Personal Asset Management based on Risk-Return Index

IT 20

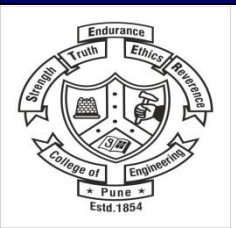
111608025 - Gaurav Sherwani

111608043 - Murtaza Laljiwala

111608076 - Ayeshabi Tigdikar

Under the guidance of

Prof. Rahul Adhao & Prof. Nikita V Mahajan

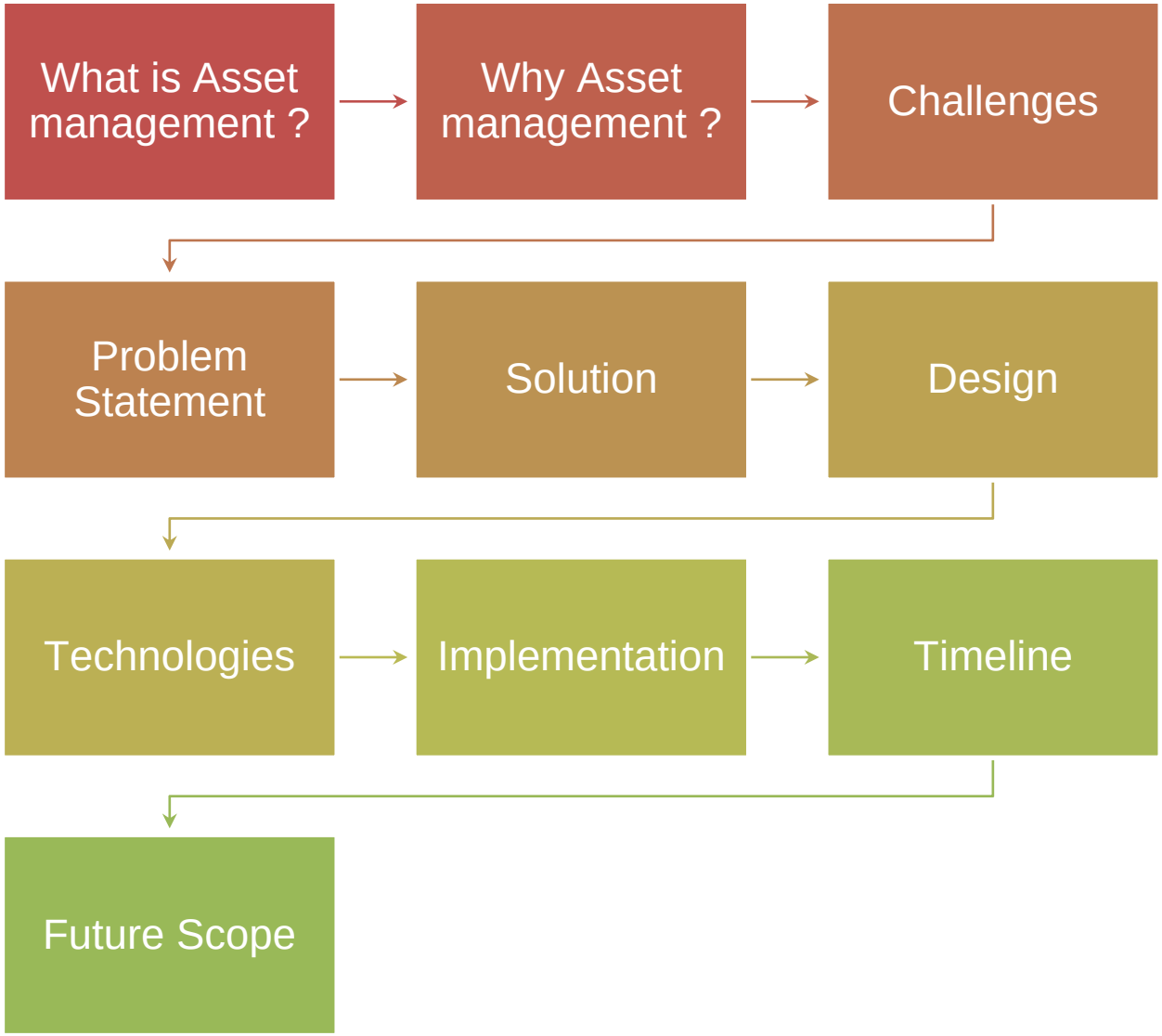


Department of Computer Engineering and Information Technology

College of Engineering Pune (COEP)

Forerunners in Technical Education

Outline


What is Asset management ?
Why Asset management ?
Challenges
Problem Statement
Solution
Design
Technologies
Implementation
Timeline
Future Scope

Introduction

Finance is an essential part of everyone's life. Everyone sets financial goals once they start earning.

Personal Finance for the mass has for long been ignored by many investment banks. Moreover, the Banking strategies used by investment banks are very expensive as they require individual portfolio managers which can't be afforded by a common man.

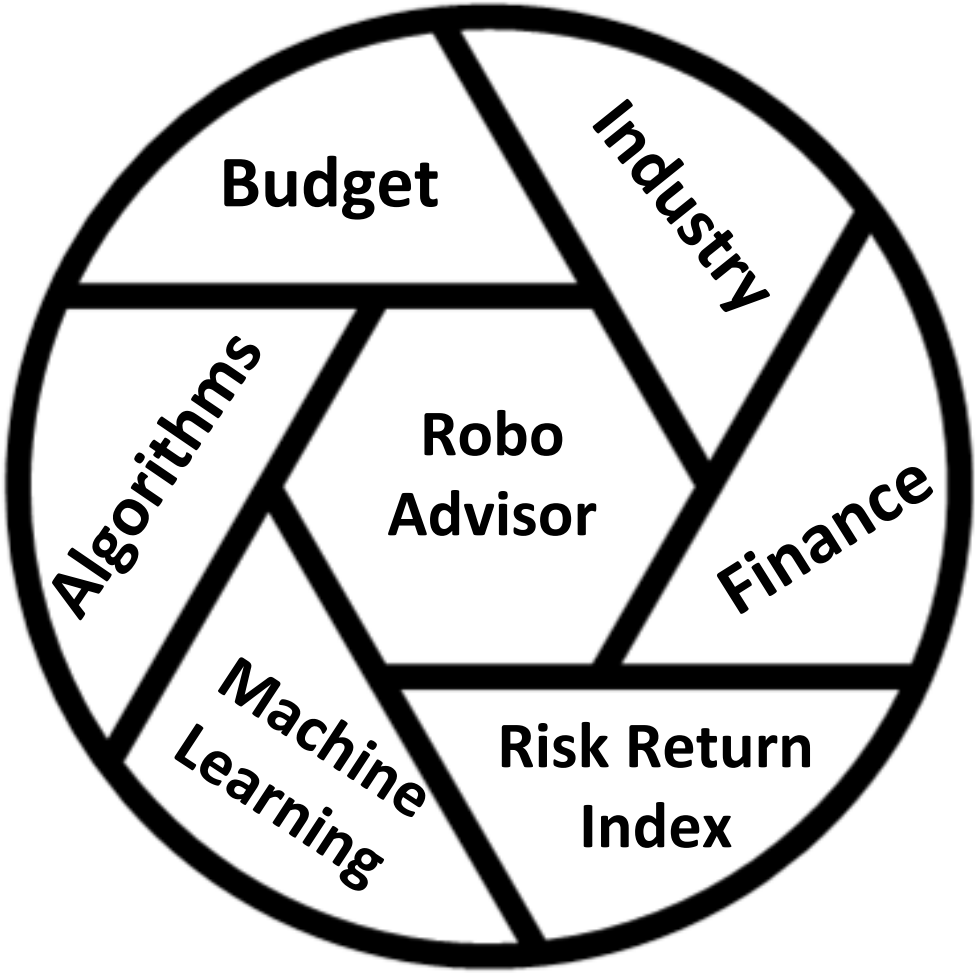
So what is the solution?

Asset Management

Asset management is the process of developing, operating, maintaining, and selling assets in a cost-effective manner.

Why Asset Management?

- Create and Stick to a Budget
- Plan and Save for Retirement
- Manage Loans
- Improve Financial Well-Being
- Manage Assets in a systematic way
- Family Security


Budget
Industry
Algorithms
Robo Advisor
Finance
Machine Learning
Risk Return Index

CONCEPT

Challenges

COST

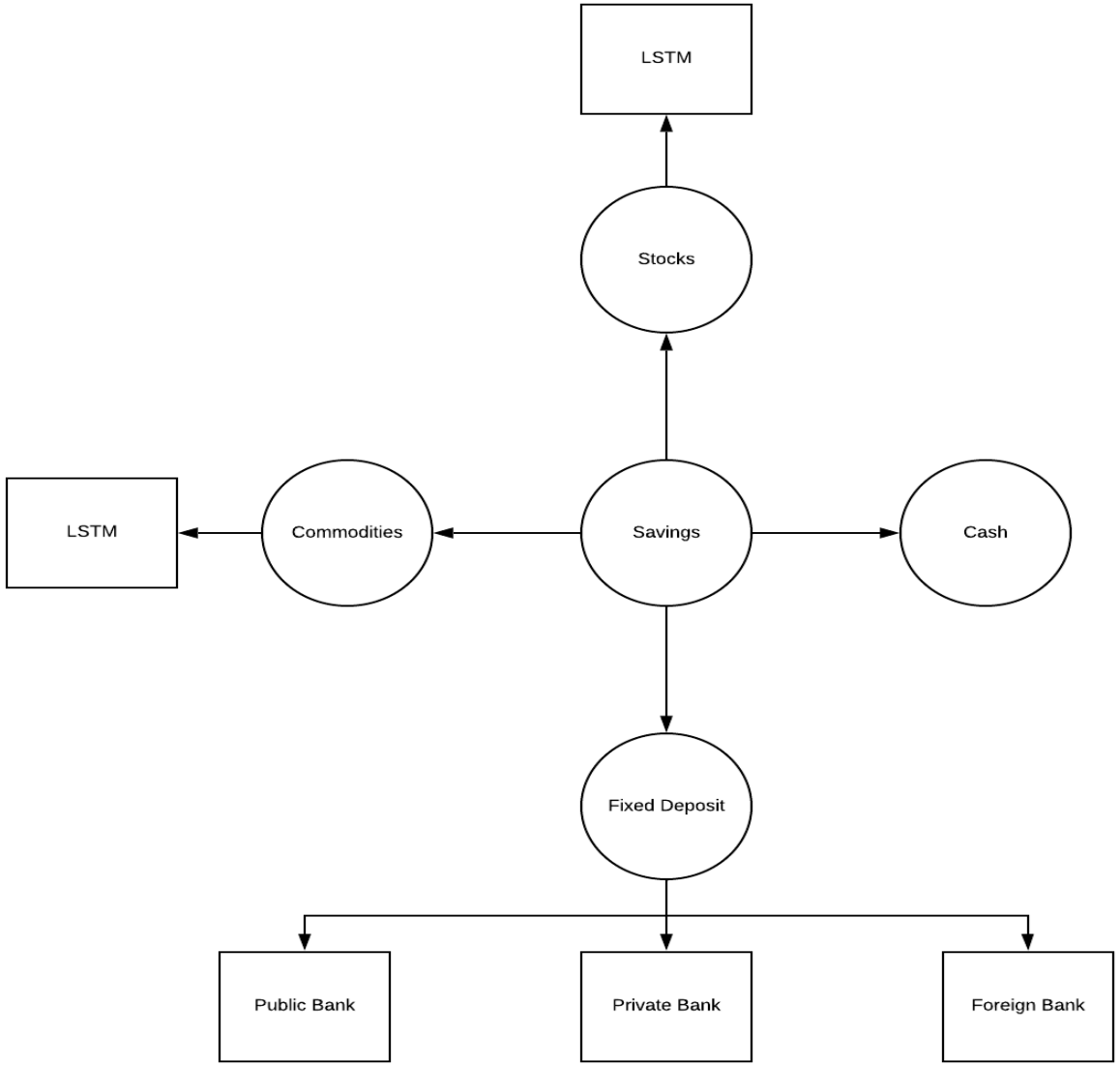
HUMAN INTERVENTION

ACCESSIBILITY

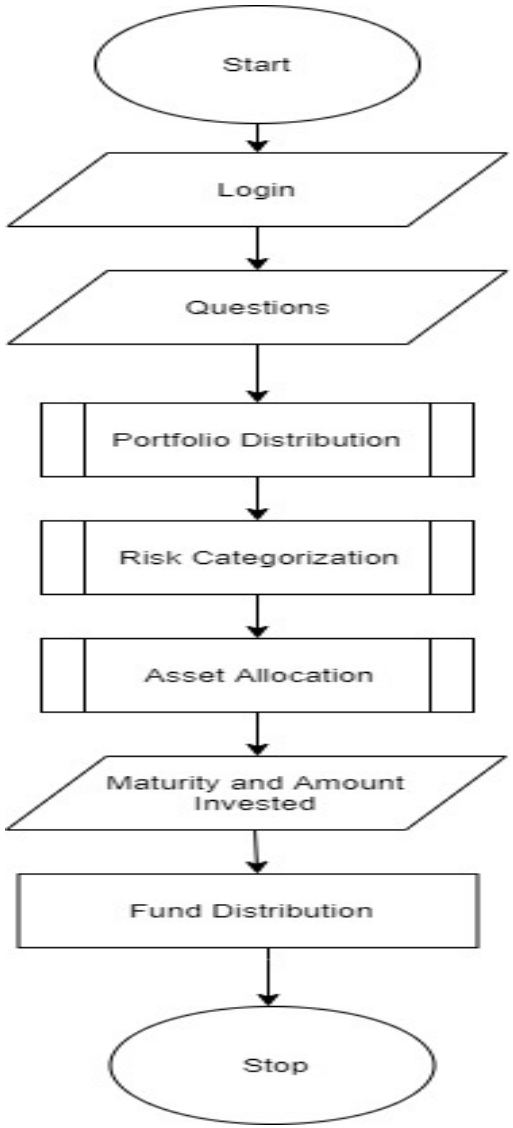
LACK OF TRANSPARENCY

PONZI INVESTMENT SCHEMES

Solution & Project Overview

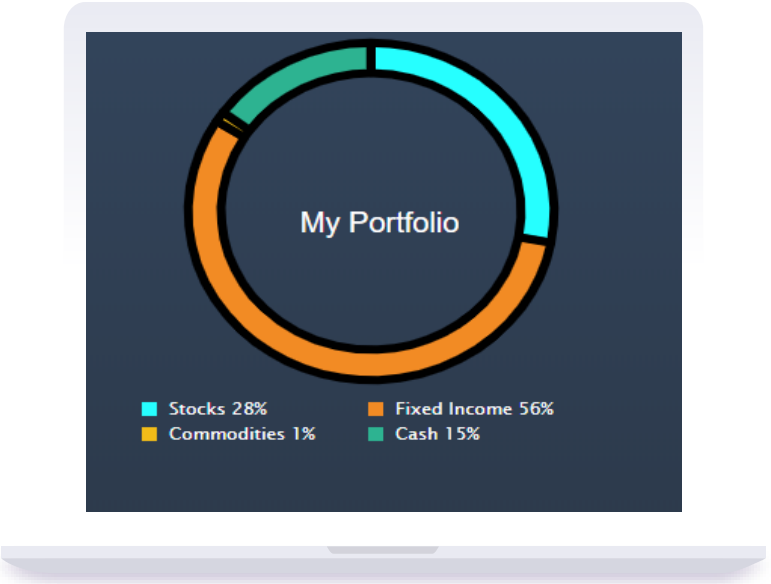


System Design

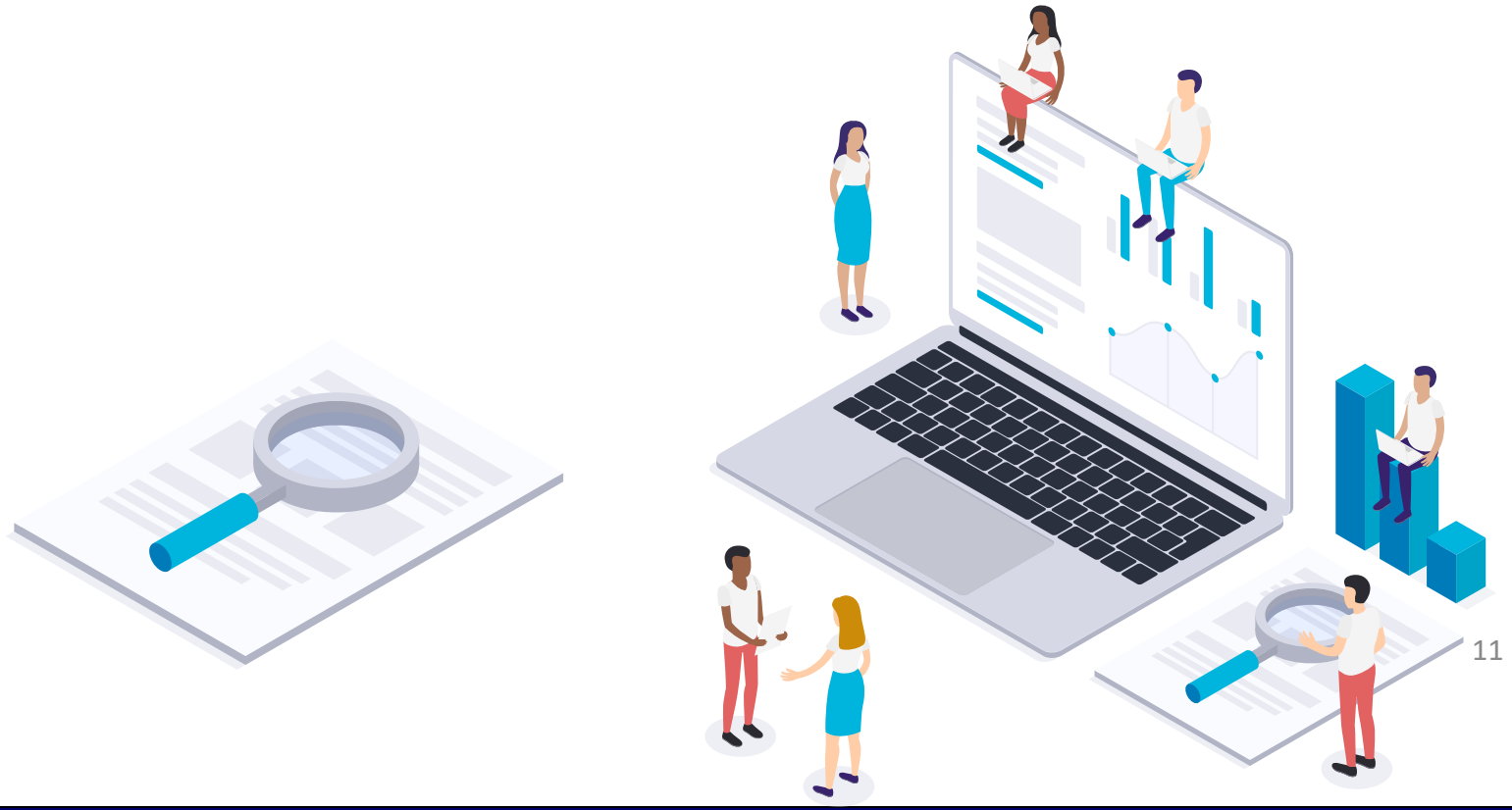


Application:

Users can use this application so that they can invest their savings in different financial instruments and hedge them against losses. The application focuses on allocating the assets to an individual based on a questionnaire.



A Multidimensional Risk Assessment Instrument



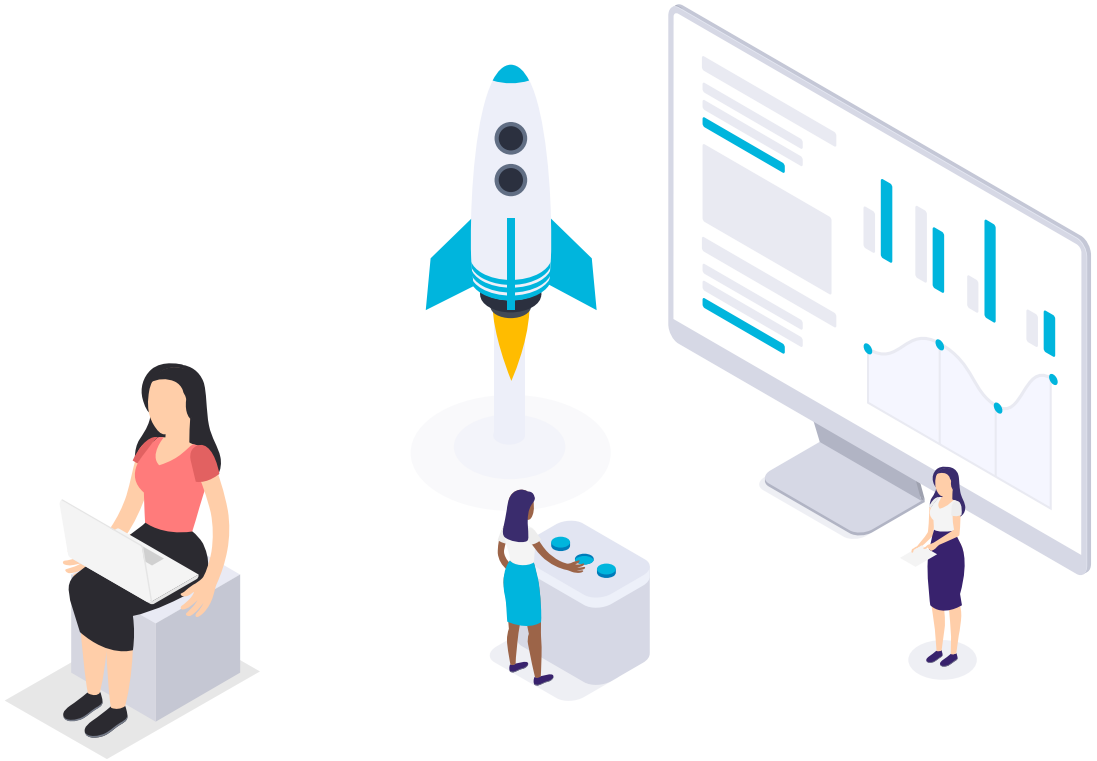
Input:

- Answers to situation based psychological questionnaire
- Scoring based on weighted indices
- Age (100-Age rule)
- Maturity date

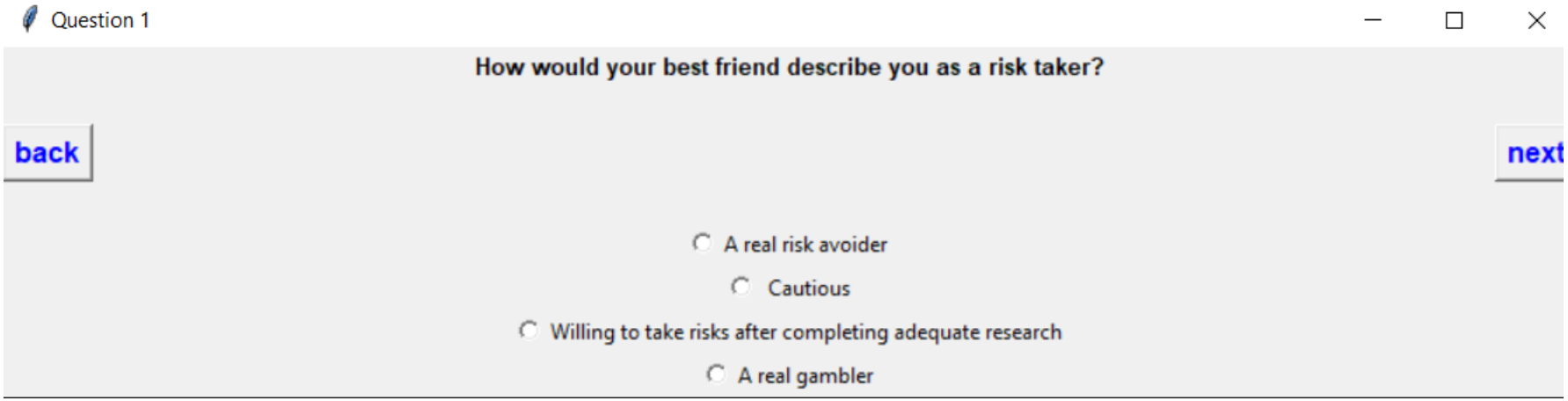
Output:

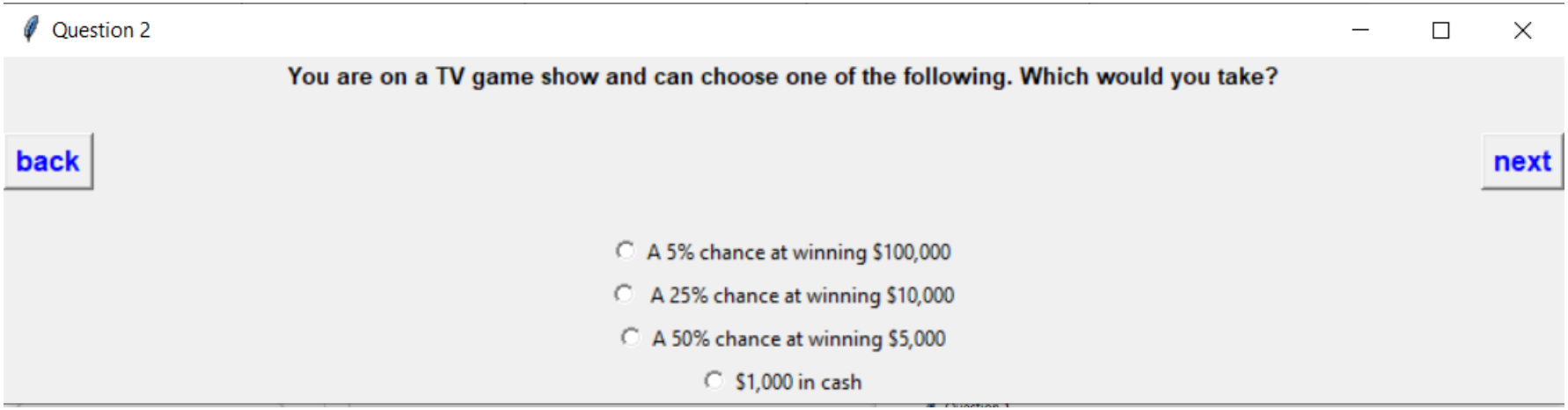
- Risk class categorization (Aggressive, Moderately Aggressive or Conservative)
- Asset allocation
- Break-up of individual components
  - ❑Stocks
  - ❑FDs
  - ❑Commodities
  - ❑Cash

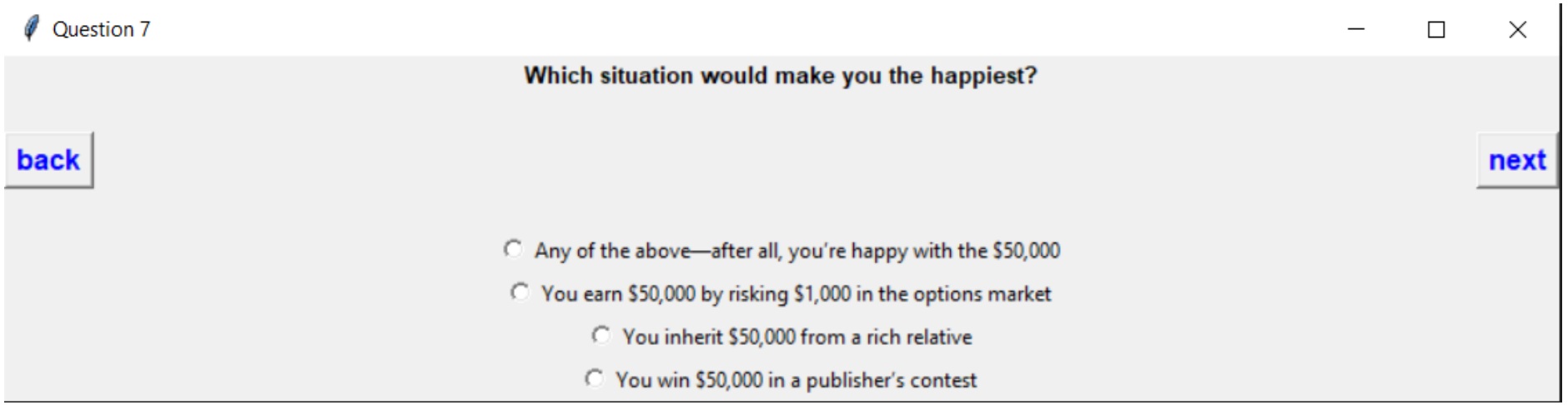
Implementation

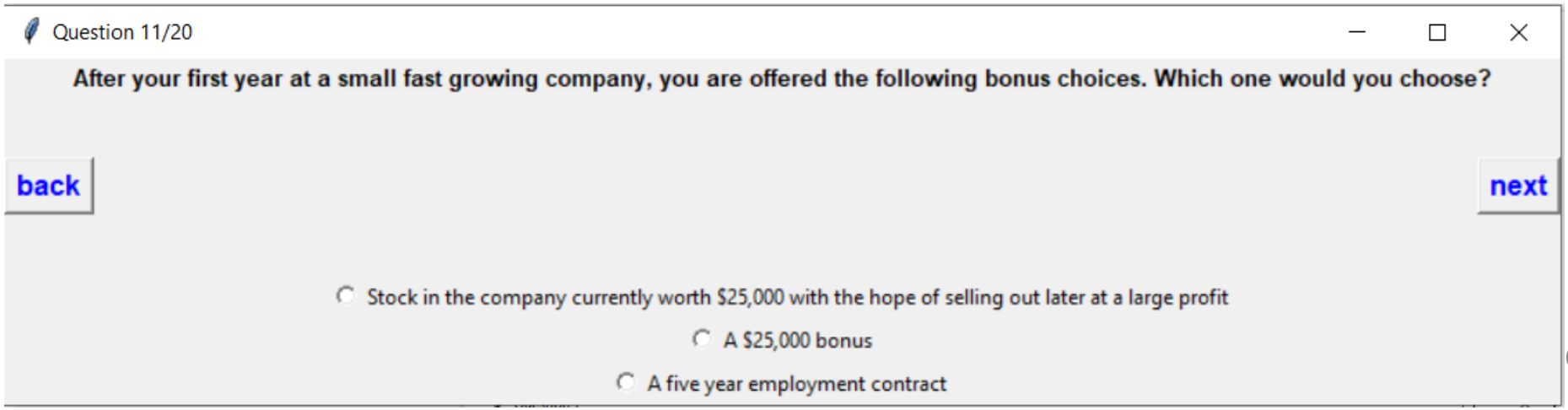


Set of psychological risk assessment questions:



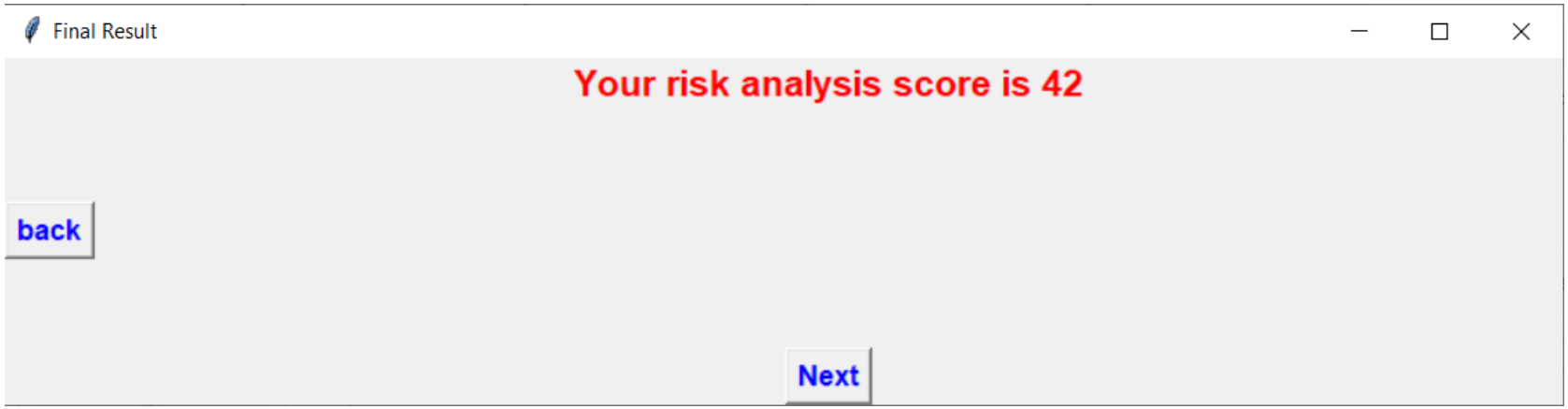



Question 7
Which situation would make you the happiest?
back
next
Any of the above—after all, you're happy with the $50,000
You earn $50,000 by risking $1,000 in the options market
You inherit $50,000 from a rich relative
You win $50,000 in a publisher's contest

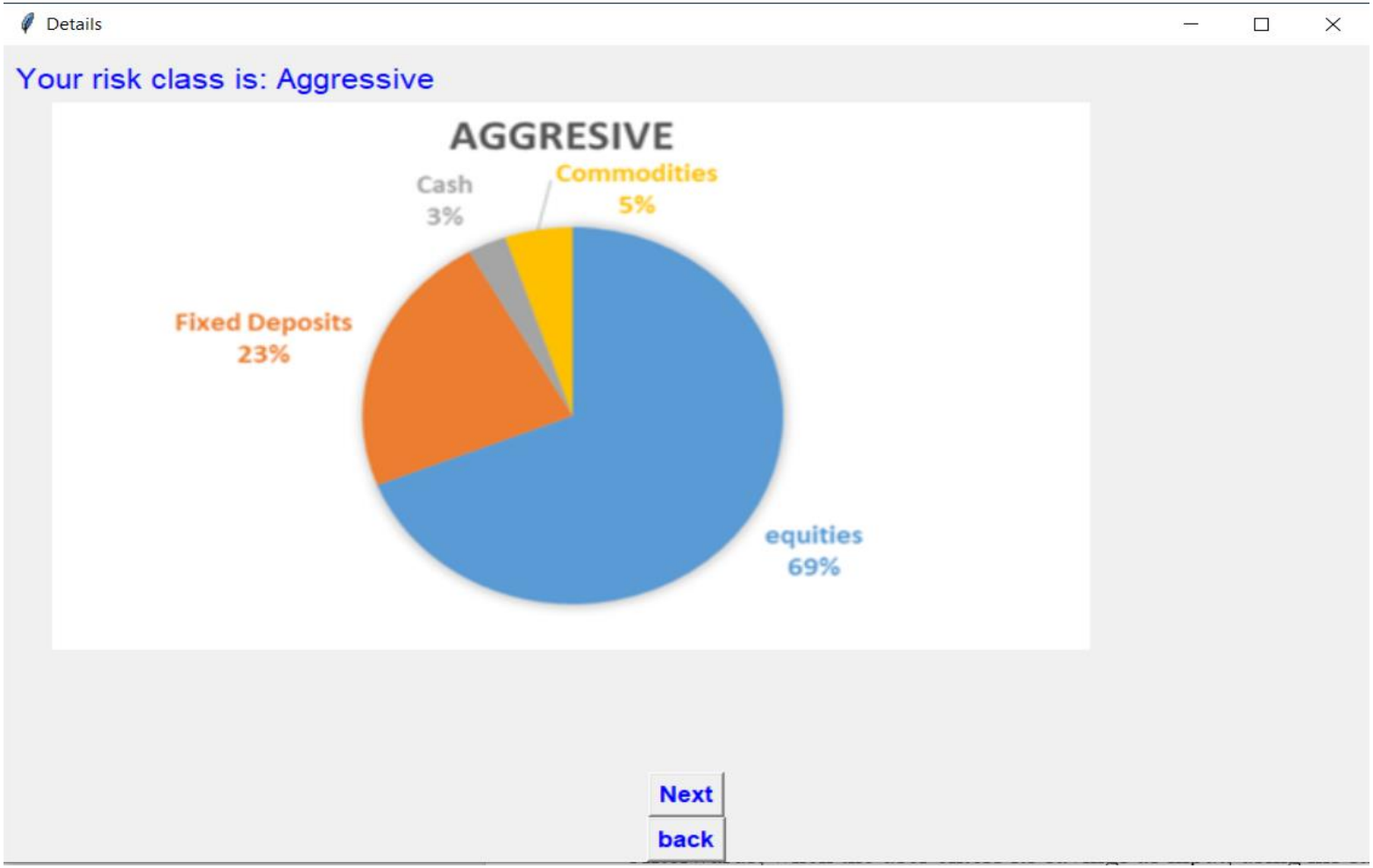

Question 11/20
After your first year at a small fast growing company, you are offered the following bonus choices. Which one would you choose?
back
next
Stock in the company currently worth $25,000 with the hope of selling out later at a large profit
A $25,000 bonus
A five year employment contract

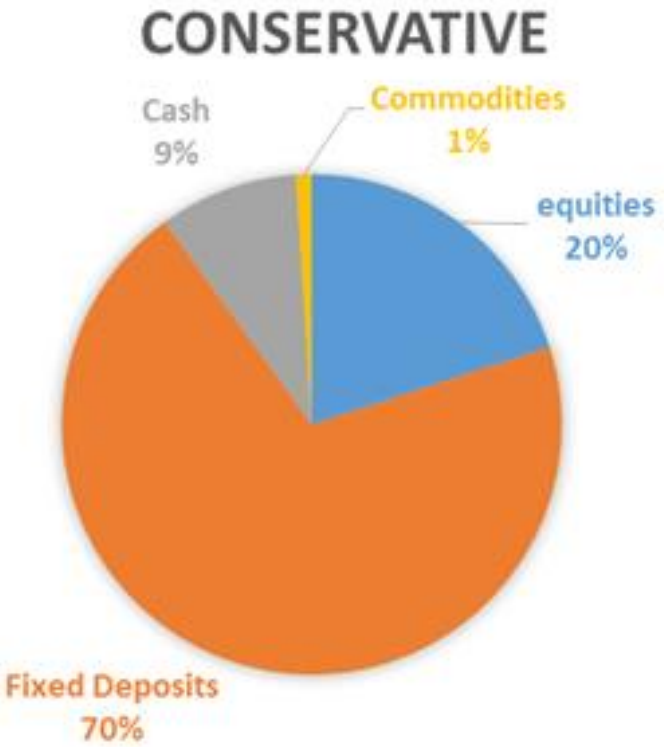
6

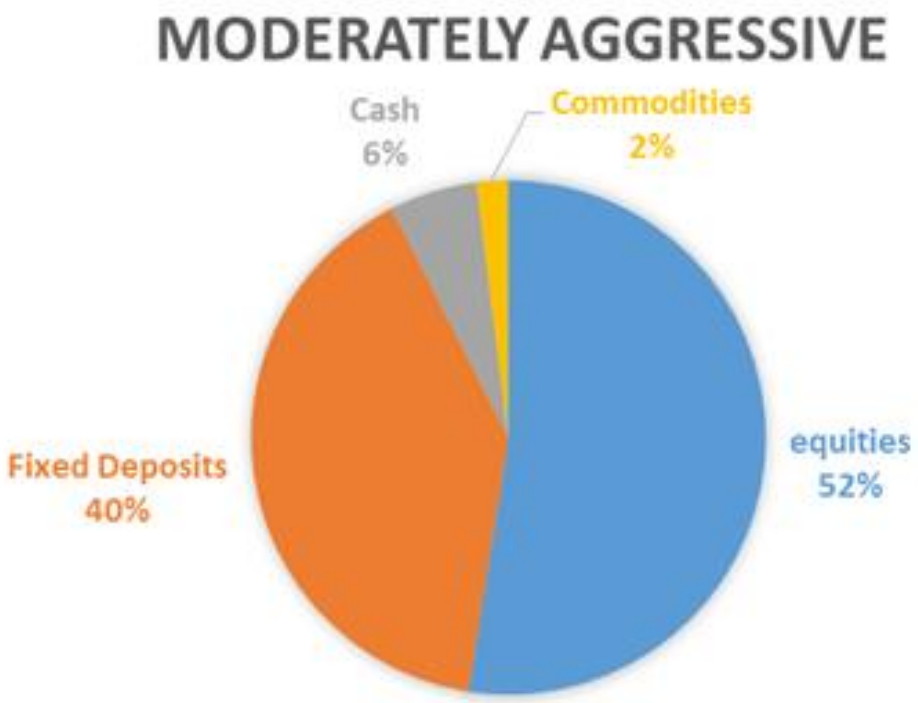
Result: A risk analysis score

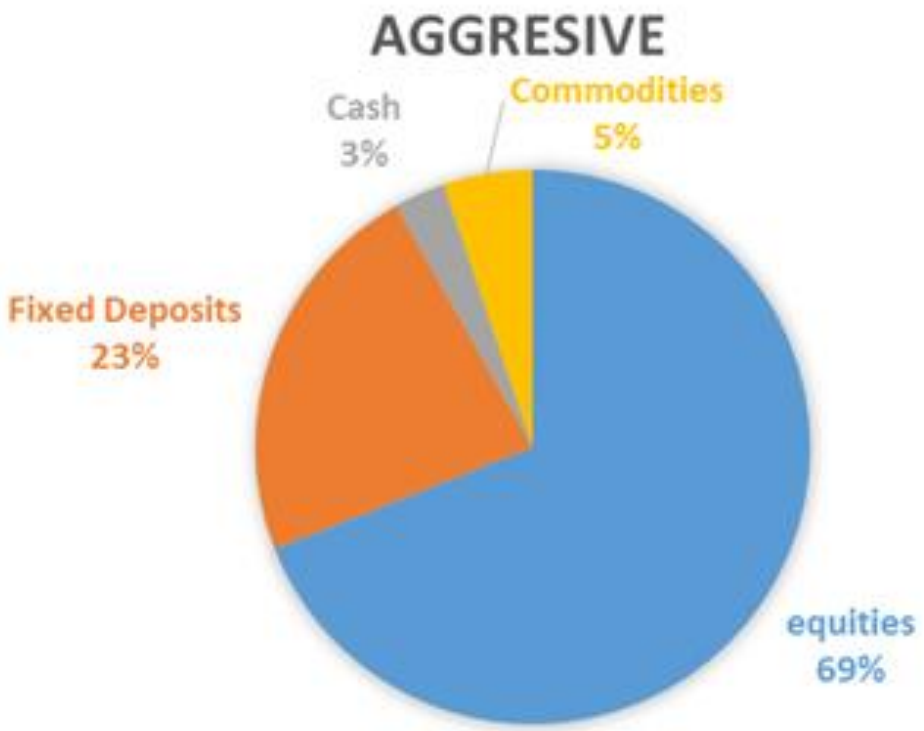


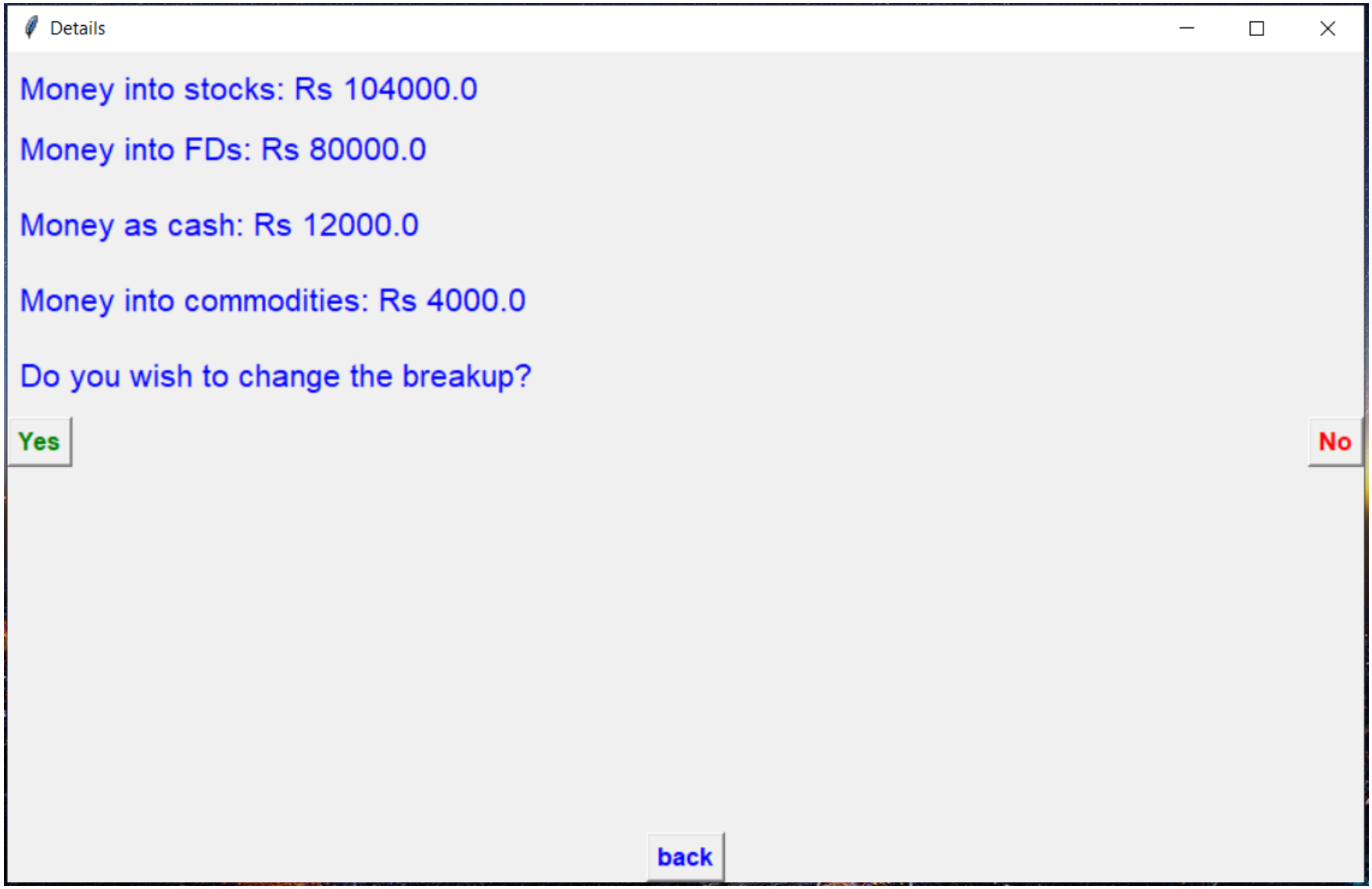
- Score is out of 69
- Magnitude of risk the user can take
- Further Classification into one of the three classes:
  - 1-30: Conservative
  - 31-55: Moderately Aggressive
  - 56-69: Aggressive


Details
Your risk class is: Aggressive
AGGRESIVE
Cash
3%
Commodities
5%
Fixed Deposits
23%
equities
69%
Next
back

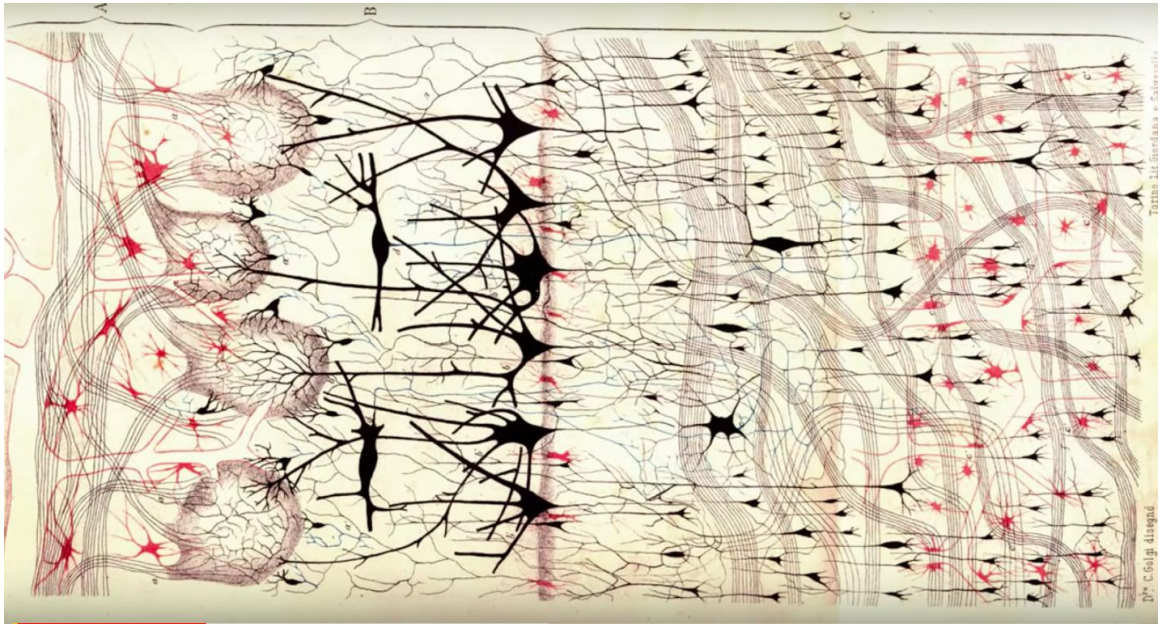

CONSERVATIVE
Cash
9%
Commodities
1%
equities
20%
Fixed Deposits
70%


MODERATELY AGGRESSIVE
Cash
6%
Commodities
2%
Fixed Deposits
40%
equities
52%


AGGRESIVE
Cash
3%
Commodities
5%
Fixed Deposits
23%
equities
69%

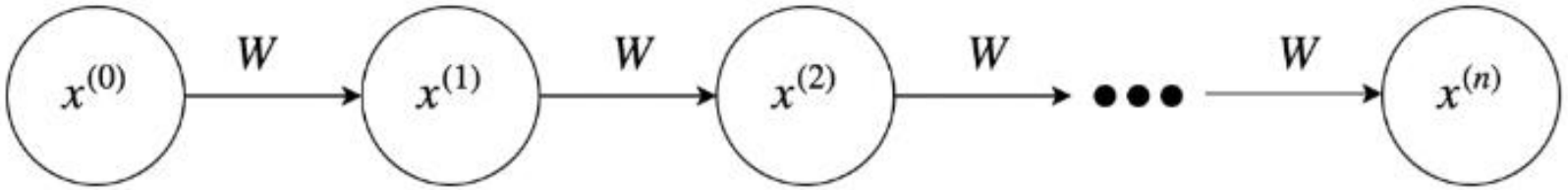

Details
Money into stocks: Rs 104000.0
Money into FDs: Rs 80000.0
Money as cash: Rs 12000.0
Money into commodities: Rs 4000.0
Do you wish to change the breakup?
Yes
No
back

RNN vs LSTM



Why LSTM?

Traditional RNN Drawbacks



$$x^{(n)} = W^n x^{(0)} \qquad x^{(i)}, W \in \mathbb{R}, \; i \in [0, n]$$

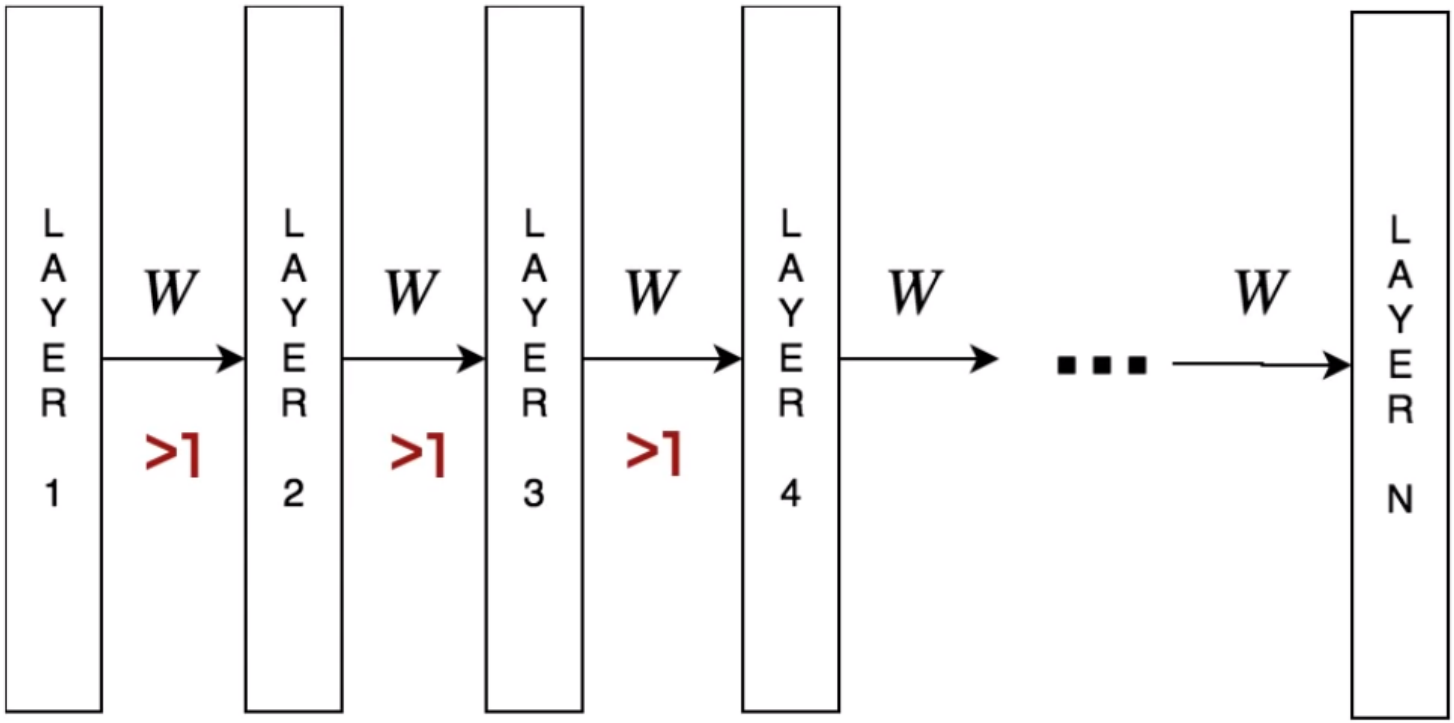
$$W^n x^{(0)} \rightarrow \begin{cases} \infty; & W > 1 \\ 0; & W < 1 \end{cases}$$

new weight = weight - learning rate*gradient

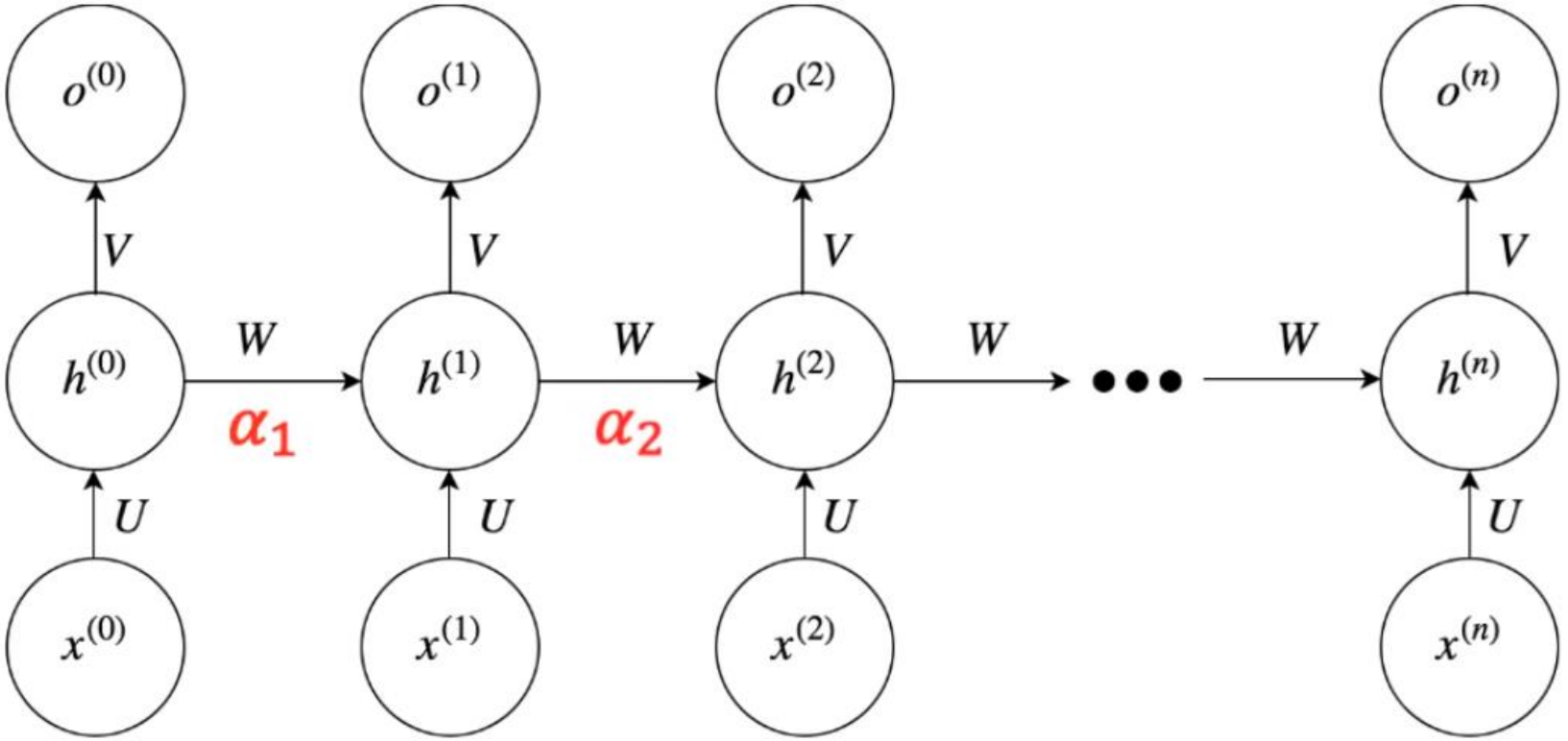
2.0999 = 2.1 - 0.001

Not much of a difference

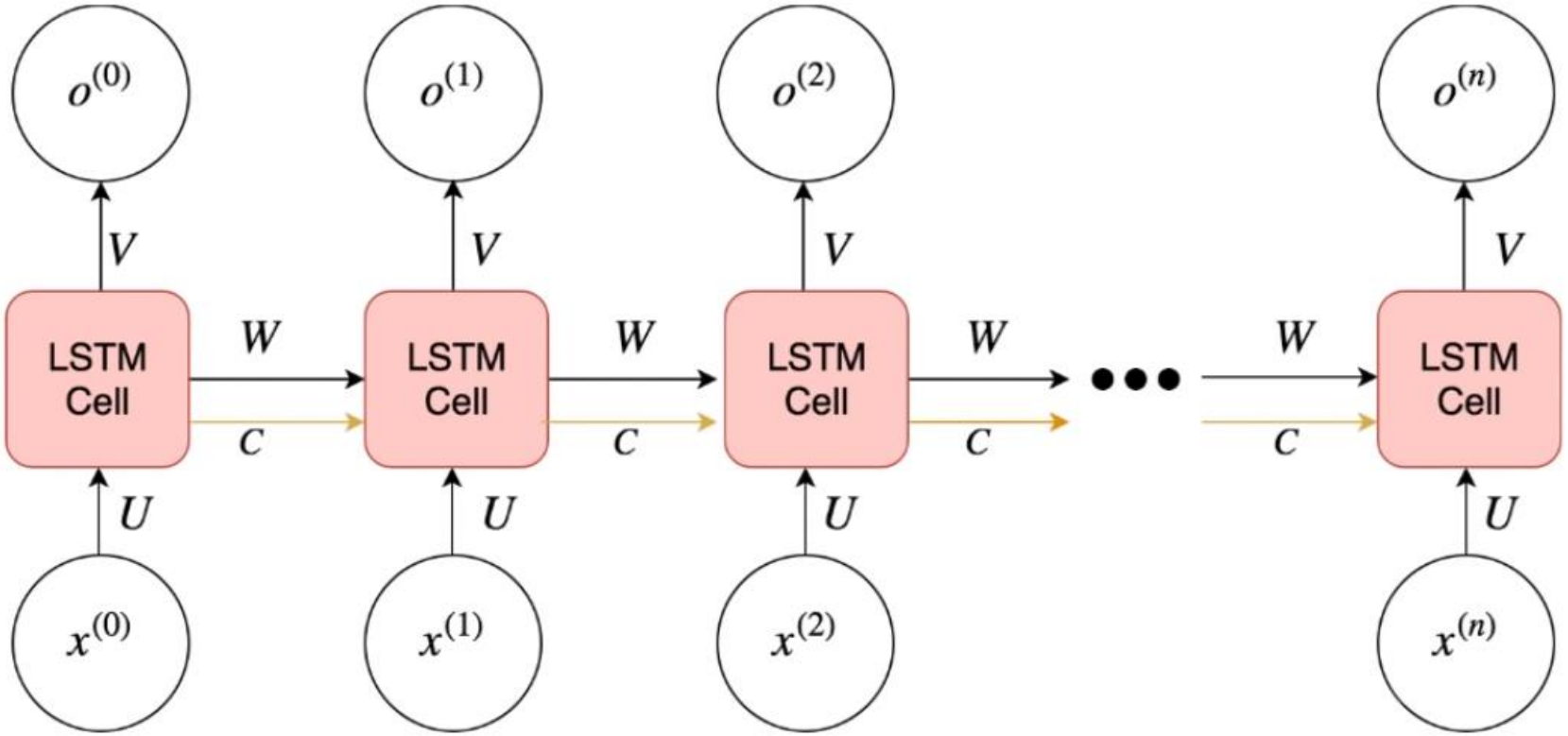
update value



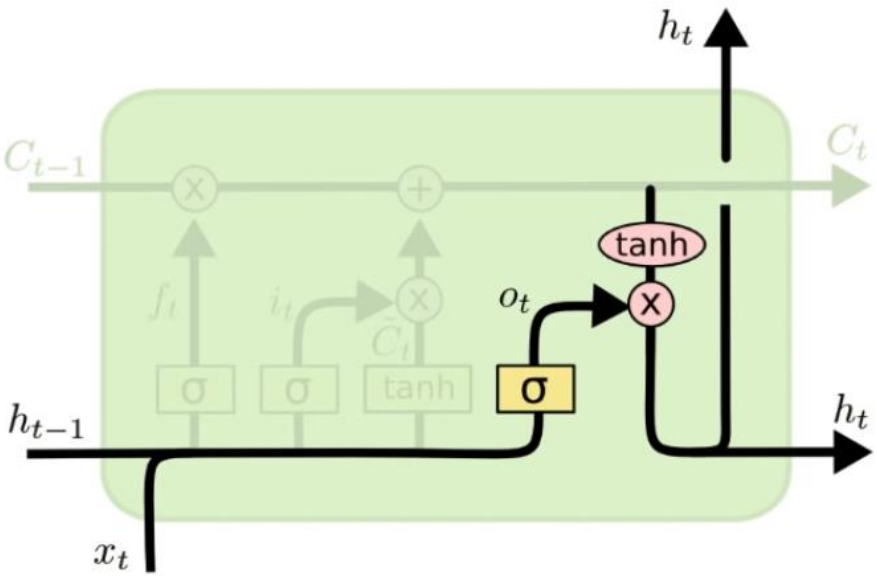
Solution: Gated RNN's



LSTM a Gated RNN!



Cell State



Three Gates of LSTM Cell:

- **Input Gate** Is Cell Updated?

$$i^{(t)} = \sigma\left(W^i\left[h^{(t-1)}, x^{(t)}\right] + b^i\right)$$

- **Forget Gate** Is memory set to 0?

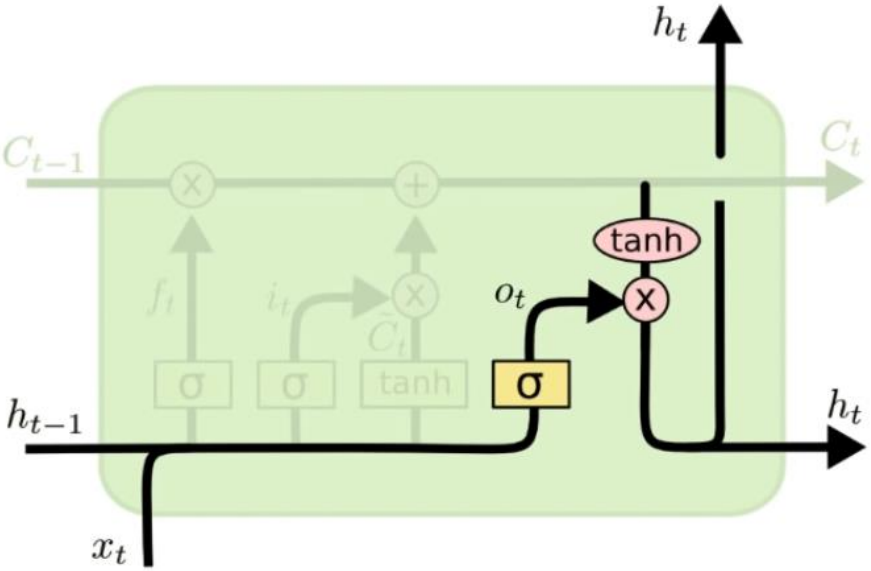
$$f^{(t)} = \sigma\left(W^f\left[h^{(t-1)}, x^{(t)}\right] + b^f\right)$$

- **Output Gate** Is current info visible?

$$o^{(t)} = \sigma\left(W^o\left[h^{(t-1)}, x^{(t)}\right] + b^o\right)$$

28

Cell State Gates



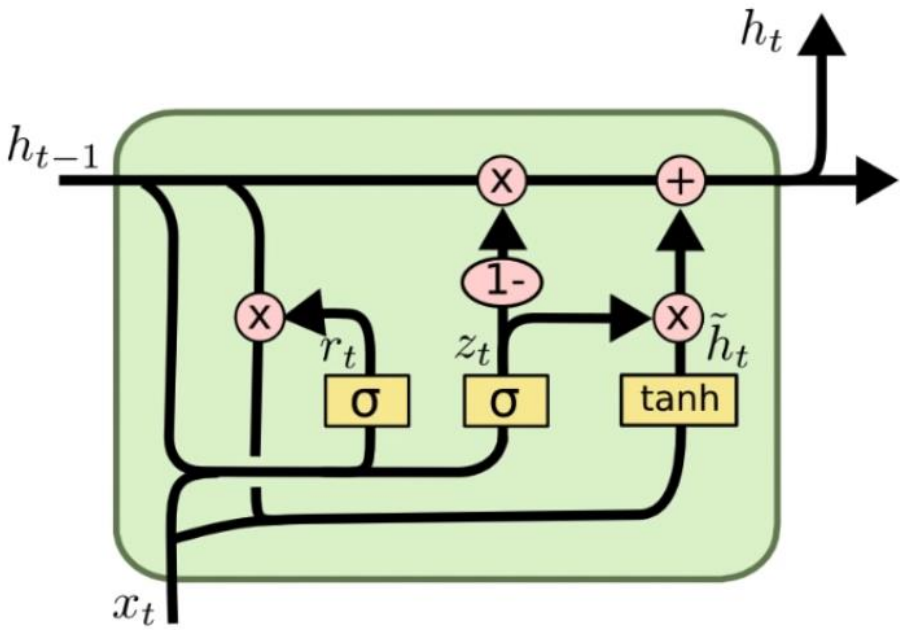
$$\bar{C}^{(t)} = \tanh\left(W^C\left[h^{(t-1)}, x^{(t)}\right] + b^C\right)$$

$$C^{(t)} = f^{(t)}C^{(t-1)} + i^{(t)}\,\bar{C}^{(t)}$$

$$h^{(t)} = \tanh\left(C^{(t)}\right) \times o^{(t)}$$

LSTM Parameters: $b^i, W^i, b^f, W^f, b^C, W^C, b^o, W^o$

GRU



TWO Gates of GRU Cell:

- Update Gate

$$z^{(t)} = \sigma\left(W^z\left[h^{(t)}, x^{(t)}\right] + b^z\right)$$

- Reset Gate

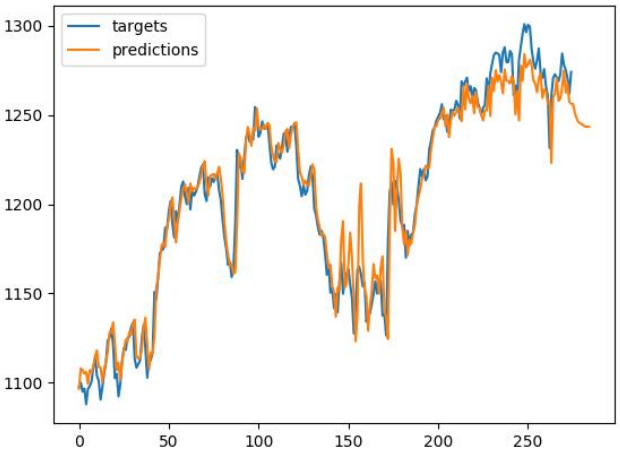
$$r^{(t)} = \sigma\left(W^r\left[h^{(t)}, x^{(t)}\right] + b^r\right)$$

Stocks

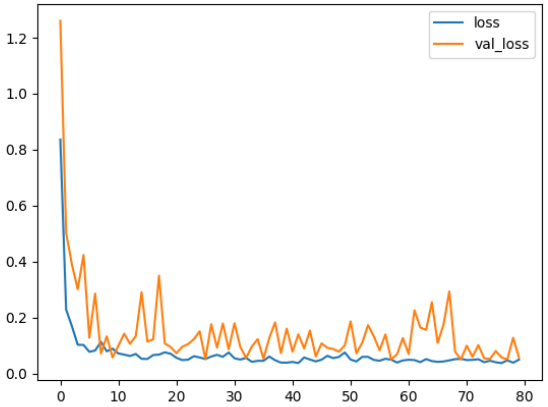
Index Funds
Mutual Funds

	0
0	1256.253
1	1251.59
2	1248.262
3	1246.127
4	1245.399
5	1244.86
6	1244.051
7	1243.519
8	1243.444
9	1243.382

Predicted Values



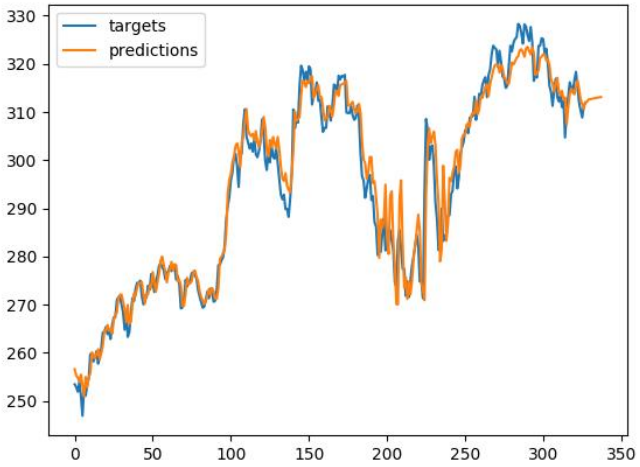
Stock Prediction (HDFCNIFETF.NS)



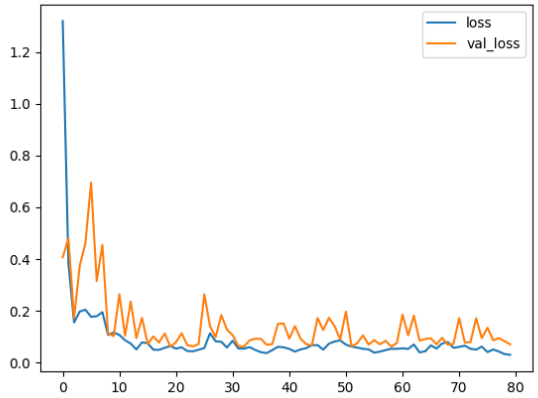
Mean Square Error

	0
0	312.0935
1	312.5988
2	312.6568
3	312.7124
4	312.8123
5	312.8834
6	312.945
7	313.0035
8	313.0575
9	313.1068

Predicted Values



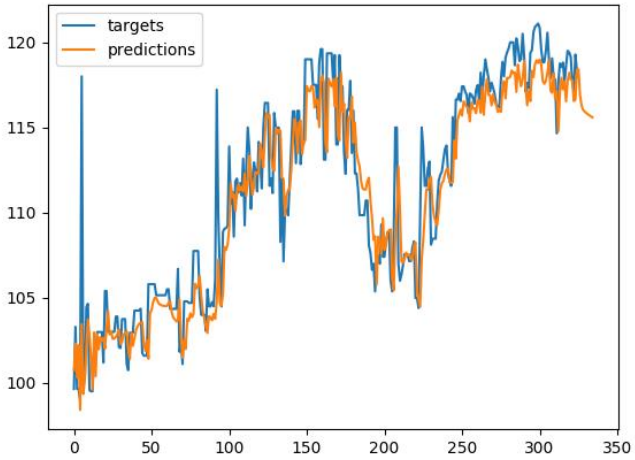
Stock Prediction (SETFNIFBK.NS)



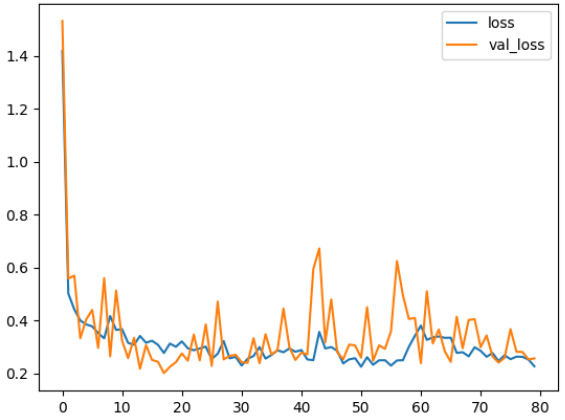
Mean Square Error

	0
0	118.4092
1	116.8749
2	116.2747
3	116.0247
4	115.9326
5	115.843
6	115.7809
7	115.7125
8	115.6498
9	115.5875

Predicted Values



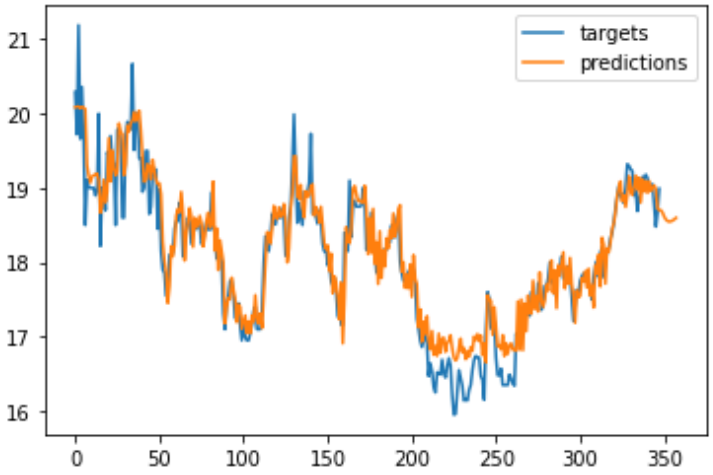
Stock Prediction (M50.BO)



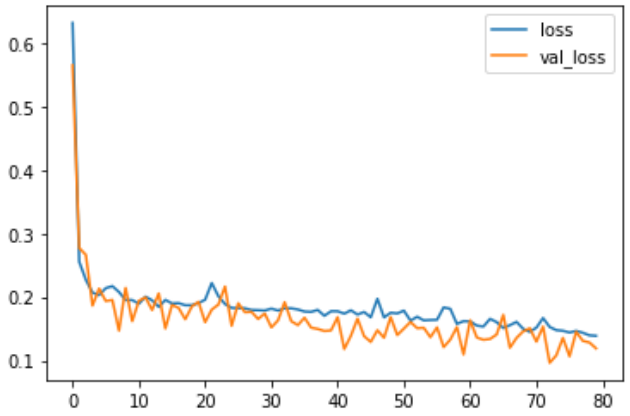
Mean Square Error

	0
0	18.7007
1	18.66626
2	18.61111
3	18.57508
4	18.55444
5	18.54671
6	18.55205
7	18.5633
8	18.57857
9	18.59794

Predicted Values



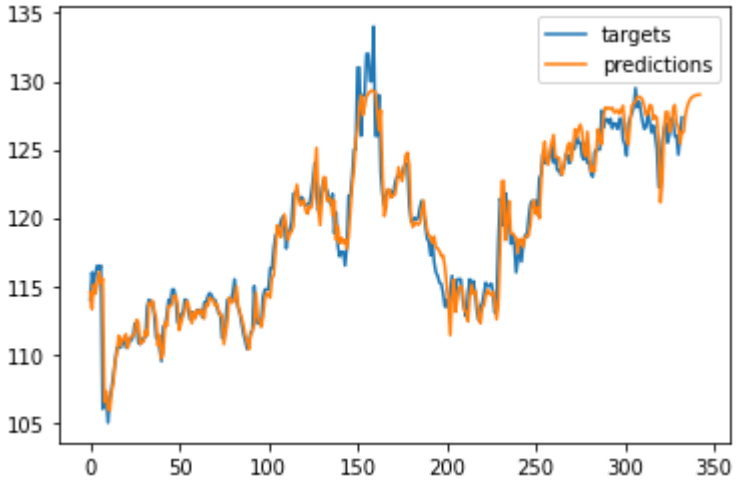
Stock Prediction (M100.BO)



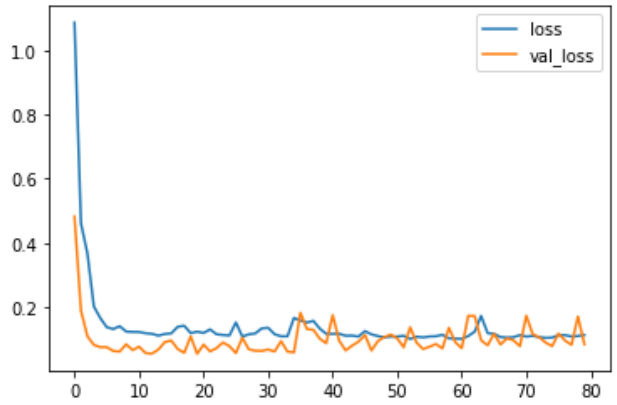
Mean Square Error

	0
0	126.2886
1	127.5186
2	128.1371
3	128.5038
4	128.7281
5	128.856
6	128.9312
7	128.9766
8	129.0047
9	129.0222

Predicted Values



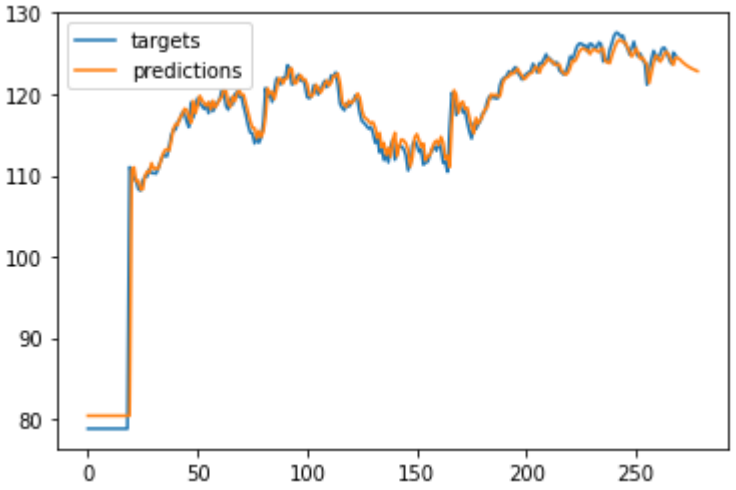
Stock Prediction (SETFBSE100.BO)



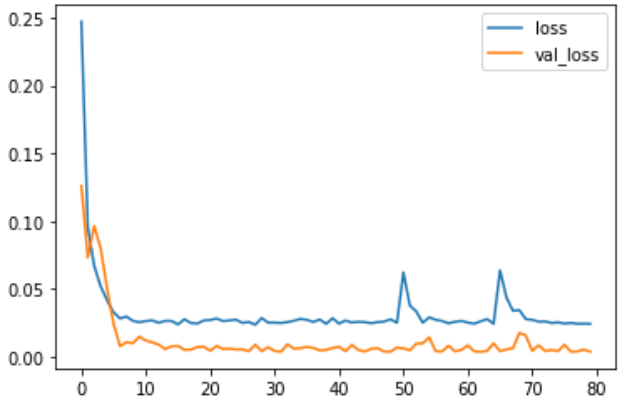
Mean Square Error

	0
0	124.4724
1	124.287
2	123.9966
3	123.7626
4	123.5571
5	123.3772
6	123.2188
7	123.0792
8	122.9561
9	122.8475

Predicted Values



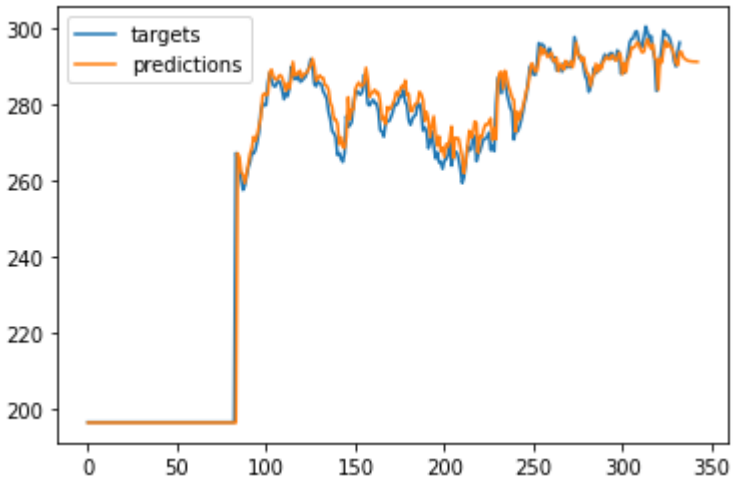
Stock Prediction (SETFNIF50.NS)



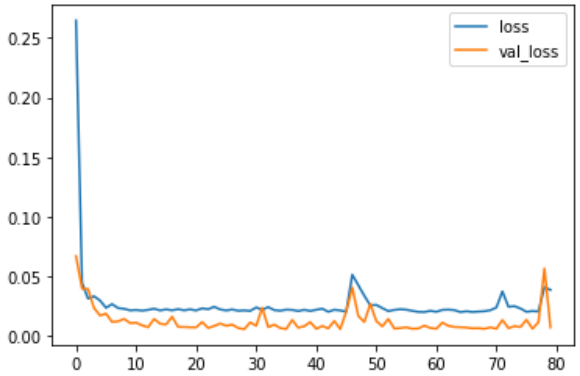
Mean Square Error

	0
0	293.5793
1	292.2597
2	291.7458
3	291.4291
4	291.2429
5	291.1319
6	291.0656
7	291.0258
8	291.002
9	290.9877

Predicted Values

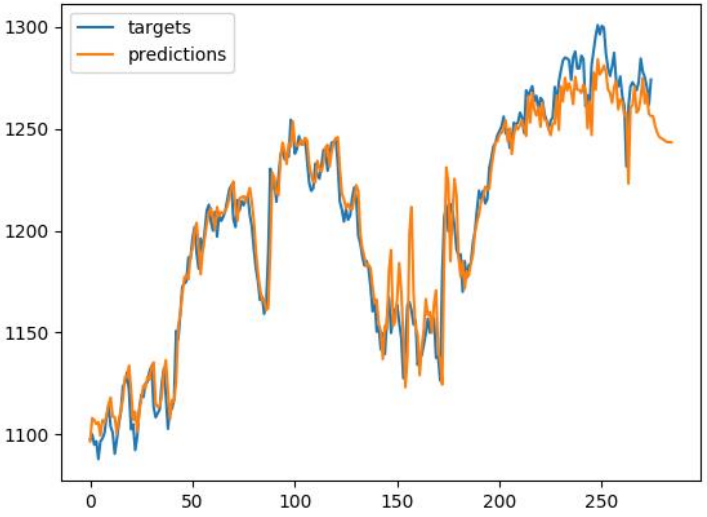


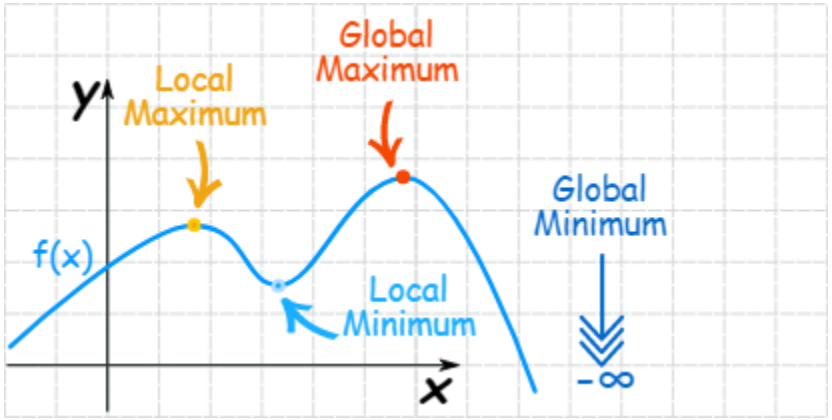
Stock Prediction (SETFNN50.NS)



Mean Square Error

Investing strategy based on predictions





Using DP to Maximise Profits

100	180	260	310	40	535	695

Local Minima	100	40
Local Maxima	310	695

Commodities

Crude Oil

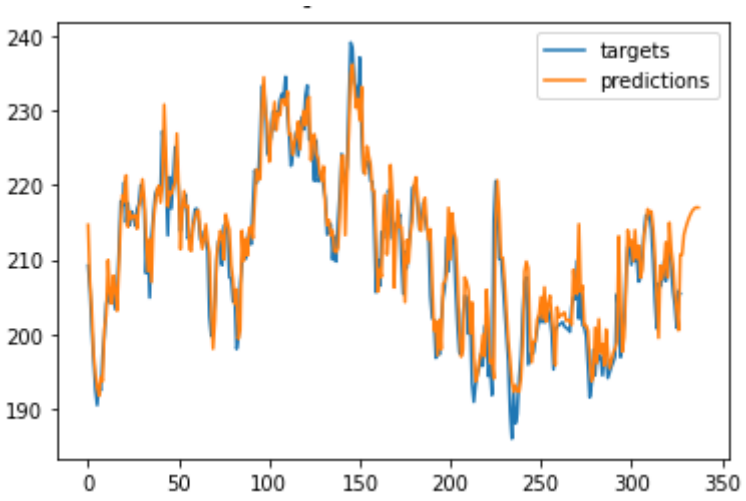
- Dictates Global Economy
- Depends on:
  - current supply in terms of output
  - access to future supply
  - Demand
  - Potential world crises (in OPEC)

Gold

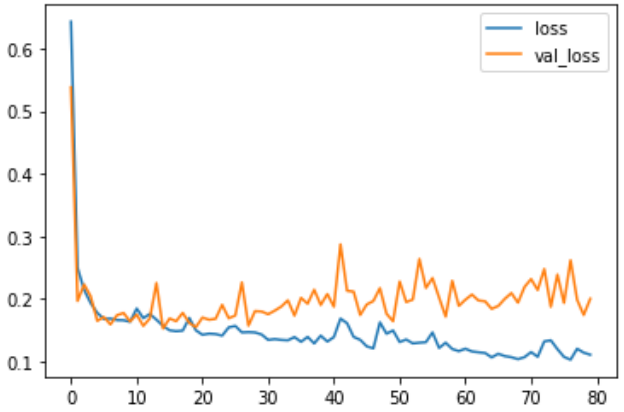
- Tends to move in the direction opp. the market
- Used as a market hedge
- Allocated on the basis of questionnaire

	0
0	210.6702
1	213.3439
2	214.2684
3	215.0629
4	215.7215
5	216.2674
6	216.6724
7	216.9235
8	217.0238
9	216.9844

Predicted Values



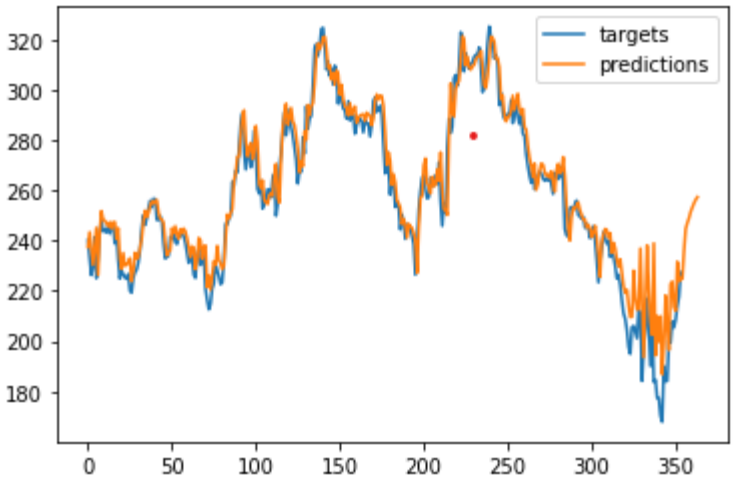
Stock Prediction (AMBUJACEM.NS)



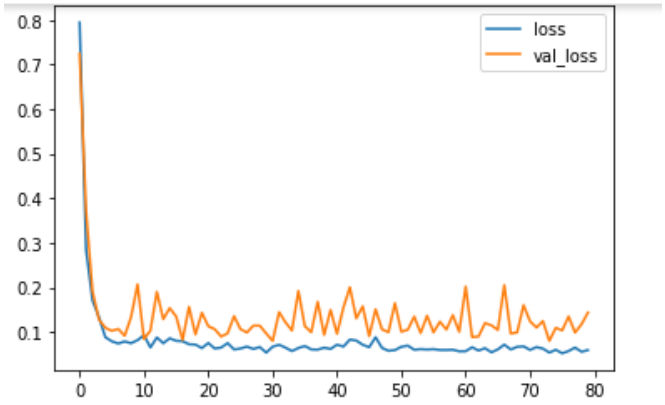
Mean Square Error

	0
0	224.8382
1	236.0543
2	244.7556
3	247.1265
4	249.0646
5	251.5855
6	253.3573
7	255.0003
8	256.3522
9	257.3673

Predicted Values



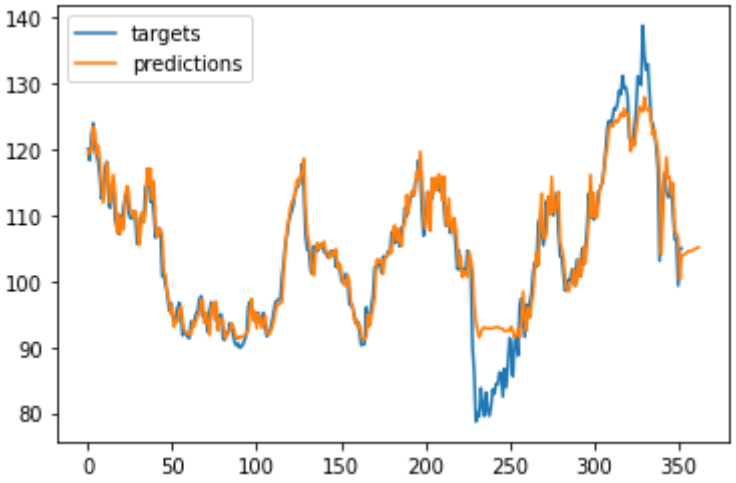
Stock Prediction (HINDPETRO.NS)



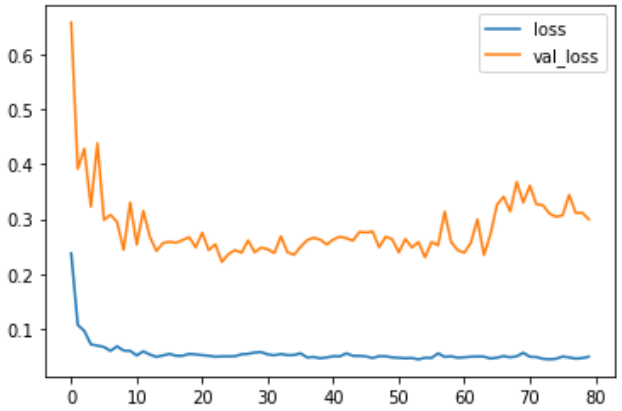
Mean Square Error

	0
0	103.939
1	104.1297
2	104.3534
3	104.5842
4	104.53
5	104.6671
6	104.8003
7	104.907
8	105.0163
9	105.1631

Predicted Values



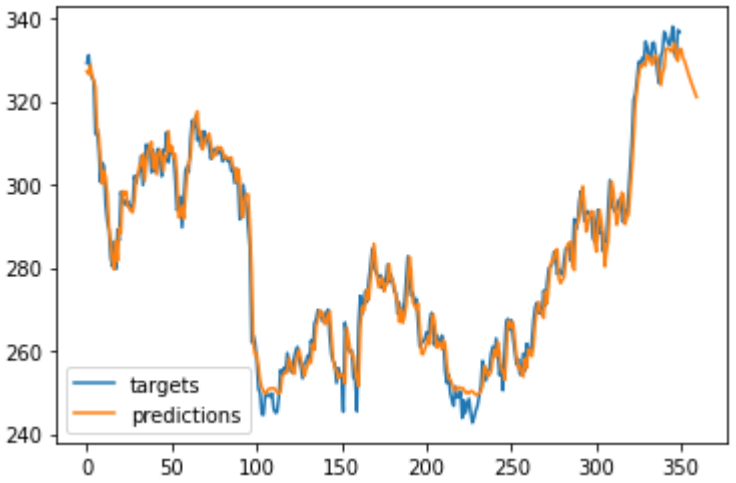
Stock Prediction (NMDC.NS)



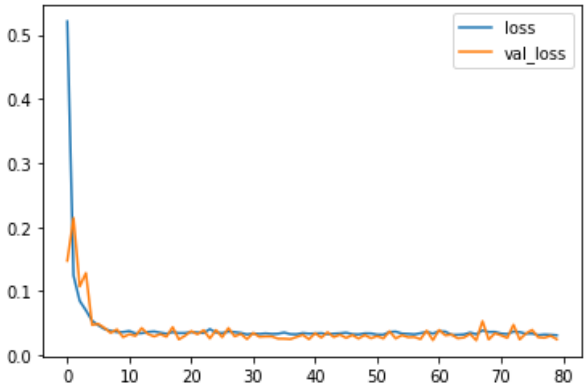
Mean Square Error

	0
0	332.5921
1	330.4983
2	329.7291
3	328.3099
4	326.9422
5	325.6666
6	324.4541
7	323.2947
8	322.1621
9	321.0874

Predicted Values



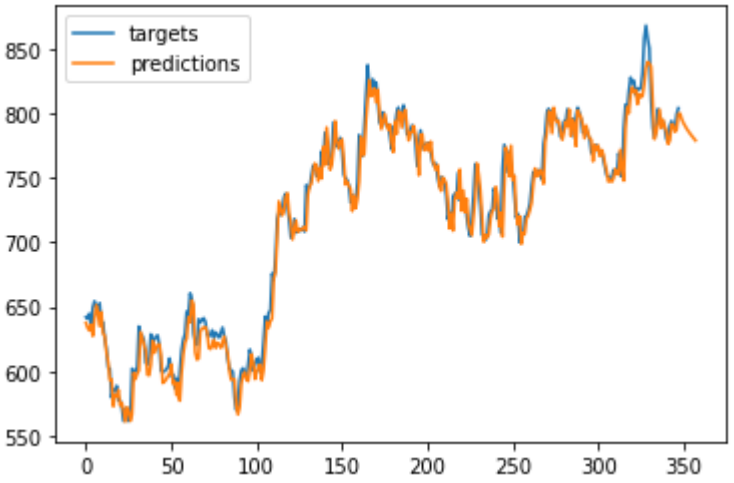
Stock Prediction (TATACHEM.NS)



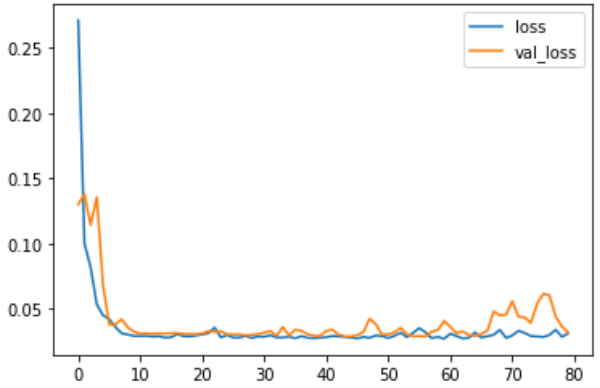
Mean Square Error

	0
0	800.0246
1	795.6107
2	792.6269
3	790.1512
4	788.0056
5	786.0689
6	784.2169
7	782.5464
8	780.8914
9	779.1681

Predicted Values



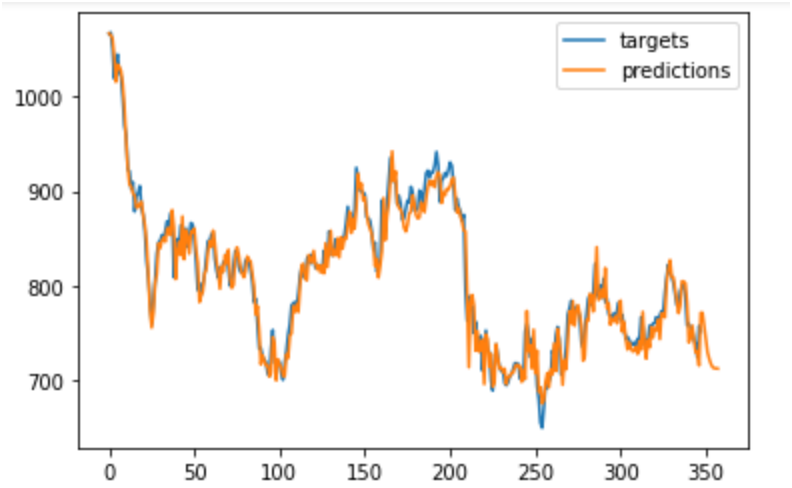
Stock Prediction (RAMCOCEM.NS)



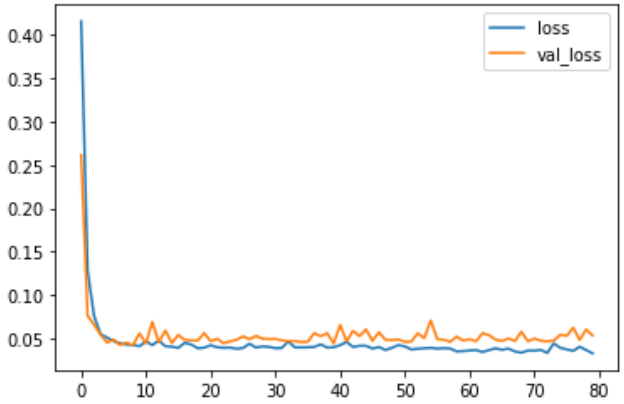
Mean Square Error

	0
0	771.0362
1	756.8341
2	741.4639
3	728.8448
4	721.9846
5	716.5945
6	713.2457
7	712.0552
8	712.1171
9	711.7824

Predicted Values



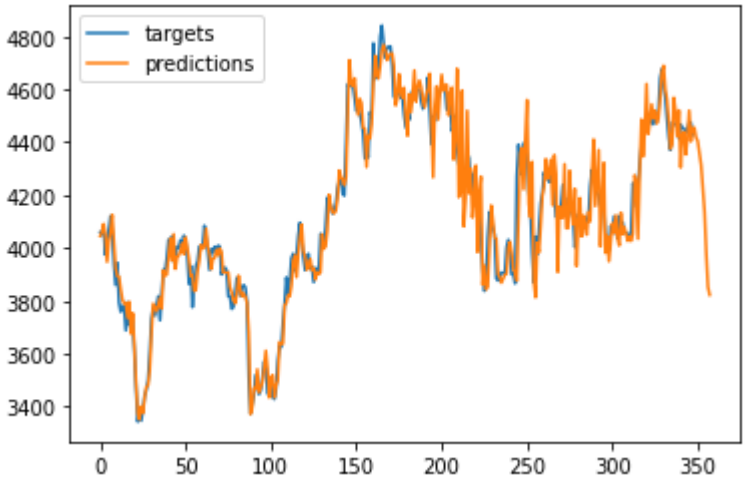
Stock Prediction (GRASIM.NS)



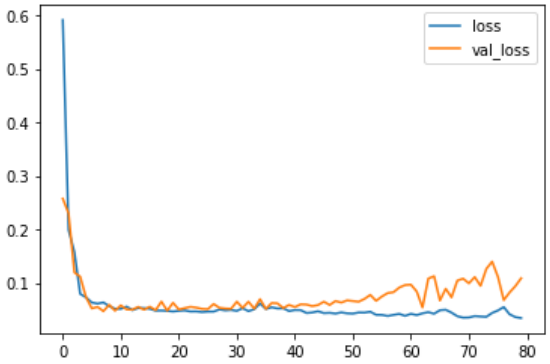
Mean Square Error

	0
0	4514.23
1	4549.246
2	4605.075
3	4614.17
4	4631.175
5	4632.896
6	4633.68
7	4629.086
8	4625.664
9	4619.58

Predicted Values

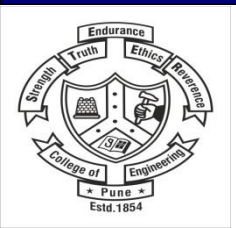


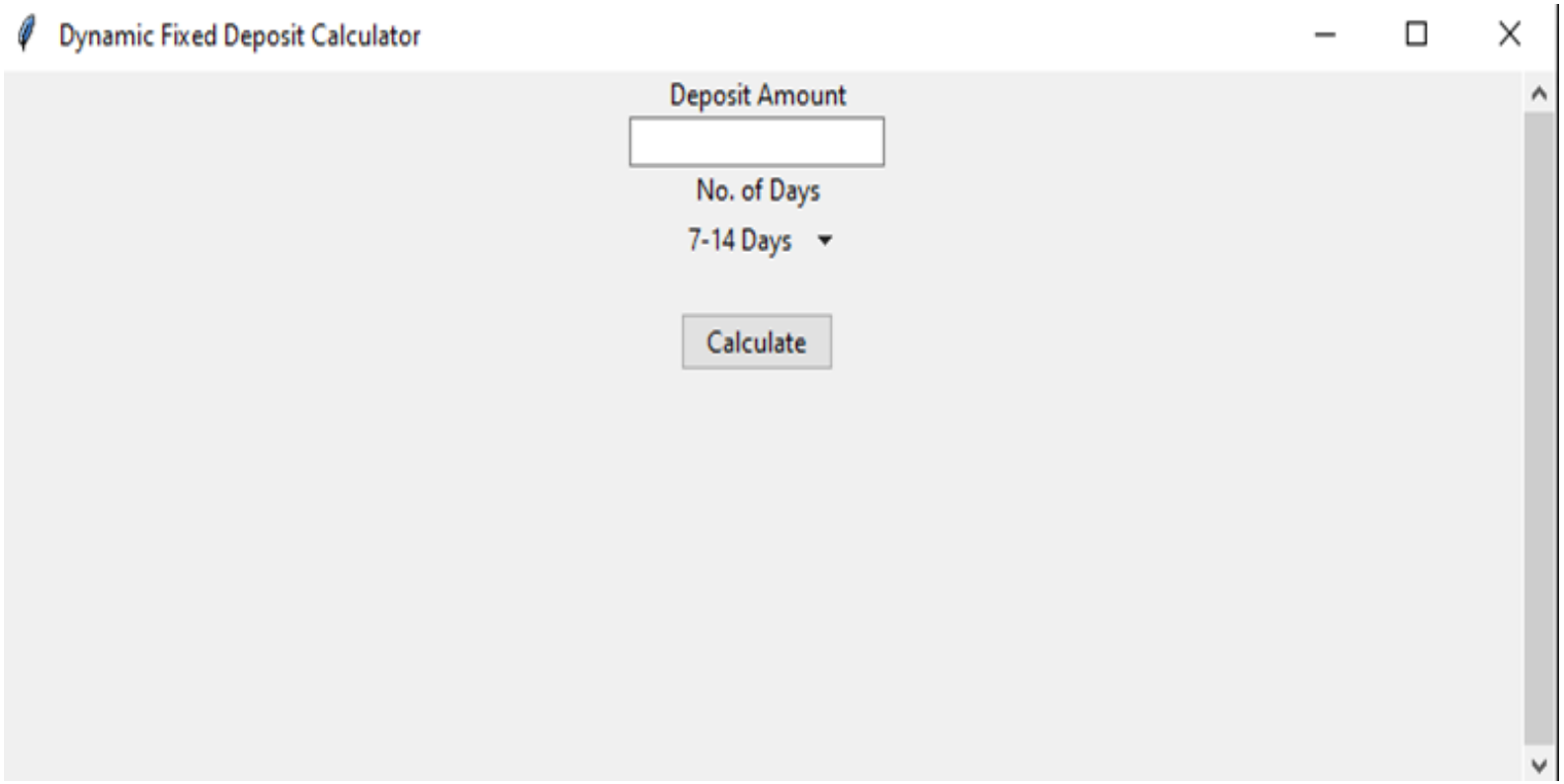
Stock Prediction (ULTRACEMCO.NS)



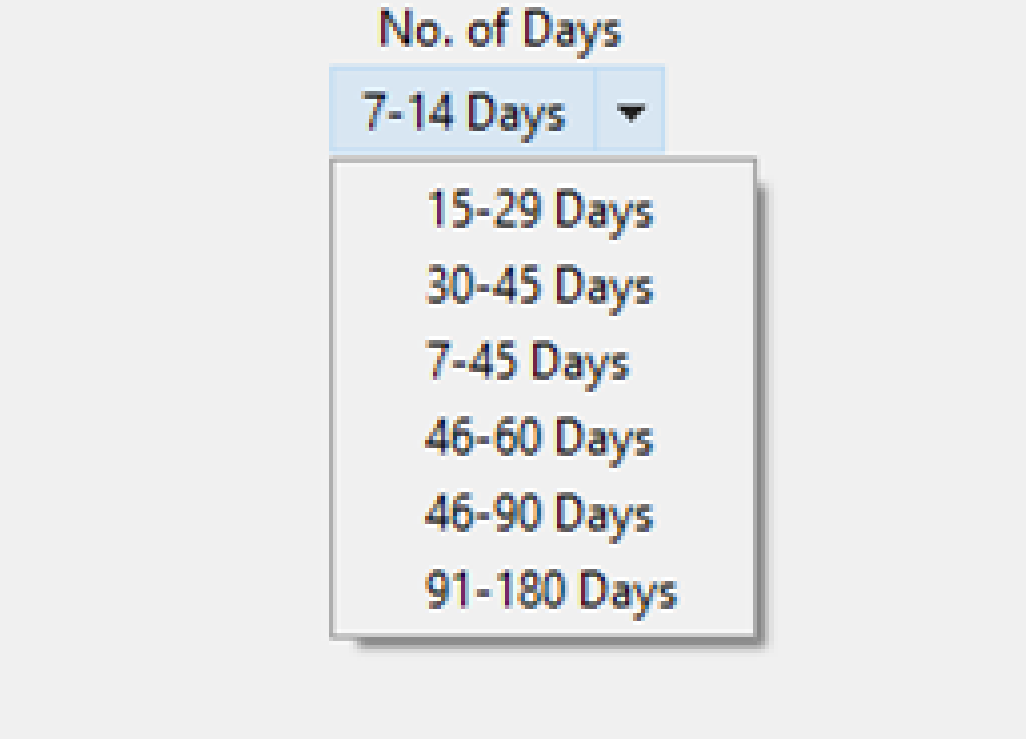
Mean Square Error

Fixed Deposit

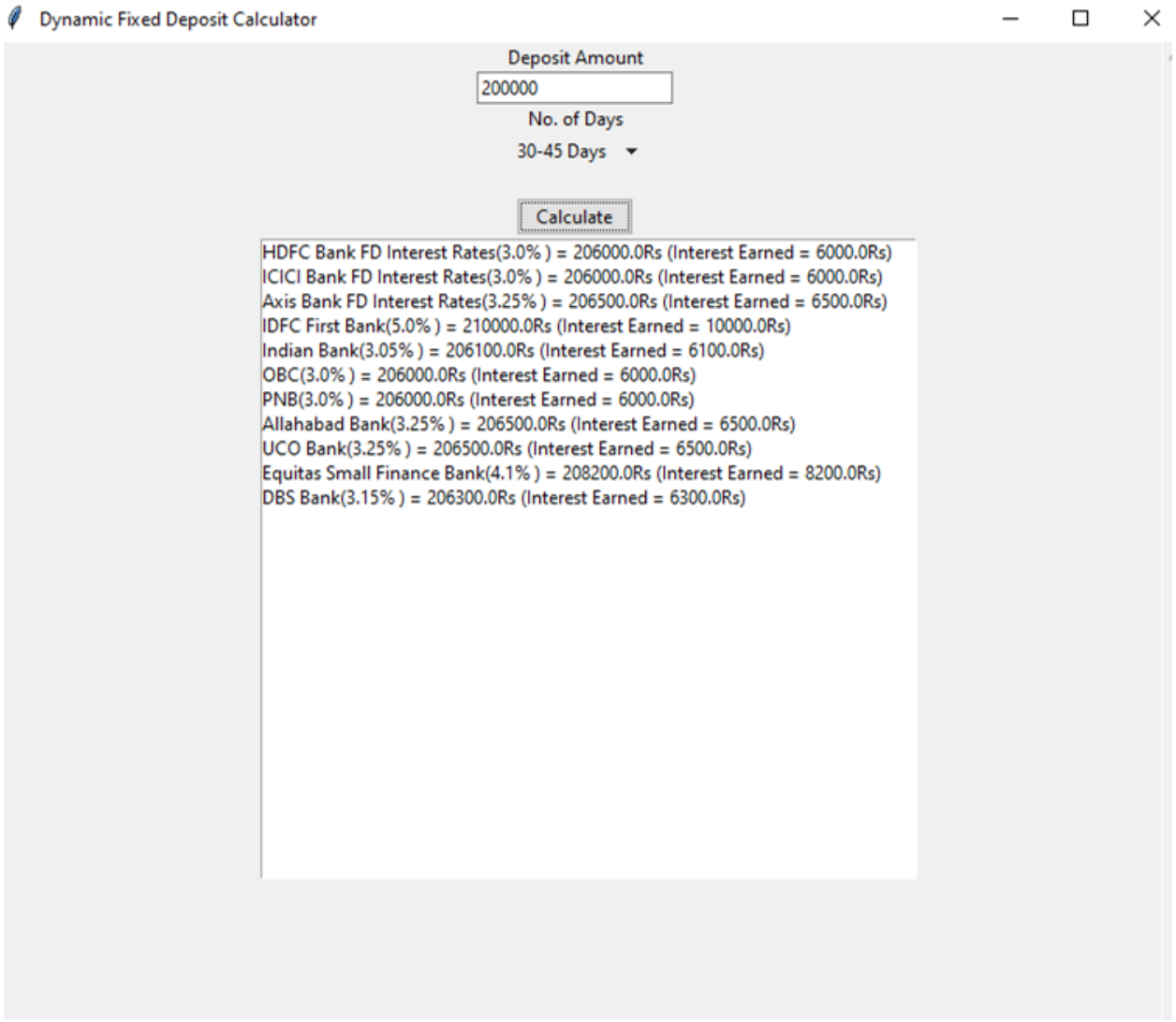



Dynamic Fixed Deposit Calculator
Deposit Amount
No. of Days
7-14 Days
Calculate

Window 1

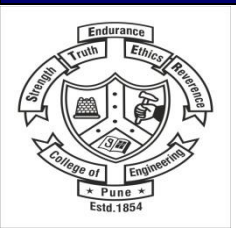

No. of Days
7-14 Days
15-29 Days
30-45 Days
7-45 Days
46-60 Days
46-90 Days
91-180 Days

DropDown

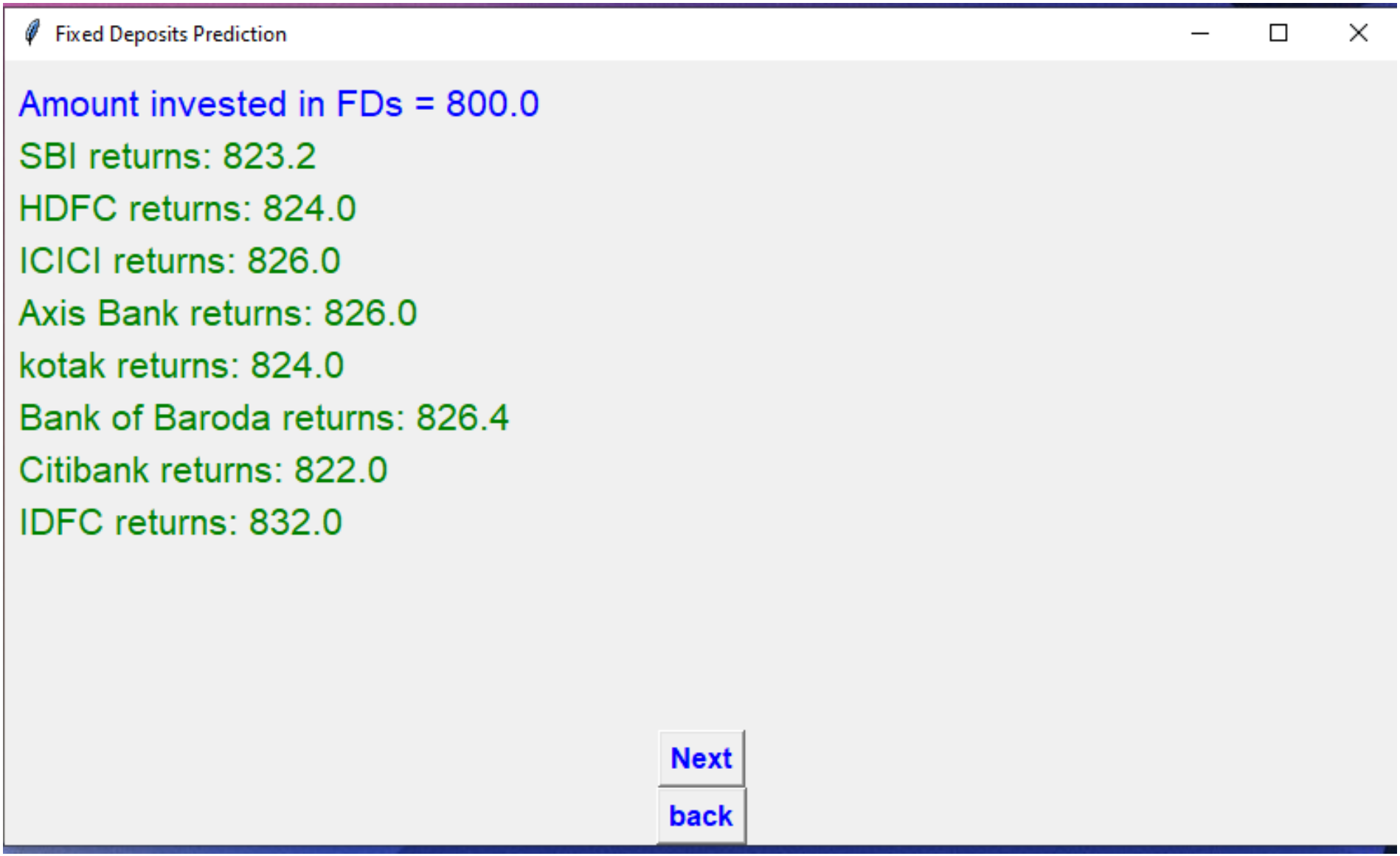

Dynamic Fixed Deposit Calculator
Deposit Amount
200000
No. of Days
30-45 Days
Calculate
HDFC Bank FD Interest Rates(3.0%) = 206000.0Rs (Interest Earned = 6000.0Rs)
ICICI Bank FD Interest Rates(3.0%) = 206000.0Rs (Interest Earned = 6000.0Rs)
Axis Bank FD Interest Rates(3.25%) = 206500.0Rs (Interest Earned = 6500.0Rs)
IDFC First Bank(5.0%) = 210000.0Rs (Interest Earned = 10000.0Rs)
Indian Bank(3.05%) = 206100.0Rs (Interest Earned = 6100.0Rs)
OBC(3.0%) = 206000.0Rs (Interest Earned = 6000.0Rs)
PNB(3.0%) = 206000.0Rs (Interest Earned = 6000.0Rs)
Allahabad Bank(3.25%) = 206500.0Rs (Interest Earned = 6500.0Rs)
UCO Bank(3.25%) = 206500.0Rs (Interest Earned = 6500.0Rs)
Equitas Small Finance Bank(4.1%) = 208200.0Rs (Interest Earned = 8200.0Rs)
DBS Bank(3.15%) = 206300.0Rs (Interest Earned = 6300.0Rs)

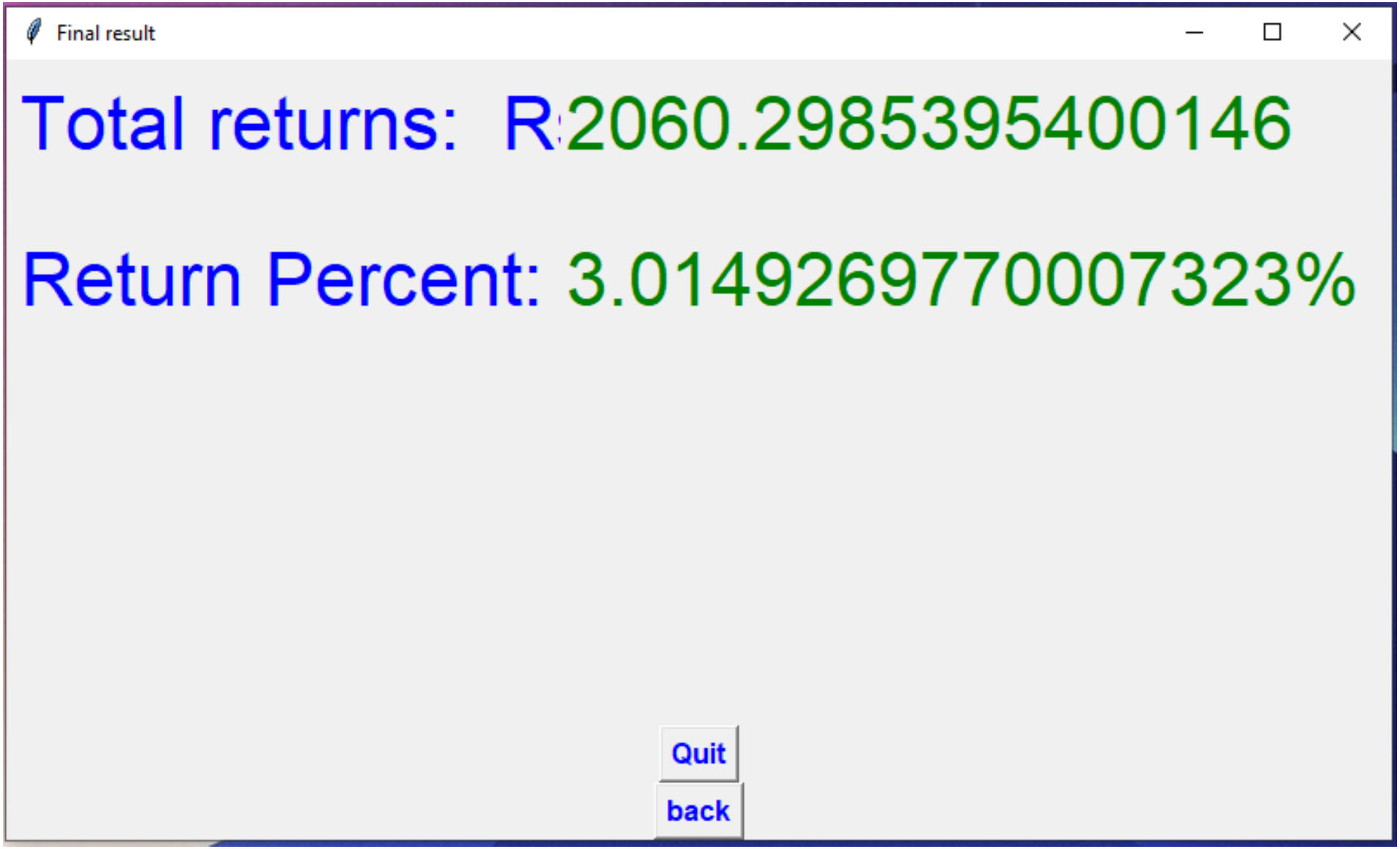
Results

Investments based on our Algorithms

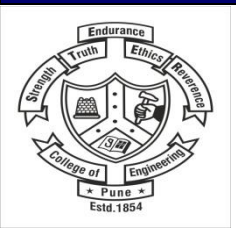


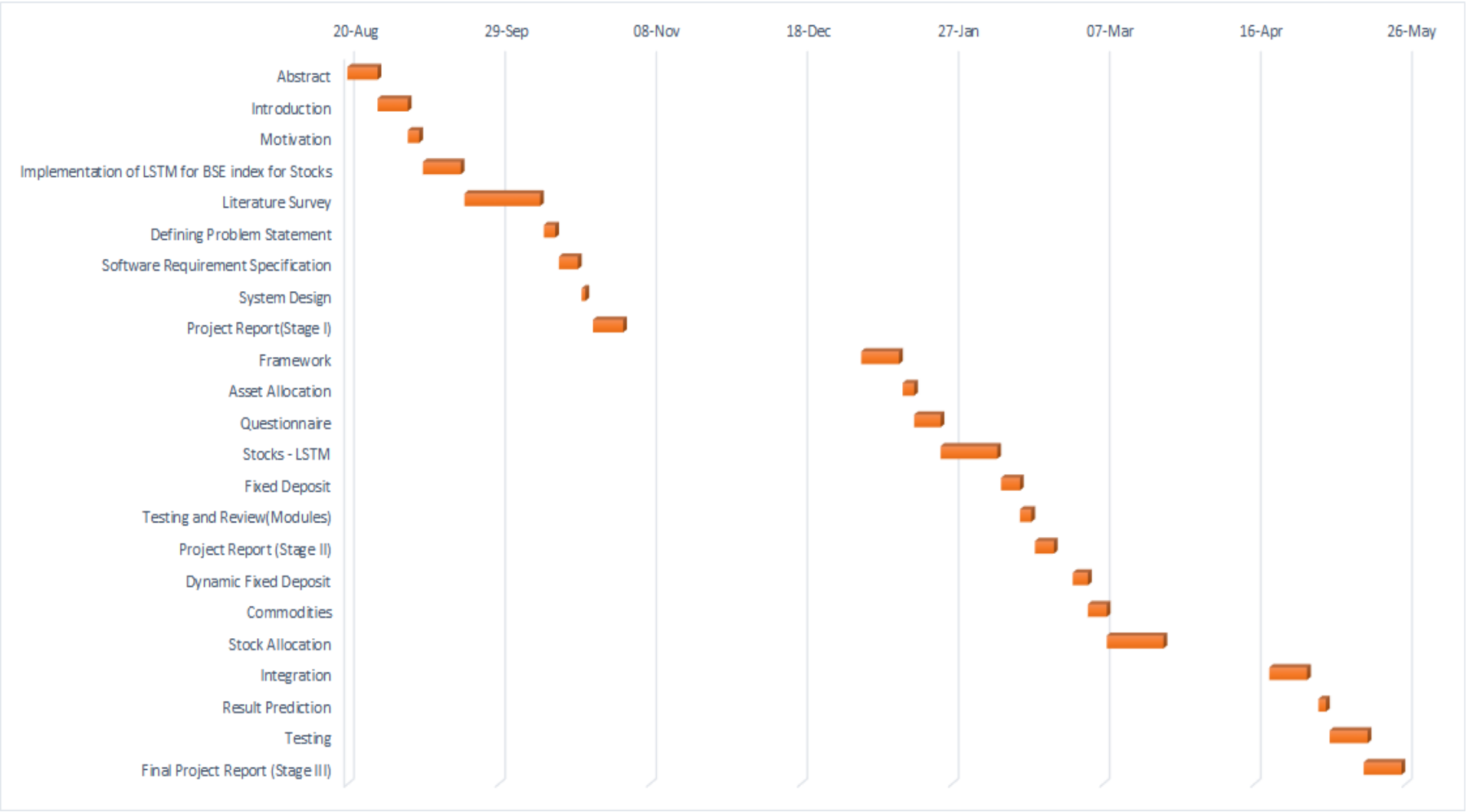

Stocks and Commodities Prediction
Amount invested in Stocks = 1040.0
HDFC returns: Not profitable
M50 returns: Not profitable
M100 returns: 1042.8728236121792
SETFBSE returns: 1062.5114270275053
NIFBK returns: 1043.3765911253658
Amount invested in Commodities = 40.0
Ambuja returns: 41.20634940776128
HindPetro returns: 45.78711251250934
Grasim returns: 40.00347564488788
TataChem returns: Not profitable
NMDC returns: 40.49204592594784
Next
back


Fixed Deposits Prediction
Amount invested in FDs = 800.0
SBI returns: 823.2
HDFC returns: 824.0
ICICI returns: 826.0
Axis Bank returns: 826.0
kotak returns: 824.0
Bank of Baroda returns: 826.4
Citibank returns: 822.0
IDFC returns: 832.0
Next
back


Final result
Total returns: R:2060.2985395400146
Return Percent: 3.014926977000732 3%
Quit
back

Timeline


Endurance
Truth
Ethics
Reverence
Strength
College of
Engineering
Pune
Estd.1854

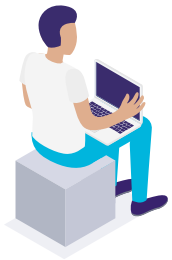

20-Aug
29-Sep
08-Nov
18-Dec
27-Jan
07-Mar
16-Apr
26-May
Abstract
Introduction
Motivation
Implementation of LSTM for BSE index for Stocks
Literature Survey
Defining Problem Statement
Software Requirement Specification
System Design
Project Report(Stage I)
Framework
Asset Allocation
Questionnaire
Stocks - LSTM
Fixed Deposit
Testing and Review(Modules)
Project Report (Stage II)
Dynamic Fixed Deposit
Commodities
Stock Allocation
Integration
Result Prediction
Testing
Final Project Report (Stage III)

Future Scope

- ★ Investment banks
- ★ Retail banks
- ★ E-wallet Integration
- ★ Credit Rating
- ★ Can Add Futures and Options

THANKS!

Any questions?



References

[1] Dharmaraja Selvathu, Vineet Kumar, Abhishek Mishra, Indian stock market prediction using artificial neural networks on tick data, 2019

[2] Manna Majumder, MD Anwar Hussian, Forecasting of Indian Stock market Index using Artificial Neural Network, 2015

[3] Özgür İcan, Taha buğra Çelik, Stock Market Prediction Performance of Neural Networks: A Literature Review, 2017

[4] Raghav Nandakumar, Uttamraj K R, Vishal R, Y V Lokeswari, Stock Price Prediction Using Long Short Term Memory, 2018

[5] Swetava Ganguli, Jared Dunnmon, Machine Learning for Better Models for Predicting Bond Prices, 2015

[6] Singhal, Tanvi A Study of Factors Influencing Switching Behaviour of Fixed Deposit Investors of Indian Banks, 2015

[7] Ahamed, H. a. , Perception And Behaviour Of Bank Deposit Investors In Tumkur, Karnataka, 2013..

[8] Salam Abdul and Kulsum, Umma, Savings Behavior in India: An Empirical Study. The Indian Economic Journal. Vol. 50, Issue 1, 2002

[9] Gaurav Kabra, P. K.. , Factors Influencing Investment Decision of Generations in India: An Econometric Study. Asian Journal of Management Research, 2010

[10] Brian J. Scott, CFA; James Balsamo; Kelly N. McShane; Christos Tasopoulos, The global case for strategic asset allocation and an examination of home bia, 2017

[11] Julie R. Agnew and Lisa R. Szykman, Asset Allocation and Information Overload: The Influence of Information Display, Asset Choice, and Investor Experience, 2005

[12] John P. Hussman, Strategic Allocation White Paper, 2019

[13] https://www.investopedia.com/terms/i/investing.asp last accessed on 17th October 2019

[14] https://www.investopedia.com/financial-edge/0312/how-commodities-predict-market-movement.aspx last accessed on 21st October 2019

[15] https://www.investopedia.com/articles/economics/08/determining-oil-prices.asp last accessed on 1st November 2019

[16] https://www.investopedia.com/articles/investing/112514/monte-carlo-simulation-basics.asp last accessed on 15th November 2019

[17] https://www.investopedia.com/articles/07/montecarlo.asp last accessed on 15th November 2019

[18] https://towardsdatascience.com/illustrated-guide-to-lstms-and-gru-s-a-step-by-step-explanation-44e9eb85bf21 last accessed on 21st January 2020

[19] https://static.arnaudsylvain.fr/2017/03/Grable-Lyton-1999-Financial-Risk-revisited.pdf2017last accessed on 15th February 2020