



What will Mr. Market do tomorrow?



Disclaimer

This is an internal version of the presentation. It is not intended to be investment advice.

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Who's Mr Market?

- Mr. Market is an allegory created by Benjamin Graham to describe the irrational or contradictory traits of the stock market ... and is often identified as having human behavioral manic-depressive characteristics (*Wikipedia*)
- Market is driven by two sets of forces:
 - Fundamental (e.g. earnings and valuation)
 - Technical
 - Macro-factors (e.g. inflation and demographics)
 - Market sentiment (e.g. fears and affection)
- Markets everywhere:
 - Commodities (more technical)
 - Crypto (more technical)
 - Companies (more fundamental)
 - Debt (more fundamental)
- The market of choice:
 - Dow Jones Industrial Average 2008/08/08 - 2016/07/01 == US DAX



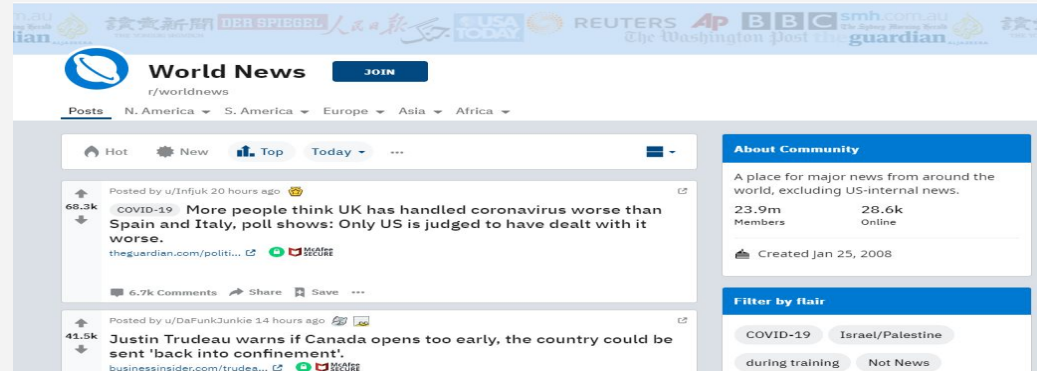
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 - Most global single country index (probably)



How to predict him? - Fundamentally

- A market can be defined by its price and risk:
 - Price - the monetary equivalent of a market unit (e.g. one ounce of gold)
 - Risk - two approaches to define risk:
 - Probability of complete failure
 - Volatility - the degree of movement up and down
- Fundamental prediction
 - Utilize reddit's daily r/worldnews titles to identify market sentiment and its implications for the market the next day (not best approach, but has logic)
 - Two types of feature generation procedures
 - Word2Vec (100 features)
 - Sentiment (4 features)



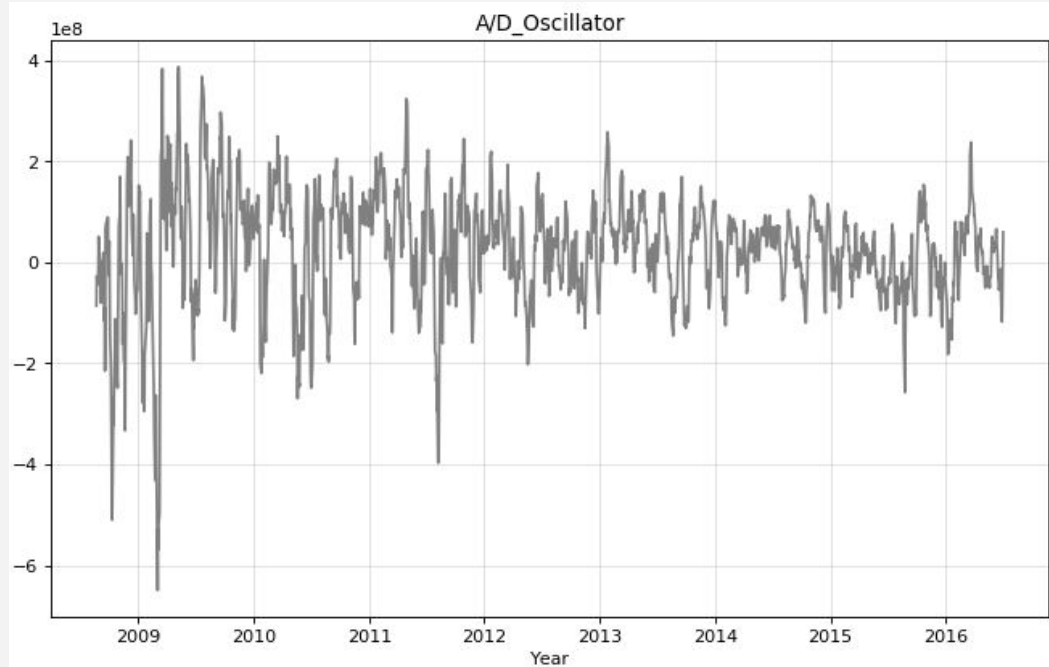
How to predict him? - Technically

- Technical analysis prediction
 - Chartist used to burn money with this approach in 60s and 70s
 - It still exists
 - But there are also quite successful quantitative investors (e.g. James Simons - Renaissance)
 - Utilize 13 technical indicators based on derivations of previous market price movement
 - A/D Oscillator
 - Disparity 5
 - Momentum
 - MAs (5, 20, 60, 150 days)
 - MACD
 - Rate of Change
 - Stochastic %K
 - Stochastic %D
 - Stochastic RSI and
 - William's %R



How to predict him? - Technically Example

Accumulation/Distribution Oscillator is a cumulative indicator that uses volume and price to assess whether a stock is being accumulated or distributed. It seeks to identify divergences between the stock price and volume flow.



$$A/D = \text{Previous A/D} + \text{CMFV}$$

where:

$$\begin{aligned} \text{CMFV} &= \text{Current money flow volume} \\ &= \frac{(P_C - P_L) - (P_H - P_C)}{P_H - P_L} \times V \end{aligned}$$

P_C = Closing price

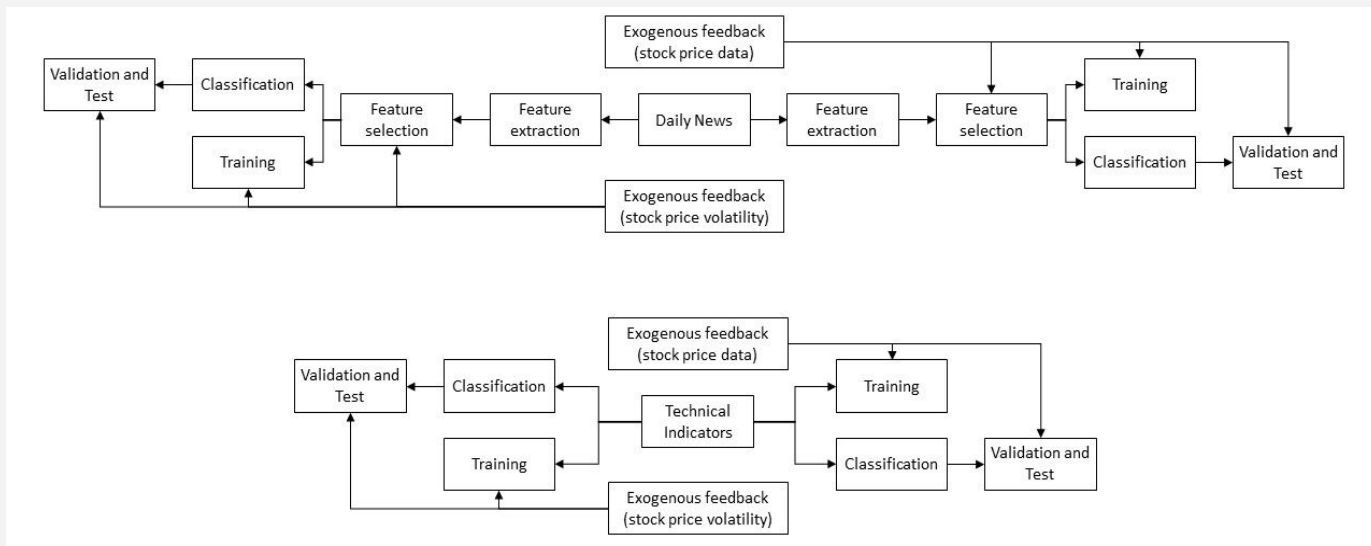
P_L = Low price for the period

P_H = High price for the period

V = Volume for the period

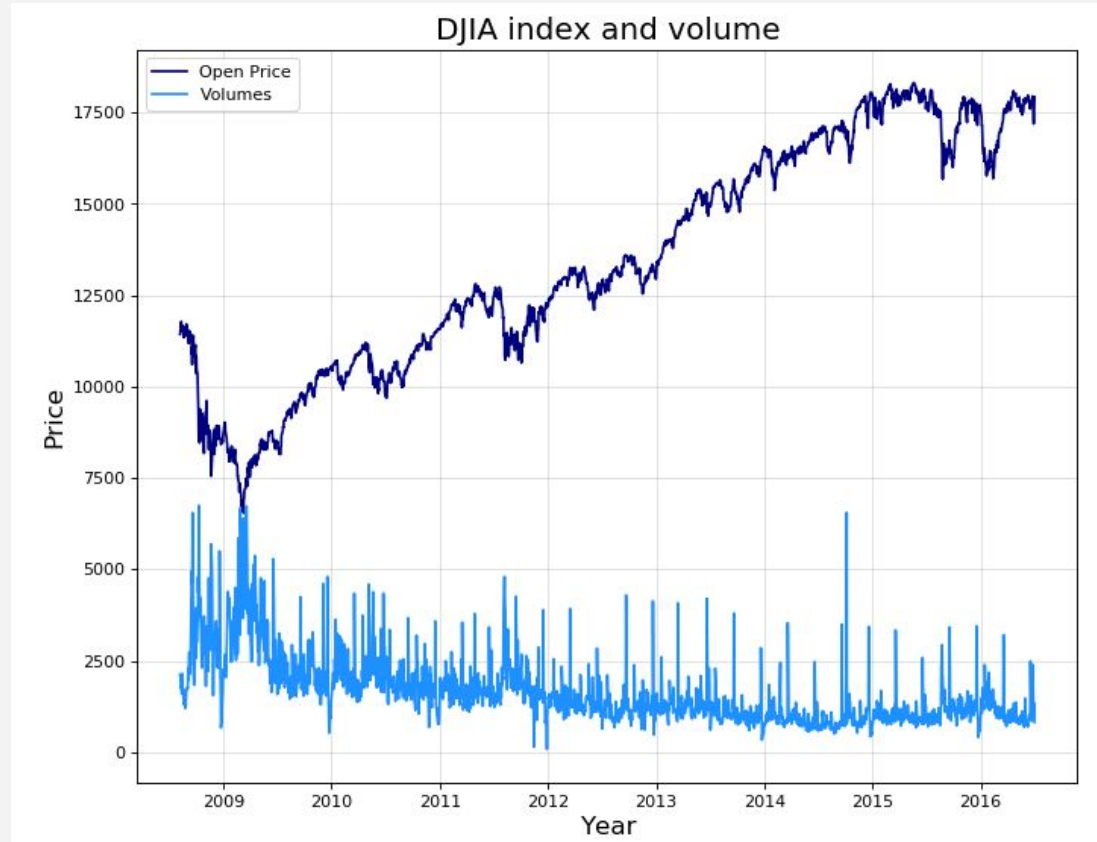
Study outline

- Two inputs:
 - Text = Fundamental (News titles)
 - Numeric = Technical (Technical indicators)
- Two target variables:
 - Market movement (up/same or down)
 - Volatility level (above or below 65 percentile over the previous 20 years = 130 volats)
- Two algorithms
 - Random forest
 - XGBoost

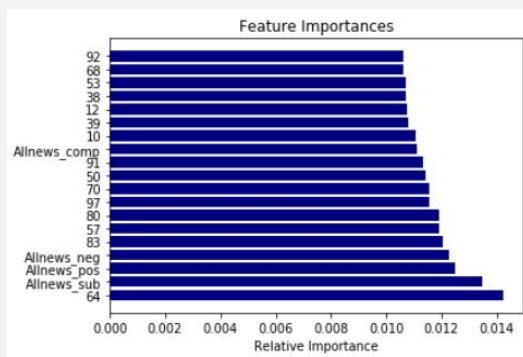
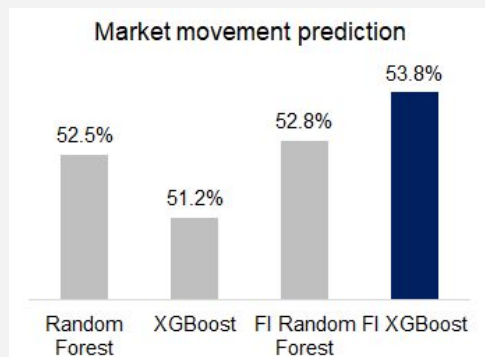


Data description

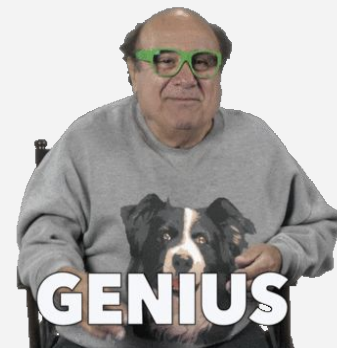
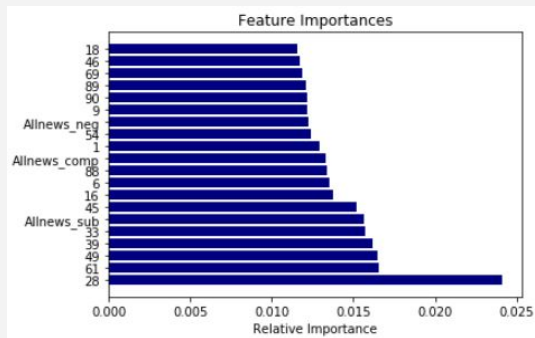
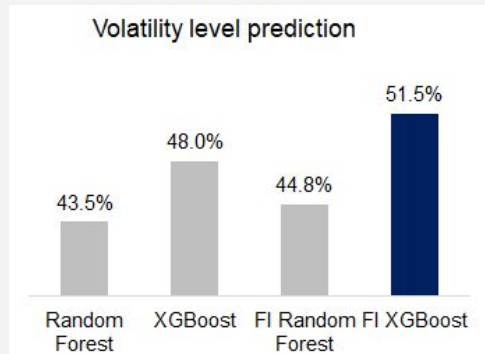
- Data is a little tricky
- Following the 2008 crisis, the market has had one of the longest rallies
- Which corresponds to our train data
- The period after 2014-12-31 is a bumpy one



Fundamental predictions accuracy



- Results are not encouraging
- Sentiment features are all in top 20 by importance
- A constant accuracy prediction of above 50% is sufficient to make money
- Text predicts market price movement better than volatility level

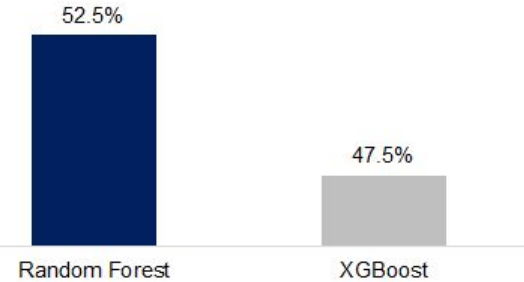


Technical indicators' predictions accuracy

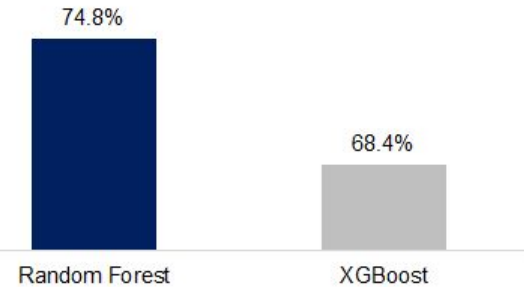
- Market movement predictions are poor
- Since we only have 13 features, no feature importance analysis is necessary
- Volatility prediction is pretty good compared to other estimations



Market movement prediction



Volatility level prediction



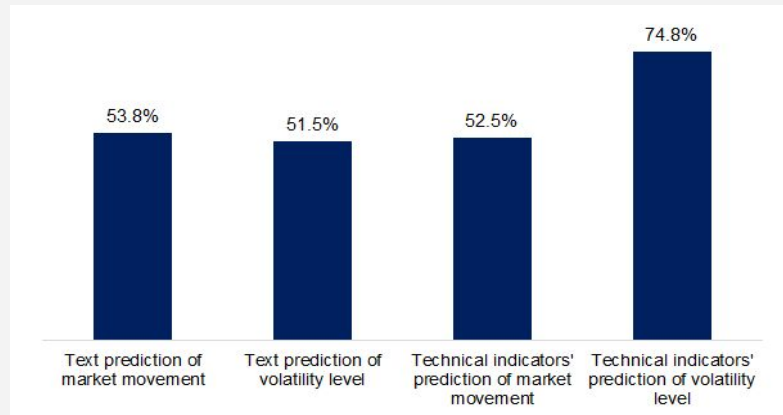
Concluding remarks

Future work

- Apply hourly or lower frequency news stream
- Utilize financial news
- Focus on a single stock instead of an index
- Training of vocabulary on Glove
- Neural Networks application

Results

- Prediction of price movement is tough
- But text as input performs better than technical indicators on price movement
- Technical indicators rock the volatility level prediction, but are of no use in price prediction



**Thank you for your time and attention,
and please invest responsibly!!!**



Credits: Frank (Danny DeVito) as Mr. Market and Charlie (Charles Rutherford Kelly) as the Chartist from *It's Always Sunny in Philadelphia*