



# Share Market Analysis and Prediction System using Machine Learning

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## Abstract:

Share Market investment is often believed to be fraught with risk and uncertainty. It is a dynamic system where even small news can have drastic effect on the share price. It is a place where a right investment can make you millionaire and at the same time a wrong one can make you lose all your hard earned money. The essence of making right investment lies in careful examination of company data already available and finding certain share movement patterns. The proposed system would automate these tasks and recommend investment friendly shares taking into account both its fundamental and technical factors. Further machine learning would be used to predict stock trend using Artificial Neural Network. This would provide a more balanced view of share performance and reduce the risk the investors face in this dynamic world of share trading.

**Keywords:** fundamental, technical, artificial neural network.

## I.INTRODUCTION

A share market is the aggregation of buyers and sellers of shares. Trade in share markets means exchange of money for a share or security from a seller to a buyer or vice versa. This requires these two parties to agree on a price. Equities (stocks or shares) confer an ownership interest in a particular company. Participants in the share market range from small individual share investors to large traders, who can be based anywhere in the world, and include banks, insurance companies or pension funds. Participants are generally subdivided into three distinct sectors: households, institutions, and foreign traders. Their buy or sell orders may be executed on their behalf by a share exchange trader. The purpose of a share exchange is to facilitate the exchange of securities between buyers and sellers, thus providing a marketplace. The exchanges provide real-time trading information on the listed securities, facilitating price discovery. History has shown that the price of shares and other assets is an important part of the dynamics of economic activity, and can influence or be an indicator of social mood. An economy where the share market is on the rise is considered to be an up-and-coming economy[1]. The share market is often considered the primary indicator of a country's economic strength and development. Prediction methodologies can be broadly classified into two categories which can (and often do) overlap. They are

1. Fundamental Analysis
2. Technical Analysis (Charting)

### 1. Fundamental analysis

Fundamental Analysts are concerned with the company that underlies the share itself in that they evaluate the company's past performance as well as the credibility of its accounts. Performance ratios are created to aid the fundamental analyst

with assessing the validity of a share, such as the P/E ratio. It is built on the belief that a company needs capital to make progress and if company operates well, it should be rewarded with additional capital. This results in a surge in share price of a company. Fundamental analysis is widely used by fund managers as it is the most reasonable, objective and inferred from publicly available information [2] like financial statements and events in a company like mergers and splits.

### 2. Technical Analysis

Technical analysts, unlike fundamental analysts, or chartists are not concerned with any of the company's fundamentals. They seek to determine the future price of a share based solely on the (potential) trends of the past price (a form of time series analysis). Numerous patterns derived from market data are employed such as the head-and-shoulders or cup-and-saucer. Alongside the patterns, statistical techniques are used such as the Exponential Moving Average (EMA). Candle stick patterns are believed to be first developed by Japanese rice merchants, and nowadays widely used by technical analysts.

### Introduction to Artificial Neural Networks

Artificial neural networks refer to a computational model whose central theme is borrowed from the analogy of biological neural networks. An ANN is formed from hundreds of artificial neurons, connected with coefficients, also called weights, which constitute the neural structure and is layered in its organization. The power of neural computations comes from connecting neurons in a network. Each neuron has weighted inputs, transfer function and one output. The behavior of a neural network is determined by the transfer functions within the hidden layers of its neurons, by the learning rule, and by the architecture itself. The weights are the adjustable parameters. The roots of all work on artificial neural networks are in neurobiological studies that date back to about a century ago. Like biological neurons,

artificial neurons receive inputs and produce an output but they do not accurately model their biological counterparts. Biological neuron stores knowledge in a memory bank, while in an artificial neuron the data or information is distributed through the network and stored in the form of weighted interconnections [3]. The simulation of transformational behavior of biological neurons is done by a nonlinear function. The interconnections between artificial neurons are called weights. Artificial neurons reside in layers. The overall input to the neuron is calculated by  $a = \sum_{i=0}^n w_i x_i$  where  $x_i$  represents the inputs to the neuron and  $w_i$  represents the weights of the neuron. To normalize this sum into a standard range, functions called threshold functions, (sigmoid functions being the most widely preferred one) are used.

## II. LITERATURE SURVEY

Existing Theories in Share Market

### 1. Efficient-market Hypothesis (EMH)

The Efficient Market Hypothesis posits that share prices are a function of information and rational expectations of stakeholders and the public, and that newly revealed information about a company's prospects is almost immediately reflected in the current share price. This would imply that all publicly known information about a company, including its price history, would already have been reflected in the current price of the share. Accordingly, changes in the share price reflect release of new information, changes in the market generally, or random movements around the value.

### 2. Random Walk Theory

Burton Malkiel, in his influential 1973 work "A Random Walk Down Wall Street", claimed that share prices could not be accurately predicted by looking at price history. As a result, Malkiel argued share prices are best described by a statistical process called a "random walk" meaning each day's deviations from the central value are random and unpredictable. This led to the conclusion that paying financial services persons to predict the market actually hurt, rather than helped, the net portfolio return. A number of empirical tests support the notion that the theory applies generally, as most portfolios managed by professional share predictors do not outperform the market average return after accounting for the managers' fees. While the Efficient Market Hypothesis finds favor among financial academics, its critics point to instances in which actual market experience differs from the prediction-of-unpredictability the hypothesis implies. A large industry has grown up around the implication proposition that some analysts can predict shares better than others[4]. Ironically that would be impossible under the Efficient Markets Hypothesis if the share prediction industry did not offer something its customers believed to be of value.

**Existing Applications**

#### 1. Stockal App

Stockal is an Android application available on the Google Play Store which uses Sentiment Analysis from social media sites like Twitter, Facebook etc. to find the sentiment of traders. It displays the confidence of the trader in a particular share. This app lists only the securities under the U.S. stock market.

#### 2. Screener. in

This is a web application which helps the share traders to screen shares based on various aspects like high growth shares,

undervalued shares, highest dividend yielding shares etc. It works simply by querying the database and does not provide any recommendation system. A plus point about this site is that the users can customize the queries based on their need of information.

### 3. EquityBoss.com

It is a very sophisticated web application which recommends if a share has to be bought or sold. It has a lot of features and an excellent user interface but one need to subscribe to various packages to obtain the recommendations which a new user may not be willing to do. This application is pretty close to our concept in terms of the user interface we would like to provide.

## Related Work on ANN in Share Price Prediction

### 1. Stock Price Prediction and Trend Prediction using Neural Networks

Mr. Pritam<sup>[1]</sup> analyzed feed forward network using back propagation learning method with early stopping and radial basis neural network to predict the trend of stock price (i.e. Classification) and to predict the stock price (i.e. value prediction). Fundamental or technical indicators were not used in this research as basic objective of this research was to determine the usability of artificial neural networks in predicting the future prices based on past prices alone.

### 2. Applications of ANNs in Stock Market Prediction: A Survey

This paper surveyed the application of artificial neural networks (ANNs) in stock market prediction and concluded that ANNs has ability to extract useful information from large set of data therefore ANNs play very important role in stock market prediction. Artificial neural networks approach is a relatively new, active and promising field on the prediction of stock price behaviour. ANNs are significantly more accurate than other competitive models and algorithm i.e. genetic algorithm, multiple linear regression analysis models for stock market prediction. Mostly foreign stock market dataset are used by researchers as compared to Indian stock market dataset. Different stock market parameter are used i.e. movement of SET index, fundamental analysis, closing value of the index, moving average crossover inputs, stock share value, daily returns of stock and many others for stock market prediction.

### Scope for Improvement

- Most prediction systems available in market are either based on fundamental or technical analysis alone. But this prediction system will take into account both fundamental and technical factors to provide a more balanced prediction[6].
- The idea of rating a company will help the naive users to interpret the predictions easily as they will not be exposed to technical terms related to share market.
- Since the ratings of the company will be based on the industry averages of that particular company's sector, the ratings thus provided will be more accurate.
- As the project envisages to explore the capabilities of Artificial Neural Network (ANN) in determining a share's future price, it can be further integrated into the web application if it provides satisfactory results.

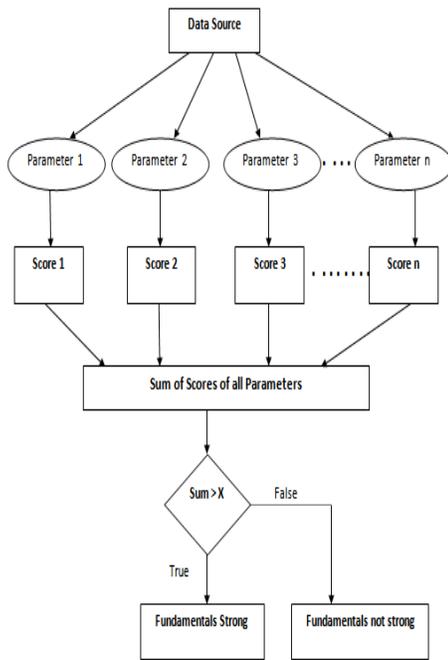
### III.METHODOLOGY

This system focuses mainly on 3 major things.

#### 1. Fundamental Analysis:

Fundamental Analysis was carried out based on four parameters – Price-to-book ratio, Price-to-earnings ratio, Dividend yield (in percent) and Return-On-Investment. These factors were selected since fundamental analysts widely use them to evaluate a share’s strength. To provide the rating, each of these parameters were compared against their industry averages. The ratings were given on a scale of 1 to 10, 1 being an indication of fundamentally weak share and a 10 implies that the particular share is strong fundamentally.

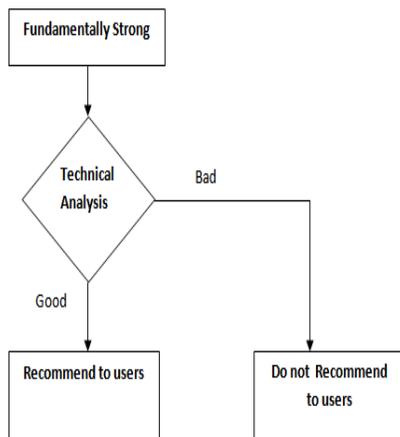
Methodology to find if the share is fundamentally strong or not.



#### 2. Technical Analysis:

In Technical Analysis, ratings were provided based on growth momentum of a share. The ratings were given on a scale of 1 to 10, 1 being an indication of technically weak share and a 10 implies that the particular share is strong technically.

Methodology to determine whether to recommend a share or not.



#### 3. Machine Learning for Price Prediction:

ANN using Feed-forward with Back propagation was used to train the machine to determine the next day’s closing price. Six inputs were identified that were likely to have impact on price movements in a day trade. These include – Open price, Close price, high price, Low price, Number of trades and Percentage ratio of deliverables to traded volume, of a share on a particular day. The machine was trained with the said inputs to predict Close price of next day as output using 450 samples.

### IV.PROPOSED SYSTEM

#### TWO VIEWS OF THE WEB APPLICATION

##### Generalized View

- It is for all users who visit the website.
- Once they open the website they can enter the company symbol and check the fundamental and technical ratings and an overall recommendation.

Company	: Adani Enterprises Ltd
NSE Code	: ADANIEM
Sector	: INDUSTRIAL MANUFACTURING
Current Price	: 150.05
High Price	: 160.7
Low Price	: 50.35
Fundamentals	: 6 / 10
Technical	: 9 / 10
Overall Recommendation	: BUY

##### Client Specific view

- If a user wants to make changes in the computation of fundamental score according to his knowledge, we will provide such users with a customizable user interface.
- He will be provided with a separate user account.
- A checkbox interface will be provided to select/unselect various parameters.
- Here the client can even change the weights of various parameters according to his needs.

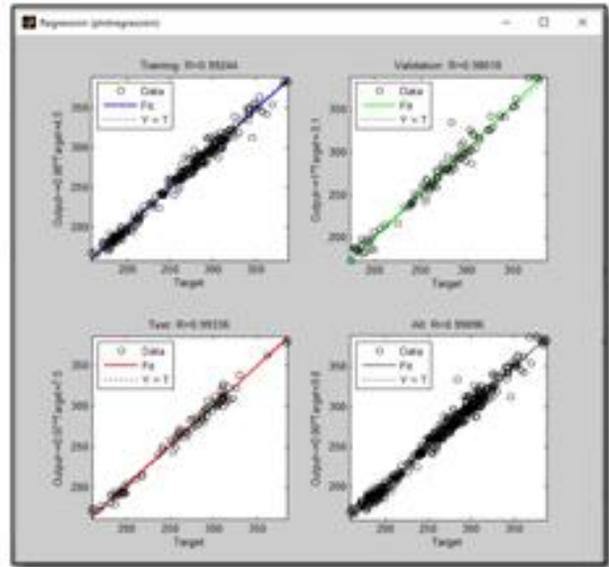
Parameter	Weightage
<input checked="" type="checkbox"/> Price-to-book	20
<input checked="" type="checkbox"/> Price-to-equity	15
<input checked="" type="checkbox"/> Dividend	5
<input type="checkbox"/> Market Capitalization	10 (Default)

Get data

**NOTE:** We are assuming the client to be an expert investor who would like to use the system to make better predictions

## V. RESULTS

Three companies were chosen in random for exploring the capabilities of artificial neural network. The four companies chosen were: Larsen & Turbo (L&T), Canara Bank and Ashok Leyland. Different models were created for each company and the numbers of neurons were adjusted until satisfactory results were obtained. These companies were provided with 6 input parameters namely Open Price, Close Price, High Price, Low Price, Number of trades and Percentage Traded to Deliverable of a particular day. The output parameter was the next day's closing price. The machine was trained using feed forward back propagation algorithm using 450 different sample input and output. Testing was done on 35 inputs and percentage error was found. Results for each of the above mentioned companies are as follows:



### 1. Larsen & Turbo

Company	Larsen & Turbo
Network Type	Feed-Forward Back Propagation
Number of hidden layers	1
Number of input Neurons	10
Regression	0.9908
Average Percentage Error	0.4988

*Actual v/s Predicted Closing price – Larsen & Turbo*

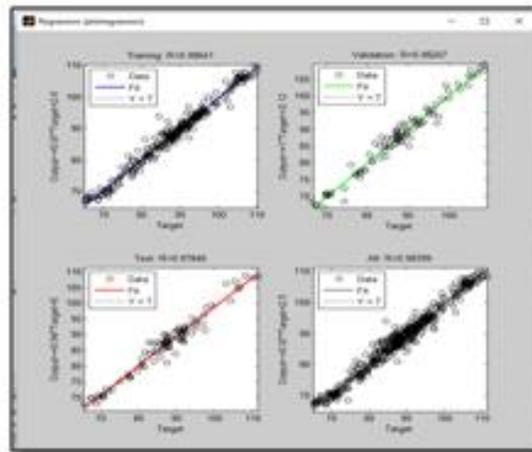
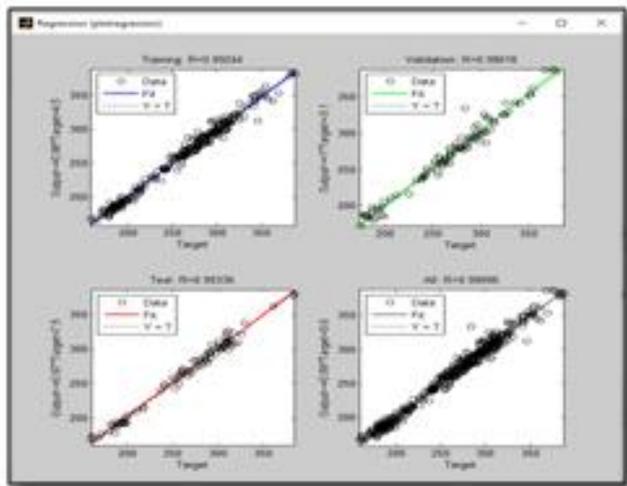
Actual Closing Price	Predicted Closing Price	Error	Error Percentage
1557.45	1539.909387	17.54061278	-1.126239
1574.9	1564.272363	10.62763659	-0.674813
1661	1648.031981	12.96801872	-0.780735
1696.45	1692.111496	4.338504402	-0.255740
1683.2	1682.967983	0.232016676	-0.013784
1685.5	1689.039137	3.539136847	0.209975
1674.05	1680.44924	6.399240314	0.382261
1704.9	1717.13184	12.23183996	0.717452
1702.8	1709.533852	6.73385216	0.395457
1678.55	1671.303823	7.246177154	-0.431692
		<b>Average Percentage Error</b>	<b>0.49881515</b>

### 2. Canara bank

Company	Canara Bank
Network Type	Feed-Forward Back Propagation
Number of hidden layers	1
Number of input Neurons	8
Regression	0.9909
Average Percentage Error	0.3769

*Actual v/s Predicted Closing price – Canara Bank*

Actual Closing Price	Predicted Closing Price	Error	Error Percentage
303.15	303.9029475	0.752947488	0.248374563
302.75	303.314092	0.56409205	0.186322725
304.45	302.2750628	-2.174937176	-0.714382387
310.5	311.3542496	0.854249574	0.275120636
309.95	310.02739	0.07738997	0.024968534
304.8	303.6455874	-1.154412609	-0.378744294
309.45	306.7716744	-2.678325605	-0.865511587
316	315.7891855	-0.210814468	-0.066713439
312.25	312.9658362	0.715836158	0.229250971
314.45	311.9957118	-2.454288243	-0.780501906
		<b>Average Percentage Error</b>	<b>0.376989104</b>



### 3. Ashok Leyland

Company	Ashok Leyland
Algorithm	Feed-Forward Back Propagation
Number of hidden layers	1
Number of input Neurons	5
Regression	0.5491
Average Percentage Error	0.9839

## VI. CONCLUSION

The developed stock market analysis and prediction system gives its prediction based of fundamental and technical factors of a particular share. An expert user can make alterations to the underlying rating algorithm based on his expertise. It also helps a naive user get a better understanding about share market through the various blogs available in the application and provides him with an easy to use interface. This project also demonstrates the use of Artificial Neural Network for predicting next day's close price. A feed forward network with back propagation was used and results obtained indicate an error rate of 0.3 to 1 percentage. Though the error rate is quite low, it can be further reduced by increasing the training set and by carefully adding few more input parameters.

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<i>Actual v/s Predicted Closing price – Ashok Leyland</i>			
Actual Closing Price	Predicted Closing Price	Error	Error Percentage
83	83.32073419	0.320734191	0.386426736
84.55	85.21943527	0.669435274	0.791762594
84.1	84.56052694	0.460526944	0.547594463
84.9	85.53343603	0.633436029	0.746096618
84.3	84.95776692	0.657766918	0.78026918
83.6	84.15709432	0.557094322	0.666380768
82.4	82.88103188	0.481031881	0.583776554
82.4	82.9407558	0.540755796	0.656257034
82.6	82.80302688	0.203026882	0.245795256
82.75	82.82210144	0.072101443	0.087131653
<b>Average Percentage Error</b>			<b>0.549149086</b>

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