What will Mr. Market do tomorrow?

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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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- The market of choice:
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    - Most global single country index (probably)

How to predict him? - Fundamentally

- A market can 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 <u>the next day (not best approach, but has logic)</u>
  - Two types of feature generation procedures
    - Word2Vec (100 features)
   - Sentiment (4 features)
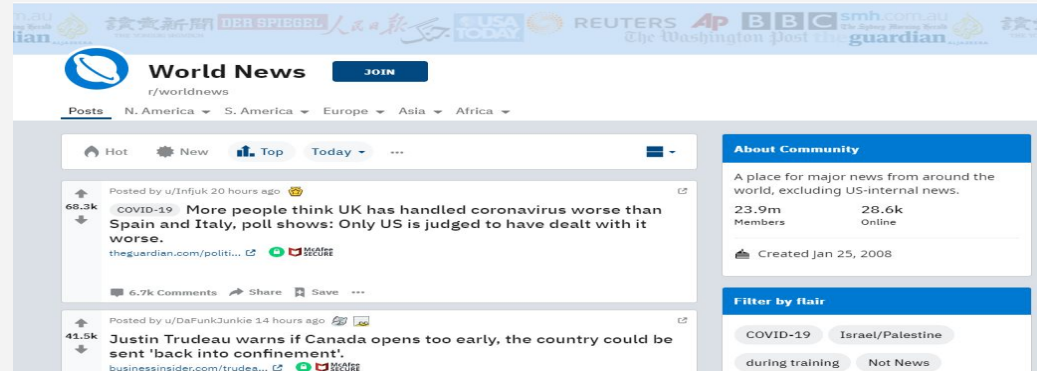
How to predict him? - Technically

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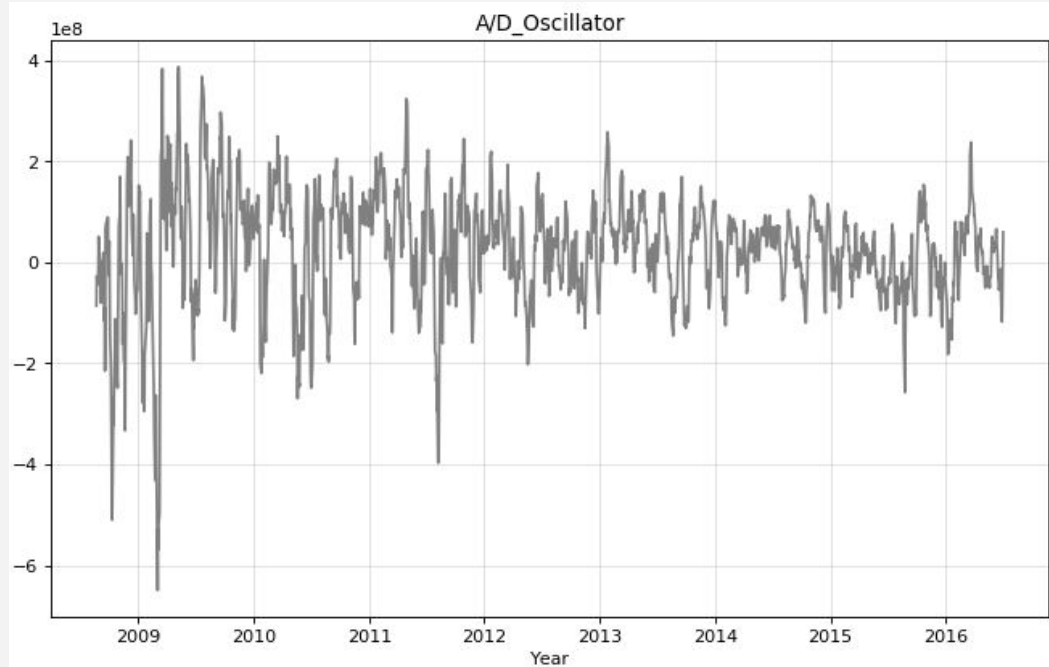
$$A/D = \text{Previous A/D} + \text{CMFV}$$

where:

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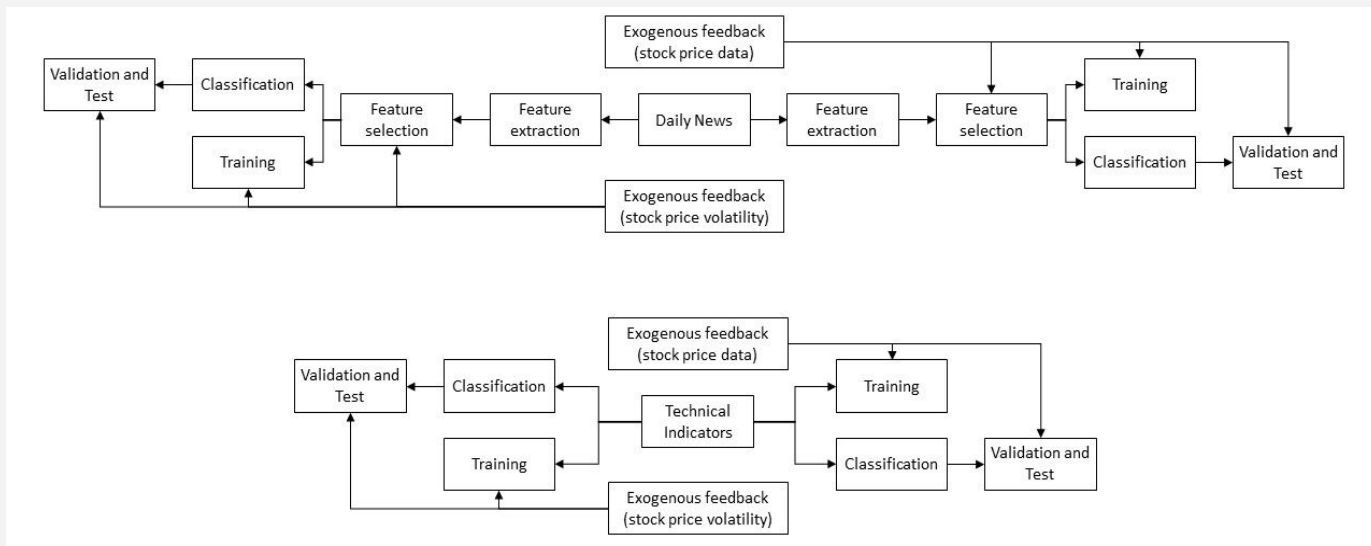$$= \frac{(P_C - P_L) - (P_H - P_C)}{P_H - P_L} \times V$$

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)
  - Nummeric = 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

Fundamental predictions accuracy

Market movement prediction

Feature Importances

Volatility level prediction

Feature Importances
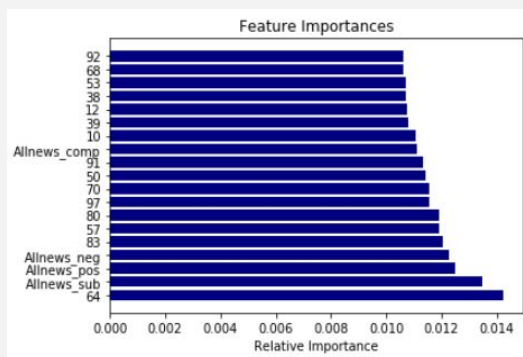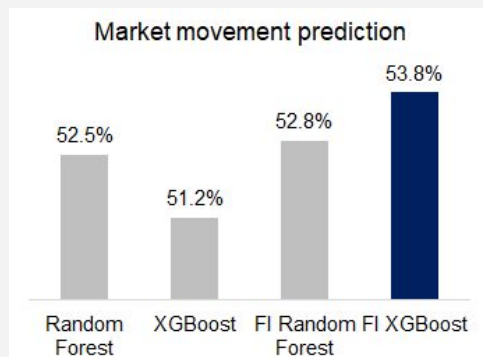
- Results are not encouraging

- 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
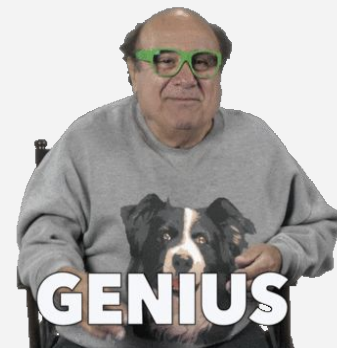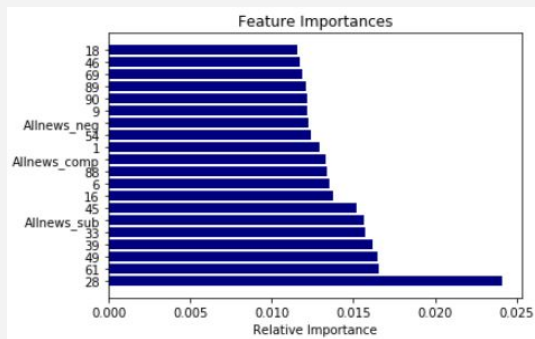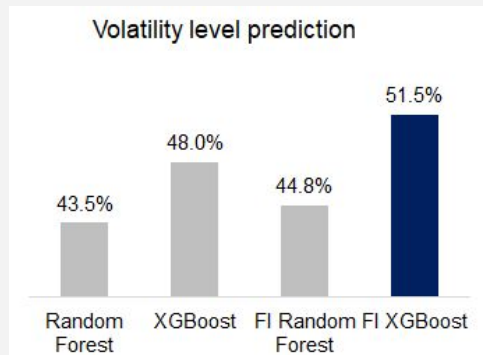
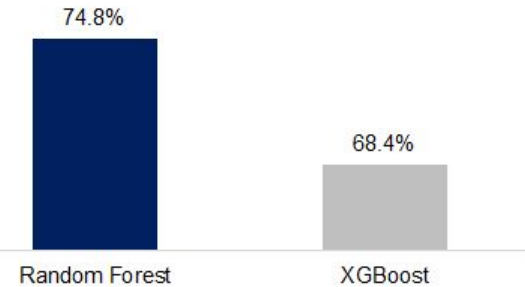# Technical indicators' predictions accuracy

- 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

52.5% Random Forest
47.5% XGBoost

Volatility level prediction

74.8% Random Forest
68.4% XGBoost
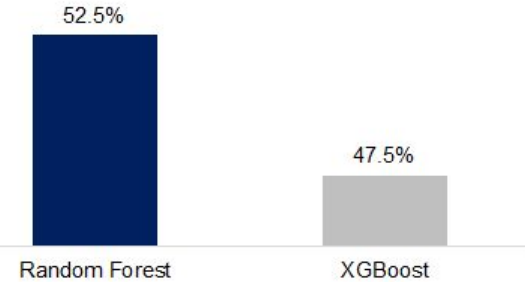
Concluding remarks

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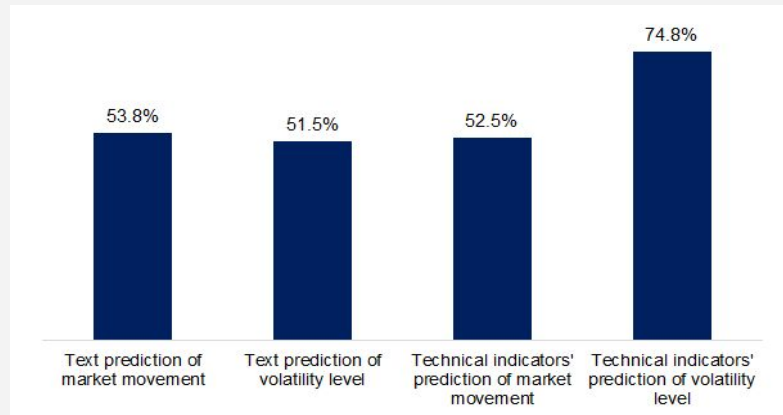
Thank you for your time and attention, and please invest responsibly!!!