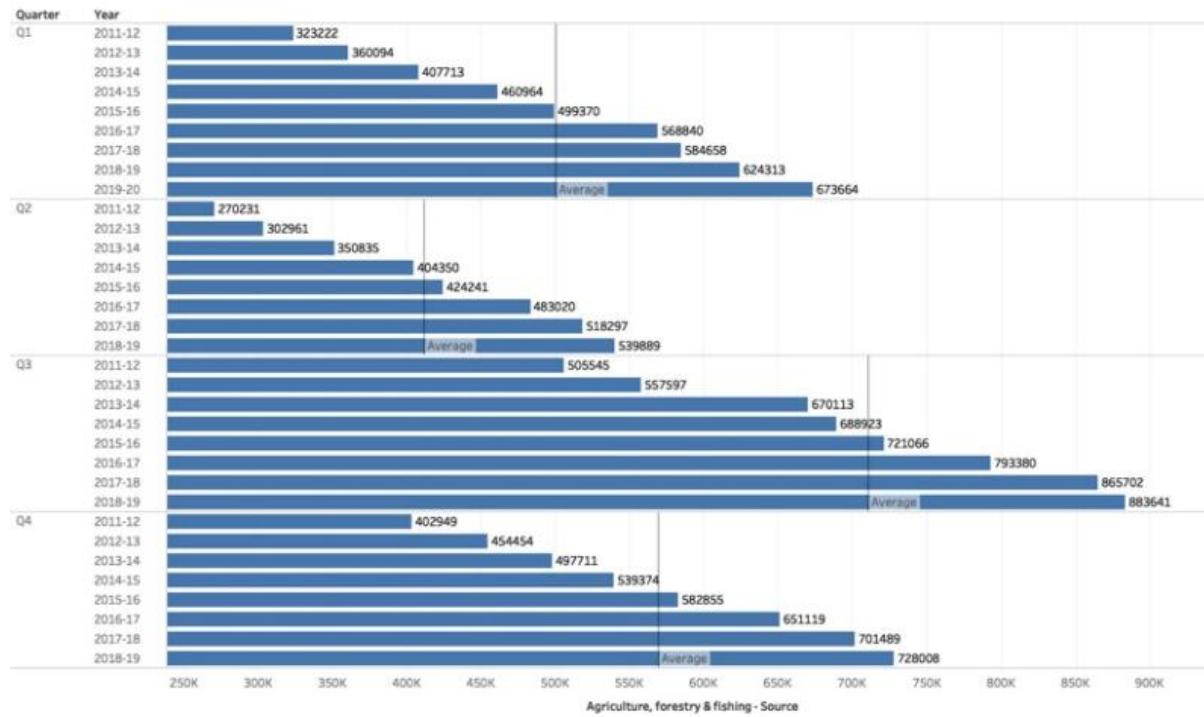


Brainstorming ideas- Visualize-2



Brainstorming ideas- Visualize-3

GDP of Agri,Forestry & Fishing (in Crores, Rs) Quarter wise Name - Source MOSPI



1. Agriculture, forestry & fishing for each Year broken down by Quarter.

Trading Concept

Example: Agriculture commodities are generally less volatile in nature and they revolve around the same price range.

Considering above idea, answers to the following are :

a. logic to achieve my goal(Buy at Low and Sell at High)?:

-mean reversion trading strategy. use Bollinger band.

-Buy: if Close price goes below -2 standard deviation from mean.

-square off position: if Close price goes above +2 standard deviation from mean

b. What will be the frequency of my trades? :

-Daily frequency

c. Which segment will it work most effectively(Equity/Commodity/FX/Crypto..):

-Agri commodity segment

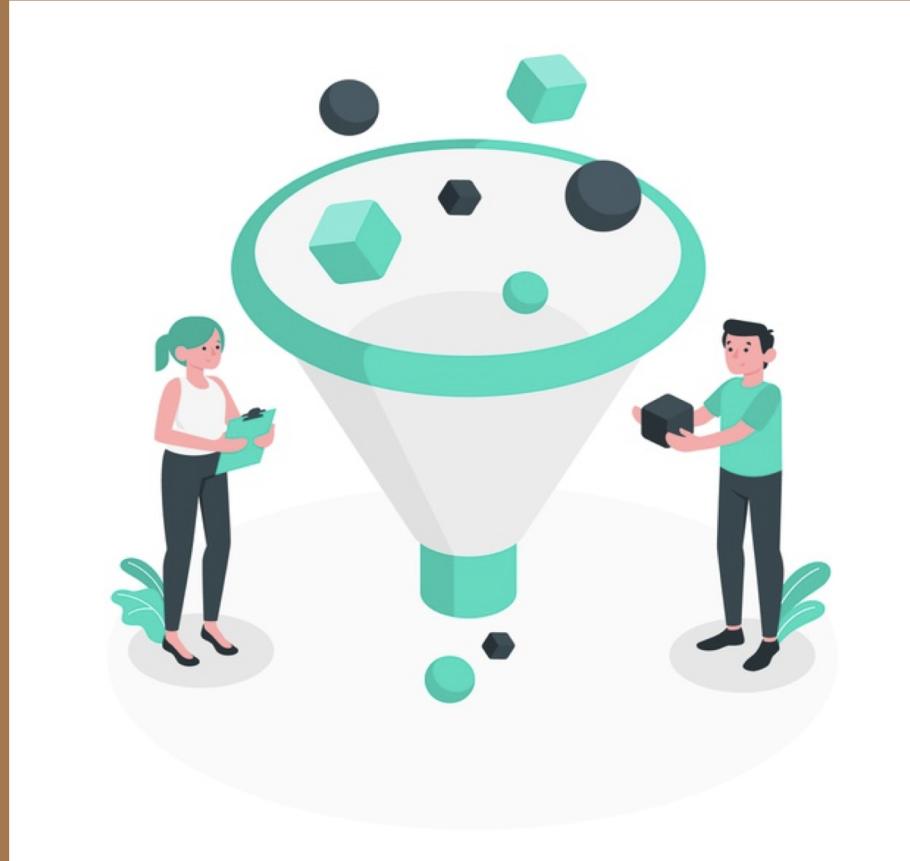
d. How much should be backtesting period?:

-1 years.(longer the better)

e. Which automation tools/languages will be most useful for this logic?:

-Python

Filtering criteria



Filtering criteria

- **What:** Determine filter criteria to choose scripts/instruments, which fits best with the logic
- **Why:** fitment for the logic
- **How:** Screeners, logic built in the algo for screening
- **Prerequisite:** Sample Data and Formulation of Logic
- **Next Step:** Verification of Logic

The selection/filtration of scripts can be done before or during the trading hours(real time). It all depends on your core logic.

Example:

As we have decided, we will use Agri commodity scripts and high liquid scripts only, therefore filtering criteria to be used as follows: a. Segment== Agri. b. Volume>1000

Visualize the Model



NCHJ0 Streaming Chart



Visualize the Model

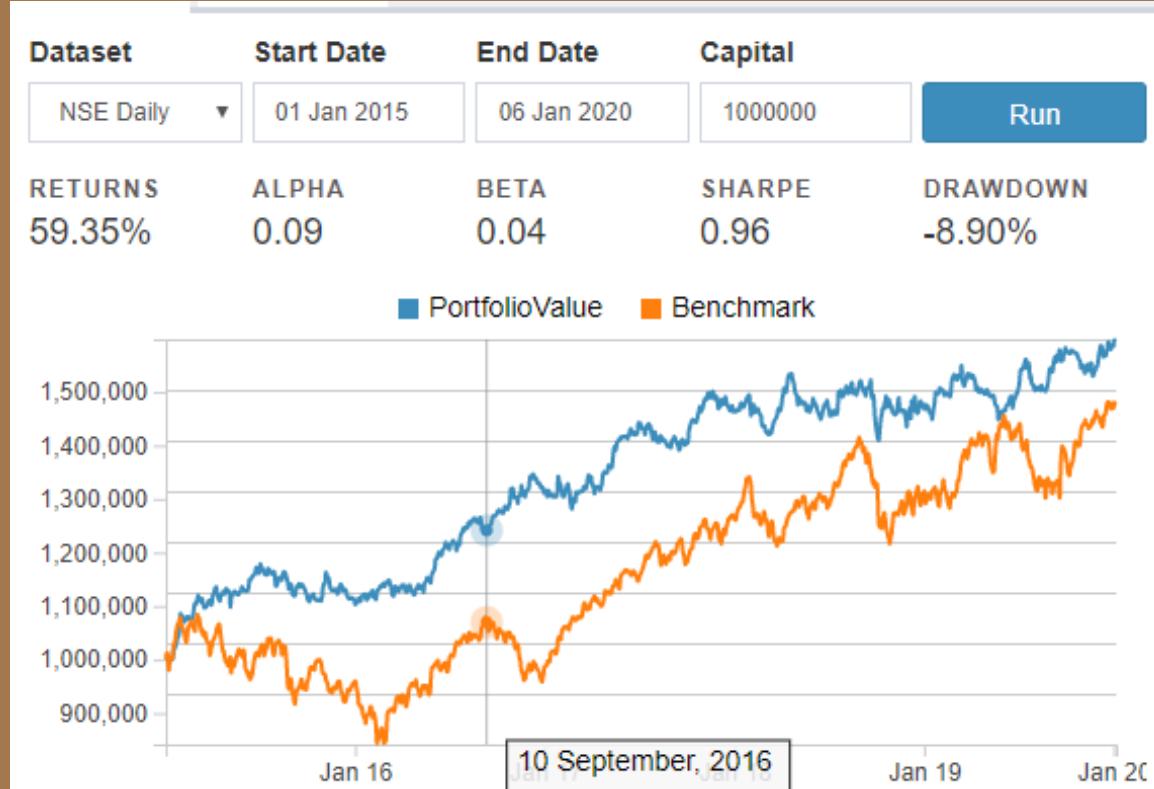
- **What:** Preliminary verification of logic
- **Why:** To save time and efforts in backtesting
- **How:** Use visualization tools like Tableau/Power BI or sample data with Excel
- **Prerequisite:** Sample Data and Formulation of Logic
- **Next Step:** Detailed backtesting

Visualize the Model

It is a 1 year graph of Chana on daily frequency. And SMA, STD(-2,+2) is applied on the 20 days lookback period.(Courtesy: [investing.com](https://www.investing.com/commodities/ncdex-chana-gram-future-advanced-chart)). the visual below, gives us the confirmation about our logic.



Backtesting



Backtesting

- **What:** Verification of logic using Historical Data
- **Why:** To save time and efforts and money
- **How:** Backtesting tools
- **Prerequisite:** Historical Data and Formulation of Logic
- **Next Step:** Paper/Simulation Trading

Backtesting - Overview

One should consider the following parameters in this stage:

Various performance parameters

- Returns
- Max drawdown
- Max continuous drawdown
- Max profit
- Max continuous profit
- Number of transactions
- Average returns per transaction
- Transaction charges
- Slippages,etc.

Few more points to focus are:

- Stop loss/Trailing stop loss
- Target price
- Entry Criteria
- Exit criteria

Backtesting - Overview

We need to perform the following activities in this stage:

- 0. Download the csv file from investing.com*
- 1. Import the necessary libraries*
- 2. Fetch the historical OHLC data for an instrument.*
- 3. Write the supporting functions to achieve our logic*
- 4. Generate the buy/sell signals using candlesticks*
- 5. Visualize the output*
- 6. Checking returns of the strategy*

Note: To review steps used in backtesting please refer to my article

<https://medium.com/@sunil.guglani/how-to-develop-your-first-trading-bot-using-python-by-recognising-candlestick-patterns-a755f7fa6674>

Backtesting – Fetch Data

Example:

0. Download the csv file from investing.com

Go to [investing.com](https://www.investing.com/commodities/ncdex-chana-gram-future-historical-data), search for Chana and download the Historical data by selecting the range:

The screenshot shows the Investing.com website for Chana Gram Futures (NCHV9). The top navigation bar includes links for Markets, Personal Finance (NEW), News, Analysis, Charts, Technical, Brokers, Tools, and Portfolio. A sidebar on the left promotes Alibaba.com with the text "Gain access to millions of business buyers on Alibaba.com" and a "Get Started" button. The main content area displays the title "Chana Gram Futures - Oct 19 (NCHV9)" and the current price "4,050.00 +71.00 (+1.78%)". It also shows the previous close at 3,979.00, open at 3,990.00, and day's range from 3,976.00 to 4,052.00. Below this, there are tabs for General, Chart, Technical, and Forum, with "Historical Data" selected. A table titled "Chana Gram Futures Historical Data" lists three daily price entries from September 17, 2019, to September 19, 2019. Two yellow arrows point to the "Download Data" button and the date range selector "09/19/2018 - 09/19/2019". The bottom right corner features social media sharing icons for Facebook, Twitter, LinkedIn, and Email.

Date	Price	Open	High	Low	Vol.	Change %
Sep 19, 2019	4,021.00	3,990.00	4,035.00	3,976.00	22.07K	1.16%
Sep 18, 2019	3,975.00	3,959.00	3,975.00	3,959.00	0.53K	-0.03%
Sep 17, 2019	3,976.00	3,966.00	3,980.00	3,955.00	0.30K	0.51%

Backtesting- algo walkthrough

- 1. Import the necessary libraries*
- 2. Fetch the historical OHLC data for an instrument.*
- 3. Write the supporting functions to achieve our logic*
- 4. Generate the buy/sell signals using candlesticks*
- 5. Visualize the output*

>> GO TO PYTHON EDITOR AND EXPLAIN THE ALGO(pls refer attached python file)

Backtesting - Candlestick chart

Visualize the Output



Backtesting - Results

*****BACKTEST RESULTS OF : Chana *****

Sum of returns in % 13.788230372932315

Average returns per transaction in % 3.4470575932330787

Absolute returns 552.0

Absolute returns per trx 138.0

Max drawdown for a trx -339.0

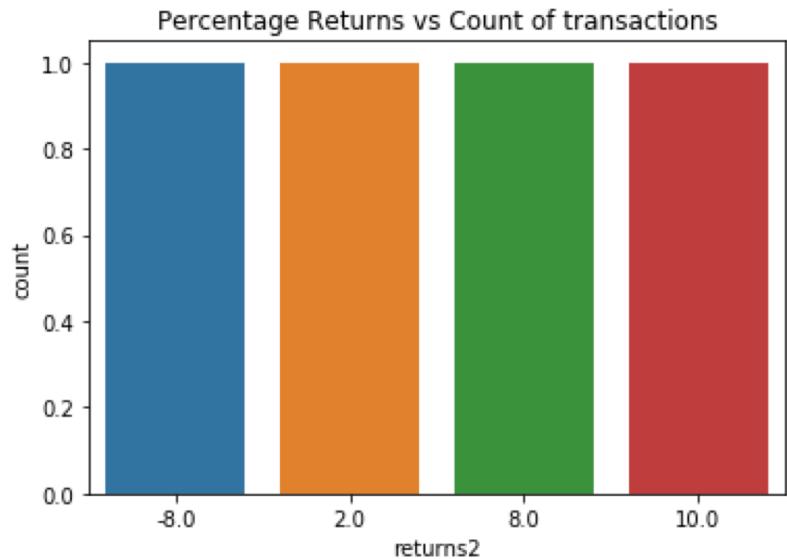
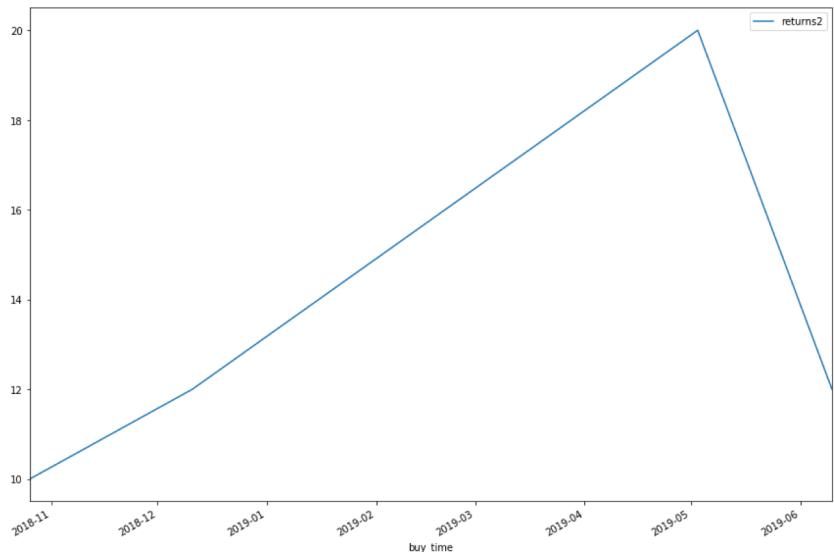
Max returns for a trx 421.0

Losing trx 1

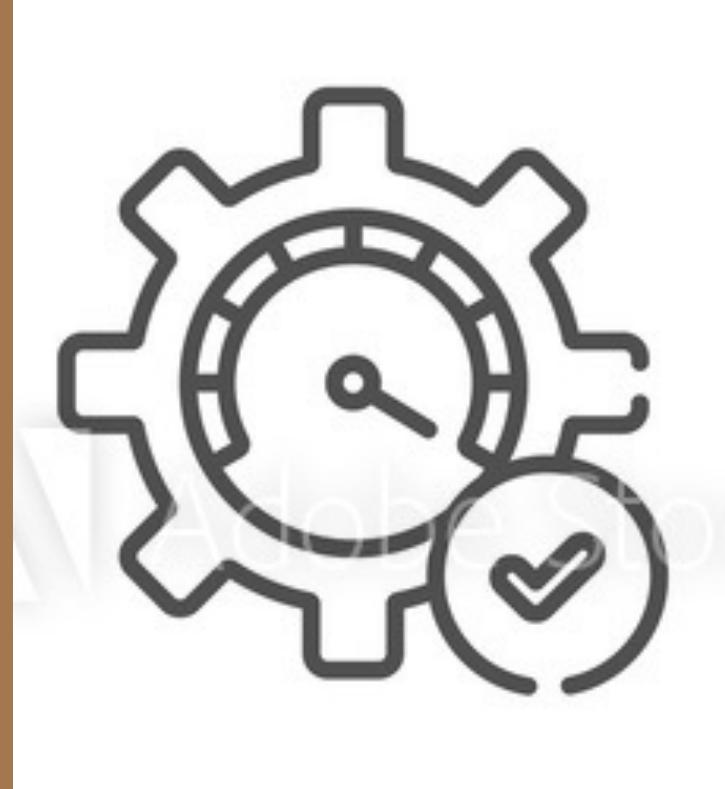
Winning trx 3

Win/Lose ratio 3.0

Backtesting Results



Optimization



Optimization

- **What:** Optimization of logic parameters to fit the best. Continuous process.
- **Why:** The price movement and behavior of the instrument may keep changing.
- **How:** Backtesting Data, Optimization algorithms
- **Prerequisite:** Backtesting performance
- **Next Step:** Paper/Simulation Trading

Things to consider are :

- **Over fitting:** is optimizing the logic and parameters to the extent that the program will work best in some specific situations and scenarios.
- Avoid overfitting of parameters.

Paper Trading



Paper Trading

Paper/simulation trading is the way of verification of your logic in the real environment. One can do this by using the feature provided by his/her broker, or you can also develop your framework to test the same.

Pros:

- One doesn't need to invest actual money in this stage.
- It gives very accurate and precise results.
- One can expect same/similar results in the real environment.

Cons:

- It is time consuming activity.

Go Live



Go Live

Functionally following aspects are required to be managed:

1. Order management
2. Risk Management
3. Money/Fund Management
4. Diversification of assets
5. Portfolio management
6. User Management
7. Slippages

Technically following aspects are required to be managed:

1. Establish Connection with the broker api.
2. Passing the buy/sell orders using the broker connection,
3. Establish Connection with the data api(if data vendor is different from broker)
4. Accessing the real time and historical data using data api connection.

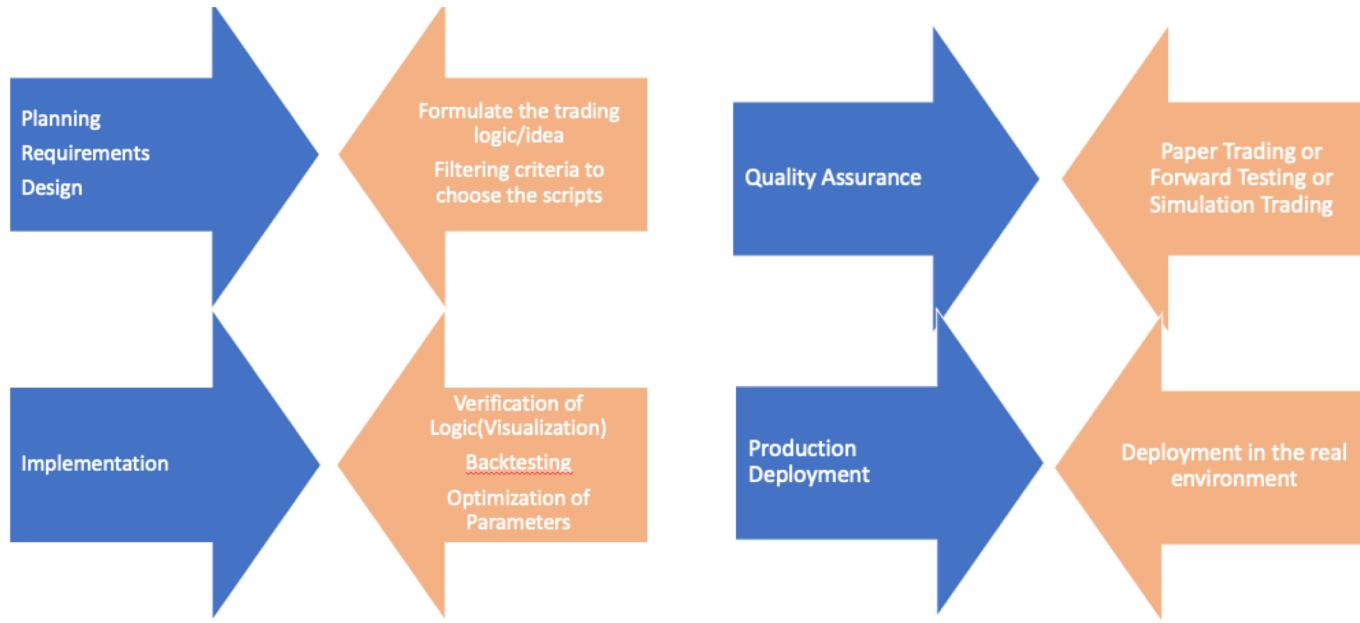
Conclusion

To summarize the following algo trading strategies, Algo can be considered as a software product and all the stages can be easily mapped with “Software **Product** Development Life Cycle”:

All the stages has their own importance and is critical to success of the algo.

- Formulate the trading logic/idea
- Filtering criteria to choose the scripts
- Verification of Logic(Visualization)
- Backtesting
- Optimization of Parameters
- Paper Trading or Forward Testing or Simulation Trading
- Deployment in the real environment

Conclusion



Questions & Answers

