Capstone Project Final Presentation

By: Riddhi Mehta (J030)

This report presents the work completed from 20th Dec 2020 to 17th Apr 2021

Portfolio Management for Short-Term Investment

1. Motivation

2. **Phase I** – Sentiment Analysis

3. **Phase 2** – Price Prediction Model

4. **Phase 3** – Two-Phase Integration

5. Future Scope (& Product)

Riddhi Mehta, Roll. No. J030, SAP ID 70091017031

Motivation

1
External

1. Nationwide survey of over 60,000 households reveal "Indians are wise savers but poor investors" [1]

2. 9 reasons have been discovered that why Indians hesitate to invest in the stock market [2]

Survey Form – 200 respondents

- Questions focused on understanding the mindset of respondents towards stock market investment

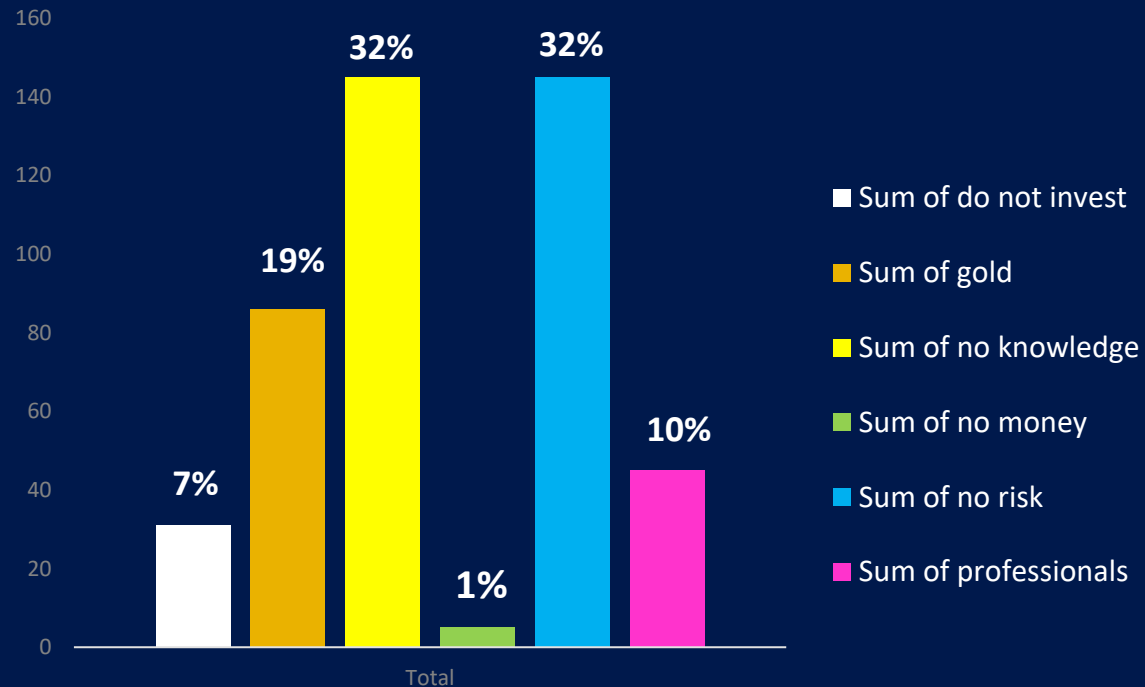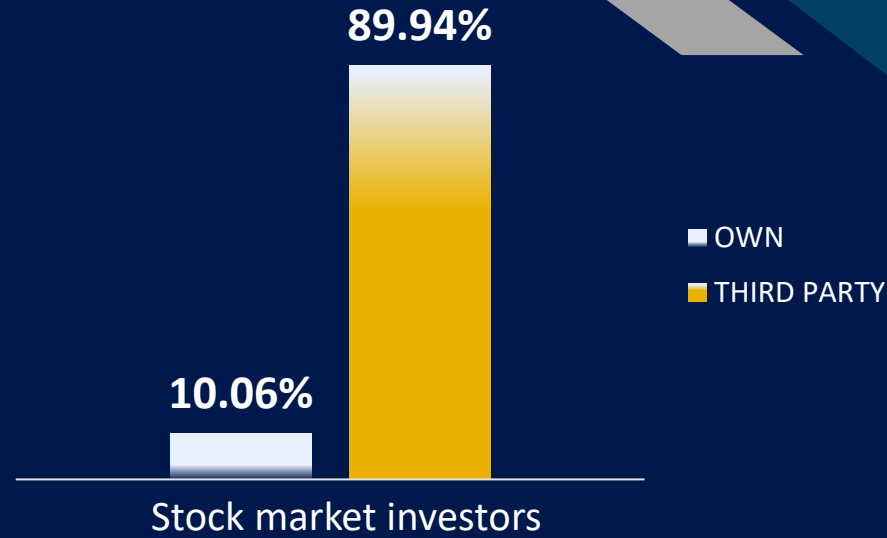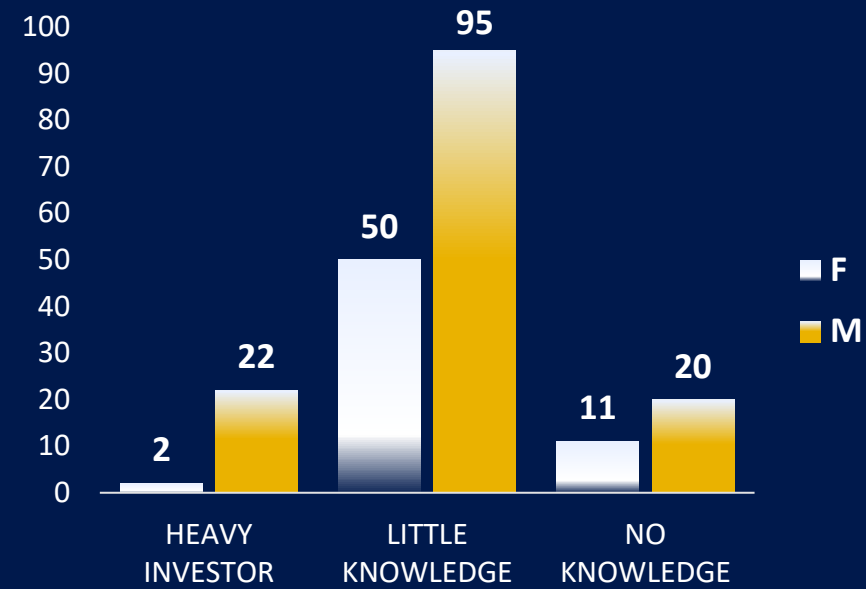- It was asked that if investing was made easier and transparent, would then the option be considered?

2
Internal

[1] Shukla, Rajesh. (2008). Indians are wise savers but poor investors: Survey. 10.13140/RG.2.2.10738.56006.
[2] https://tradebrains.in/reasons-why-most-indians-do-not-invest-in-stocks/
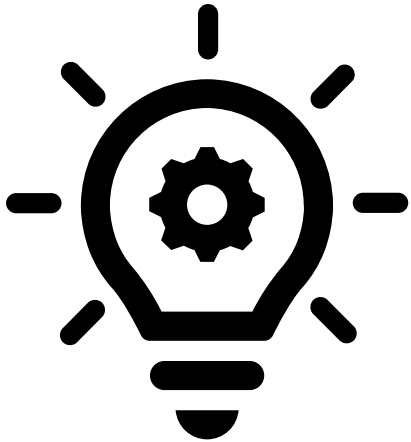
- 88% of respondents had little or no knowledge regarding the stock market
- ~90% of the ones who invest had a third party agent handle their portfolio
- ~50% of the respondents believe that the stock market has a lot of risk and the safer option is to invest in gold or land or fixed deposits
- ~77% respondents would prefer a system that would suggest best portfolio based on their requirements
- ~98% of respondents who prefer the above system would then start investing on their own

Phase I - Sentiment Analysis

IN – BUILT LIBRARY	NOVEL LOGIC

Extraction of News
    GoogleNews
 	
Sentiment Analysis
    Valence Aware Dictionary for
    Sentiment Reasoning (VADER)
	Intensity Threshold
	    0.7 to 0.5
	
	Positive : Negative Offset
	    Negative news given three times as much as importance as Positive News
	
	Overall Stock Sentiment
	    Computation of total positive value and total negative value to decide whether to buy or sell or hold stock
	
	Exception Handling
	    - Handles if no news is extracted
	    - Handles if the news is not intense

```
1  googlenews = GoogleNews(lang = 'en', period='50d', encode='utf-8')
2  googlenews.get_news("Reliance Industries Ltd. stock buy or sell?")
3  googlenews.get_texts()
```

['Analysts see the tide turning for Reliance Industries stock',
 'Stocks in Focus on March 30: Nazara Technologies, MMTC, NMDC, Reliance
 'RIL to sell stakes in Den, Hathway through OFS',
 'RIL to sell Den Networks and Hathway stakes for ₹1,122 crore',
 'Buzzing Stocks | RIL, Laxmi Organic and others that will be in focus t
 'Stock in news: Reliance, Airtel, ONGC, Hero MotoCorp, Rail Vikas Nigam
 'How will the Reliance stock move going forward',
 'Reliance opts for control in Den and Hathway, instead of full ownershi
 'Stocks to Watch: RIL, Tata, Edelweiss, DLF, Power Grid, Welspun',
 'Markets likely to be rangebound; Sun Pharma, Lupin, RIL in focus',
 'Zerodha users lose Rs 10 cr in lapsed Rights Entitlements since RIL is
 'Markets likely to be ranged; Reliance, Future, Vodafone in focus',
 'Market HIGHLIGHTS: Sensex rallies over 1,100 pts, Nifty ends at 15,245
 'Stocks in focus: RIL, Future Retail, NTPC, TCS, HDFC Bank, IDBI Bank,
 'Why Future Retail shares hit 10% lower circuit in opening trade',
 'Stocks to Watch: Future Group, RIL, Airtel, auto companies, insurance
 'Top buy and sell ideas by Mitessh Thakkar, Yogesh Mehta for short term
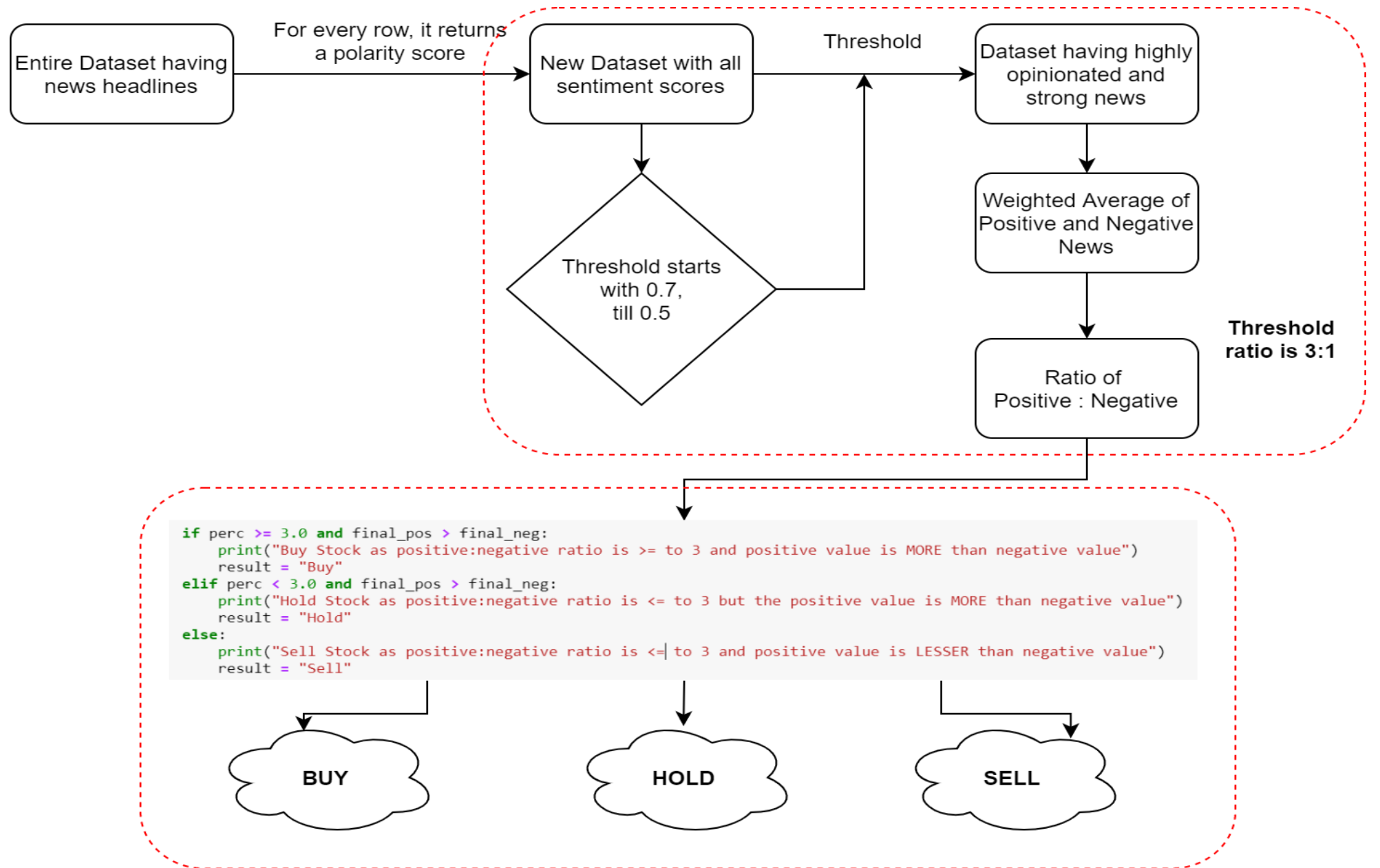 'Markets may continue to see sell off: Future group, Bharti, auto stock
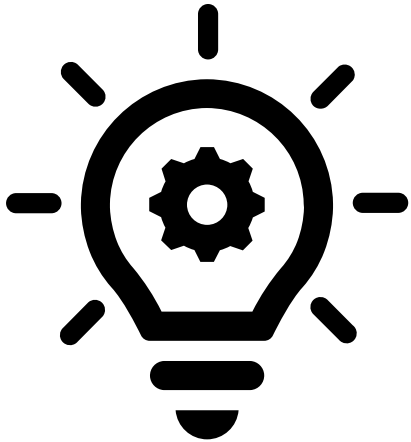```

	neg	neu	pos	compound
BPCL sells 54.16 per cent stake in NRL to OIL;...	0.000	1.000	0.000	0.0000
Sensex ends 258 pts higher, Nifty reclaims 15K...	0.000	0.523	0.477	0.8020
Only Jio can drive Reliance going forward: Mah...	0.000	1.000	0.000	0.0000
Indian markets may remain under pressure; Reli...	0.180	0.820	0.000	-0.2960
Why HDFC Securities is Bullish on TCS and Infosys	0.000	0.784	0.216	0.2960
ONGC Takes Leaf Out Of Reliance's Book, Floats...	0.000	1.000	0.000	0.0000
M-cap of seven of top 10 most valuable firms a...	0.000	0.715	0.285	0.6361
Why Analysts Think Wipro's $1.45 Billion Capco...	0.259	0.741	0.000	-0.5423
Mukesh Ambani poorer by Rs 23,871 crore in sto...	0.286	0.714	0.000	-0.6369
Stock Market Highlights: Sensex ends flat, Nif...	0.000	0.707	0.293	0.6597
Should You Subscribe to Anupam Rasayan IPO as ...	0.000	1.000	0.000	0.0000

GoogleNews Extraction Module Sample

VADER Sentiment Analyzer Module Output

3

Entire Dataset having news headlines

→ For every row, it returns a polarity score →

New Dataset with all sentiment scores

→ Threshold →

Dataset having highly opinionated and strong news

Threshold starts with 0.7, till 0.5

Weighted Average of Positive and Negative News

Ratio of Positive : Negative

Threshold ratio is 3:1

```python
if perc >= 3.0 and final_pos > final_neg:
    print("Buy Stock as positive:negative ratio is >= to 3 and positive value is MORE than negative value")
    result = "Buy"
elif perc < 3.0 and final_pos > final_neg:
    print("Hold Stock as positive:negative ratio is <= to 3 but the positive value is MORE than negative value")
    result = "Hold"
else:
    print("Sell Stock as positive:negative ratio is <= to 3 and positive value is LESSER than negative value")
    result = "Sell"
```

BUY          HOLD          SELL

# Phase II – Price Prediction

| IN – BUILT LIBRARY | NOVEL LOGIC |
|---|---|
| Basic Prediction Model(s)<br><br>- Moving Average<br><br>- Auto-Regressive Integrated Moving Average (ARIMA)<br><br>- Long Short-Term Memory Neural Network (LSTM) | Parameter-Tuned Prediction Model(s)<br><br>- ARIMA<br><br>- LSTM<br><br>Future Price Prediction<br>ARIMA and LSTM both were customised to predict on loop for 20 future days<br><br>Best of Both Worlds<br>Average of the predictions of ARIMA and LSTM resulted in the least RMSE* |

*Least RMSE is applicable for only selected stocks

**MOVING AVERAGE**
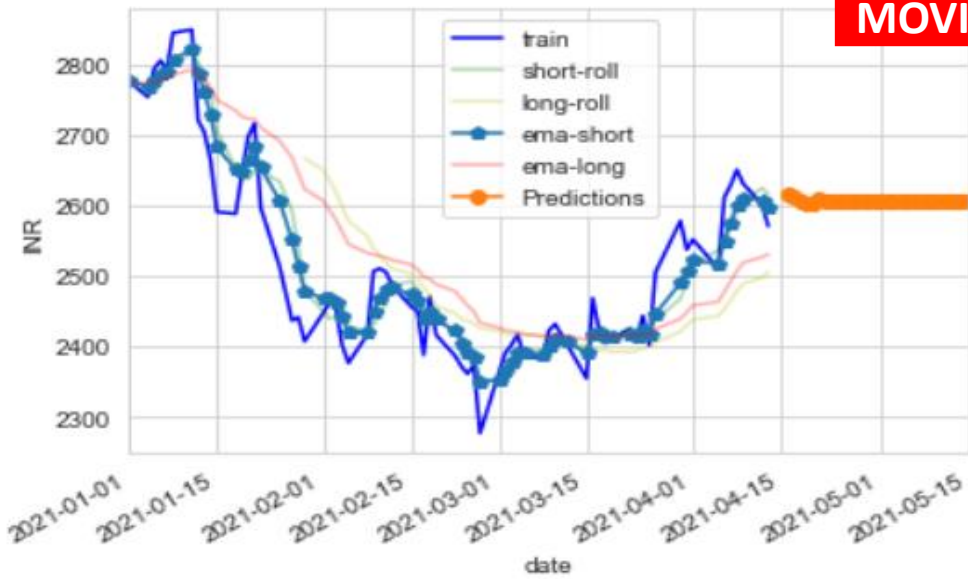
- After multiple predictions, the average is over the same values
- Hence, **straight line**

**ARIMA**
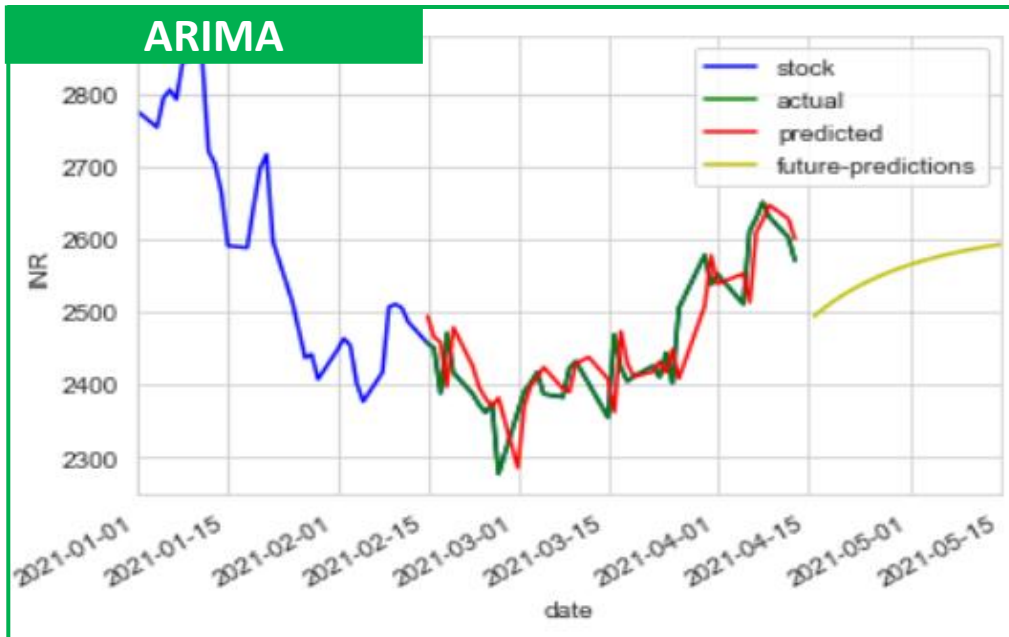
**LSTM**
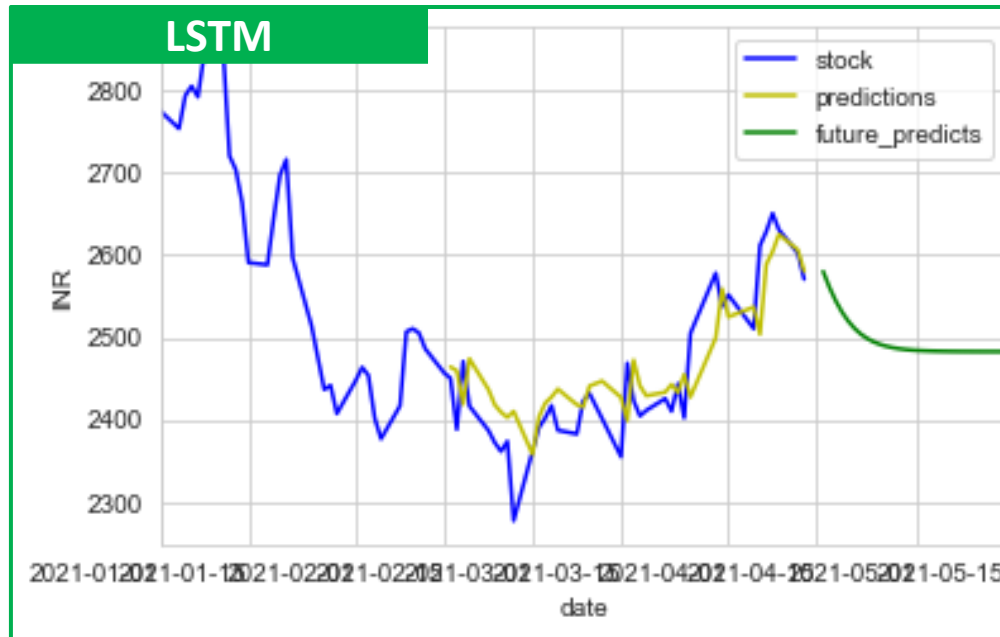
- Selecting ARIMA and LSTM for further algorithm development

**ASIAN PAINTS LTD.**

**Stage:** Basic Prediction Model

# Phase II – Price Prediction – NOVELTY *explained*

Def (arima):

    Def(arima_model):
        In-built arima
        prediction model

    Def(evaluate_arima):
        **Runs** arima_model for
        different order
        parameter in given
        range options

    Def(future_arima):
        **Uses** the best order
        from evaluate_arima
        to predict price on
        loop for 20 days

---

Def (lstm):

for i range (time_steps):
    **Runs** lstm and exits when
    the best time_steps value is
    chosen

**Uses** the best time_steps value
to predict price on loop for 20
days

---

Def (best_of_two):

**Rmse**(arima)
**Rmse**(lstm)
Average = (predictions of arima
+ predictions of lstm) / 2
**Rmse**(Average)

**Minimum**(**Rmse**(arima),
        **Rmse**(lstm),
        **Rmse**(Average))

**Chooses** the best prediction

# Phase II – Price Prediction – NOVELTY *explained*

Def (best_of_two):

**Rmse**(arima)
**Rmse**(lstm)
Average = (predictions of arima
+ predictions of lstm) / 2
**Rmse**(Average)

**Minimum**(**Rmse**(arima),
          **Rmse**(lstm),
          **Rmse**(Average))

**Chooses** the best prediction



```
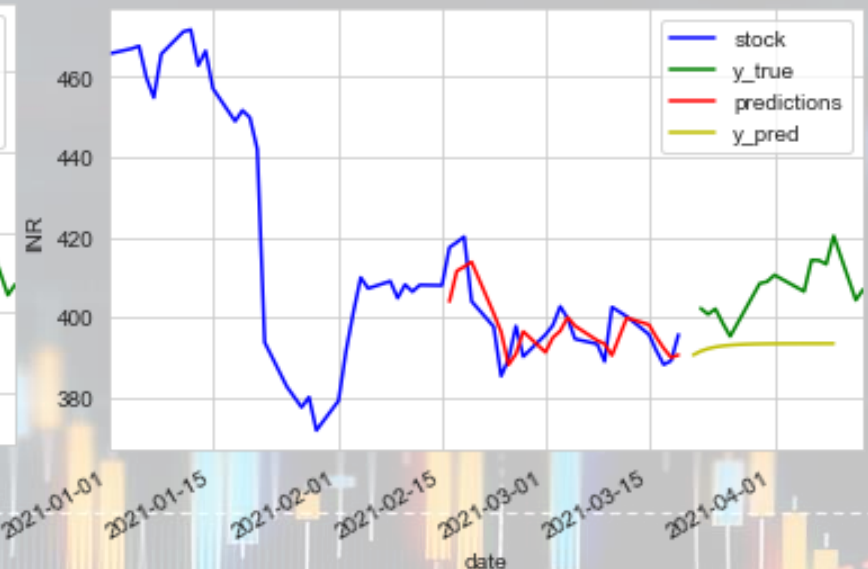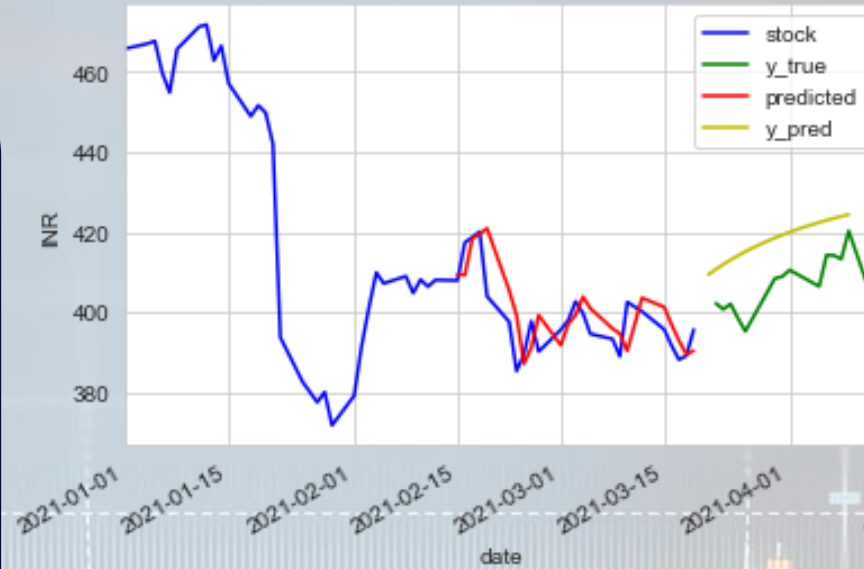     Date      ARIMA        LSTM     Average        Close
0  2021-03-22  410.724635  391.546387  401.135511  402.250000
1  2021-03-23  411.933377  392.173553  402.053465  400.750000
2  2021-03-24  413.065711  392.591675  402.828693  402.100006
3  2021-03-25  414.127759  392.871765  403.499762  398.500000
4  2021-03-26  415.124872  393.060028  404.092450  395.250000
5  2021-03-30  418.556720  393.369171  405.962946  408.450012
6  2021-03-31  419.294915  393.395538  406.345227  408.899994
7  2021-04-01  419.991816  393.413391  406.702603  410.549988
8  2021-04-05  422.419170  393.442871  407.931020  406.450012
9  2021-04-06  422.947377  393.445404  408.196390  414.250000
10 2021-04-07  423.448107  393.447113  408.447610  414.200012
11 2021-04-08  423.923026  393.448242  408.685634  413.250000
12 2021-04-09  424.373730  393.449036  408.911383  420.299988
ARIMA RMSE = 11.774855716168751
LSTM RMSE = 15.743789976604665
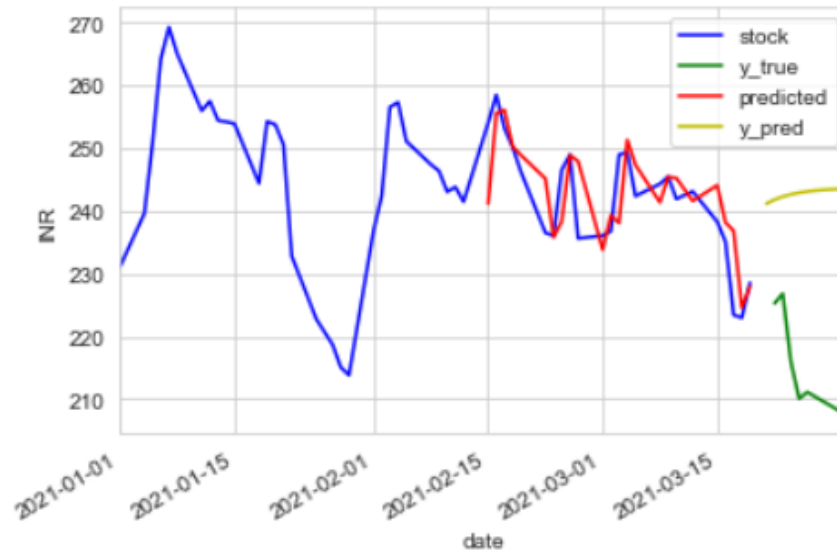AVERAGE RMSE = 5.237709437899048
```

... is in itself a novel idea!

The motivation to integrate the sentiment analysis output with the price prediction model is illustrated below.
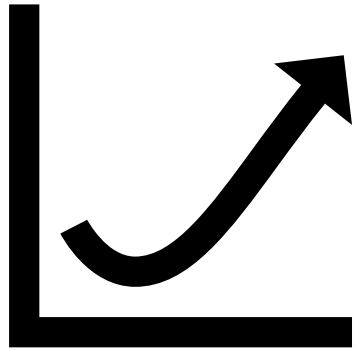
ARIMA

LSTM
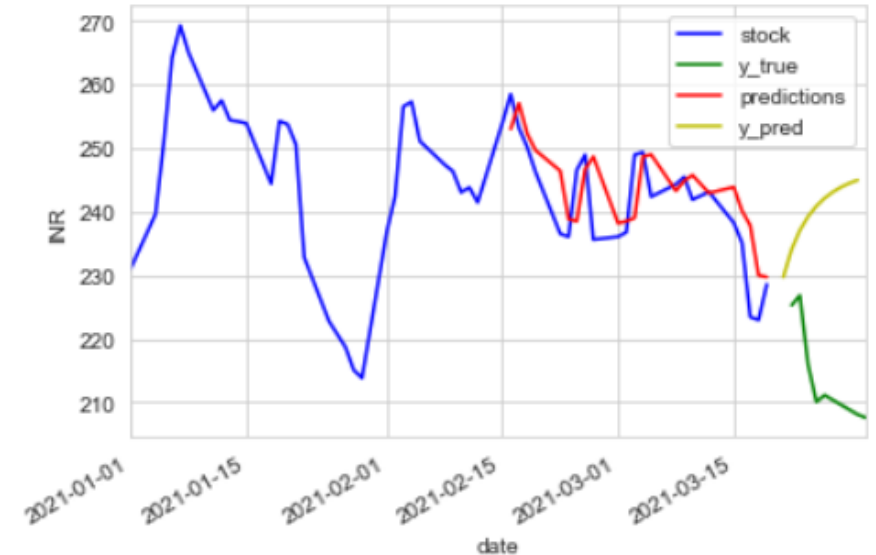
| 100 | RBLBANK | RBL Bank Ltd. | FINANCIAL SERVICES | Sell |

TWO-PHASE INTEGRATION ALGORITHM LOGIC

PHASE 1

PHASE 2

ARIMA

LSTM

Average of Results

Best RMSE

Final dataframe with predictions
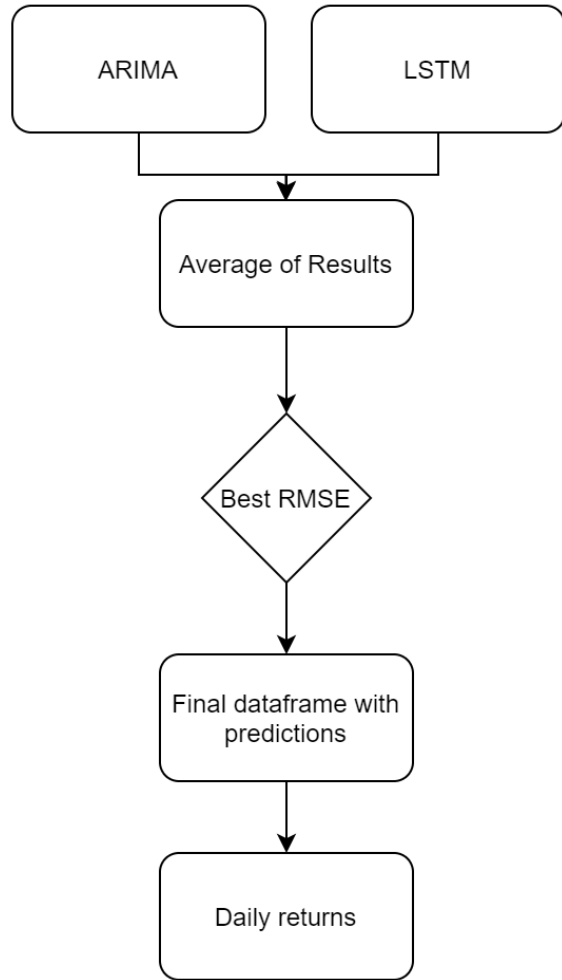
Daily returns

Sentiment Analysis

Output is either (1) Buy (2) Sell (3) Hold
(4) No concrete analysis could be done

	+ve daily returns	-ve daily returns
Buy	90% confidence	my-function
Hold	70% confidence	70% confidence
Sell	my-function	90% confidence

FINAL OUTPUT
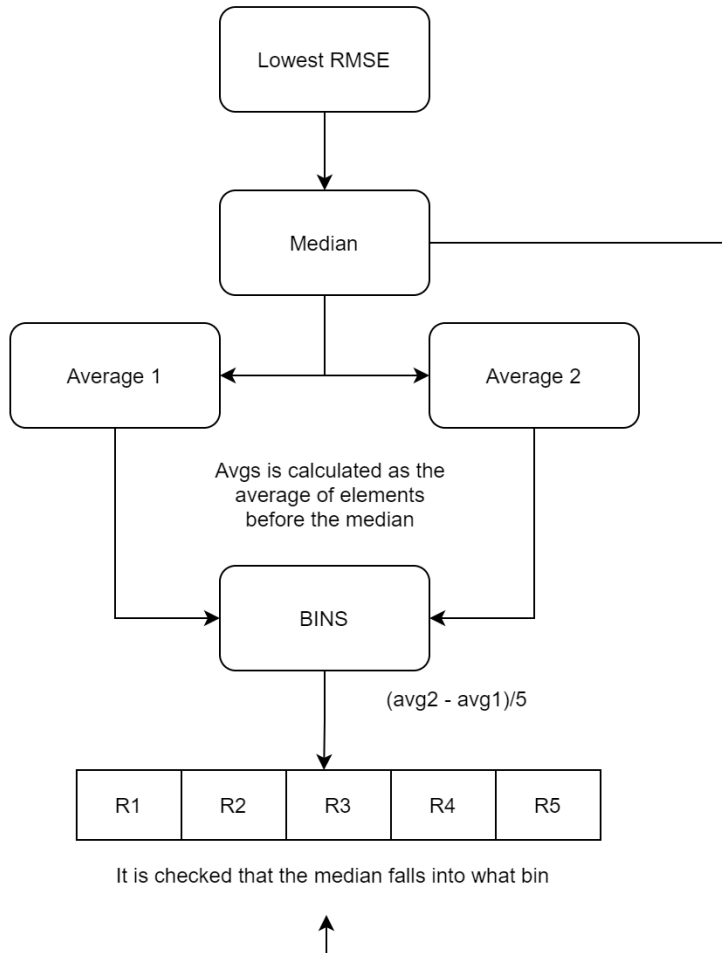
	12	12.4	12.8	13.2	14	14.8	16	18	19	20

Median	14.4
Avg 1	12.88
Avg 2	17.56
Bin size	0.936

	10%	30%	50%	70%	90%
	13.816	14.752	15.688	16.624	17.56

Sentiment = Sell ; Returns = Positive

Inference - Price Prediction is stronger than Sentiment

`

	8	10	14	18	22	22	22	23	29	30

Median	22
Avg 1	14.4
Avg 2	25.2
Bin size	2.16

	10%	30%	50%	70%	90%
	16.56	18.72	20.88	23.04	25.2

Sentiment = Sell ; Returns = Positive

Inference - Sentiment is stronger than Price Prediction

Flowchart (left side):

Lowest RMSE → Median → Average 1 / Average 2 → BINS → R1 R2 R3 R4 R5

Avgs is calculated as the average of elements before the median

(avg2 - avg1)/5

It is checked that the median falls into what bin

FUTURE SCOPE (& PRODUCT)

Concept:	
Industry	Dropdown
Risk	High, Medium
Duration	1,2,3 months
Amount to Invest	Input by User
Benchmark Index	Nifty50 / NiftyMidCap50
Exposure	Large, Mid, Small Cap

For Example:	
Industry	IT
Risk	High
Duration	2 months
Amount to Invest	16000
Benchmark Index	Any
Exposure	Any

Portfolio

Company	Weight	No of Stock	Value Invested
TCS	20.4%	1	3220
INFY	16.4%	2	2596
LTI	26.8%	1	4240
Persistent	20.1%	2	3180
Birlasoft	16.3%	10	2570
Total Portfolio Value	**100%**		**15806**

Market Cap Distribution

16.3%

20.1%

63.6%

■ Large Cap ■ Mid Cap ▪ Small Cap
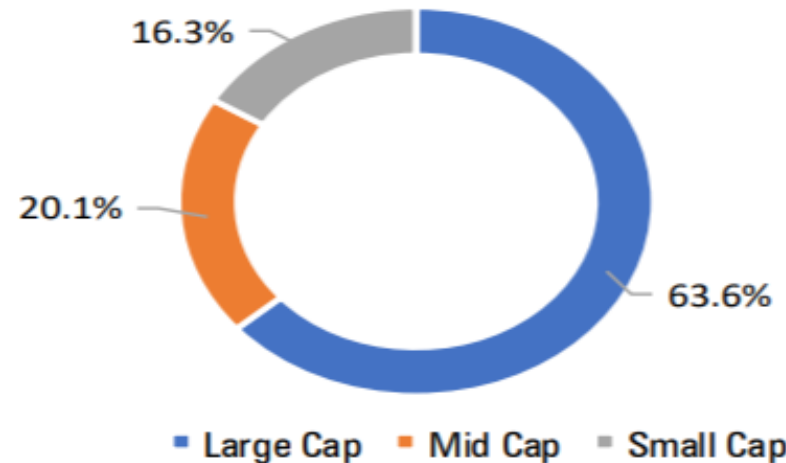
Return Expected: 9%
Confidence Probability: 85%

Presentation By: Riddhi Mehta
Roll No.: J030
Topic: Capstone Project – Portfolio Management for Short-Term Investment
Contact: riddhi.mehta1721@gmail.com