

DATA MINING, DATA ANALYSIS AND PREDICTION MODEL FOR FINANCIAL ANALYST OF INVESTMENT ADVISORY

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Abstract

Data is used for various processes, functions and decisions in everyday life. Obtaining the relevant data from resources / data mines / public resources etc., is data mining. Compiling the mined data into an appropriate format enables right platform for optimum usage of data thus mined. Analysis of the compiled data using appropriate analytical tools results in right inputs for an optimal / right decision. Methods: commonly used formats for data representation and data analysis such as pie-charts, bar diagrams apart from establishing and handling complex live data relationships. This paper utilises tools common financial tools and Regression analysis linked moving charts linked to external live data to provide snapshot presentation / representation of data mined and analysed for effective decision making. Results: The Prediction model was able to predict the share price movement over a 6 month period with 70% accuracy. Conclusions: It is shown that Regression Analysis of Market data coupled with key PRIs give a highly reliable predicted value of share price.

Keywords: *Data Mining, Data Analysis, Predictive Modelling, Regression Analysis.*

1.0 INTRODUCTION

In the Present day, A general comment by common investors and newbies is Stock market often move downwards than upwards. People lack the knowledge and understanding of the intricacies that tick the movement / fluctuations of stock markets and predictions thereof.

A Stock price movement over three to four months period is mostly speculative and depends on supply and demand. More buyers, price goes up. More supply, Price goes down. Quarterly or annual reports publication by the company, when the results are good, stock's price will go up and if they are not good, it will lead to a fall in price.

An accurate peep into the FUTURE with help of Past will be the dream of many. Prediction of Financial parameters and share price movements with high accuracy is an important tool in the hands of Business and Financial Analysts. Major decisions to invest in a business are taken on an expected value in future. Data has a major role in this sphere of activity.

Digital age Data in various forms & formats is available all around us. Data is used for various processes, functions and decisions in everyday life. Obtaining the relevant data from resources / data mines / public data etc., is data mining. Compiling the mined data into an appropriate format enables right platform for optimum usage of data thus mined. Analysis of the compiled data using appropriate analytical tools results in right inputs for a optimal / right decision.

The model used here involves process of publicly available Data mined, compiled and analysed for effective decision making.

Problems associated with handling large scale data and data compressing into relevant modules as a prelude to the data analysis is demonstrated.

This research uses commonly used formats for data representation and data analysis such a pi-charts, bar diagrams apart from establishing and handling complex live data relationships. Utilisation of complex tools such as Regression analysis and moving charts linked to external live data to provide snap shot presentation / representation of data mined and analysed for effective decision making.

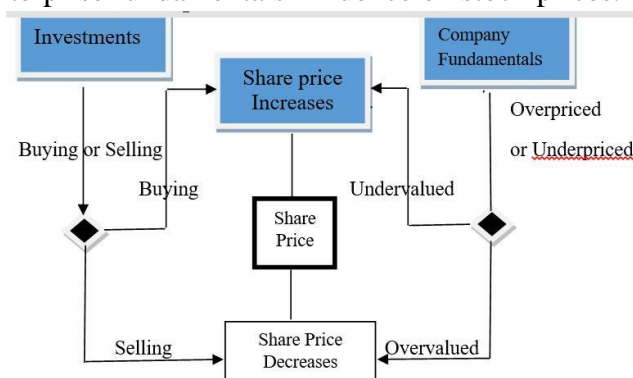
Two well-known banks namely HDFC Bank and ICICI Bank are considered, primary data is mined from the Annual Reports, Public records and published articles. Data from Stock exchanges is used. Financial tools based evaluation of data and performances is demonstrated. A regression Analysis using Share Price data indicates acceptance of the banks to an external environment.

Stocks & Markets influencers

- Investors influence

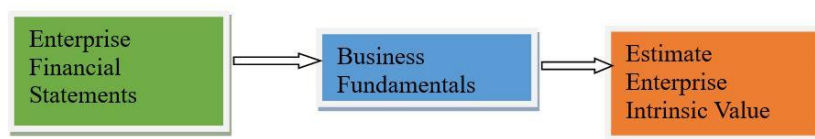
There was a 31% fall in Share Index due off selling by Institution Investors between February and April 2020. Broad players in the financial markets are Foreign Institutional Investors (FIIs), Domestic Institutional Investors (DIIs) and Retail Investors (Ris). These investor types require large amounts of data, processed, compiled and analysed for their day to day decision making. In this research, we address the data requirement, Data mining, Data Compilation and Data Analysis for a Typical Investment Analyst. Financial tools are used to develop prediction models.

- Understanding enterprise fundamentals influence on stock prices.



Share prices are speculative. A Speculation is that value changes from time to time. To understand the value of such a speculative asset there is a need to normalize the unexpectedness and fluctuations to predict a near price.

- Analysis of Enterprise fundamentals

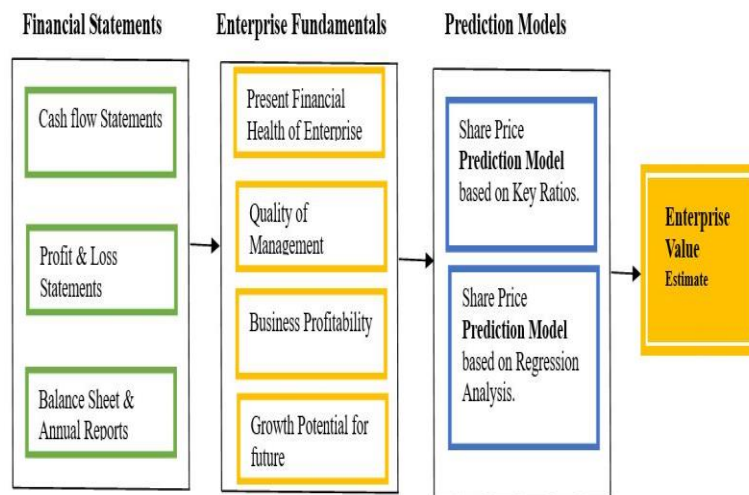


Fundamental analysis of an enterprise is a tool to estimate the intrinsic value of enterprise stocks. Estimated fair Price will then be compared with its market price to estimate the enterprise stock is over or under priced.

- Enterprise Valuation & Stock Valuation

The estimation of Enterprise Stock involves data analysis of Enterprise Financial statement such as balance sheet, Profit & Loss and cash flow statements. The correlation between financial results, fundamentals, and intrinsic value is used in the prediction model.

The correlation between enterprise financial statements, enterprise fundamentals and mathematical models are demonstrated in the below chart.



The data mined, compiled and analysed is used in mathematical models to predict various parameters of the enterprise in future.

2.0 LITERATURE SURVEY

HDFC Bank and ICICI Bank Annual Reports / Directors Report and Audit reports along with financial statements were downloaded from bank websites along with Information / audit reports / Management statements and Directors Reports.

<https://www.hdfcbank.com/personal/about-us/investor-relations/annual-reports>

<https://www.icicibank.com/aboutus/annual.page>

News Reports about these banks were mined from Economic Times, Financial Express and Money Control websites.

<https://www.moneycontrol.com>

<https://economictimes.indiatimes.com/markets/stocks/earnings>

<https://www.financialexpress.com/industry/banking-finance>

<https://www.business-standard.com> and Industry Professionals working as Financial Analysts.

3.0 COMPILING DATA

Relevant Information relating to the HDFC and ICICI banks were mined from Annual Reports of past 3 years, published articles in reputed dailies and tabulated. A sample of the Data mined and Tabulated is given below (for both the banks)

Financials of HDFC BANK

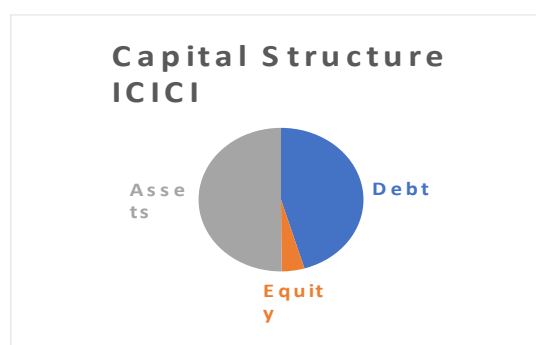
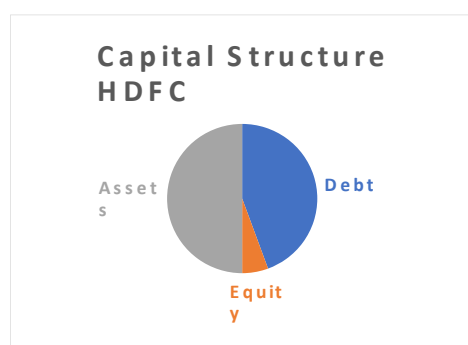
<u>Profit & Loss</u>		March 2020	March 2019	March 2018
Total Income		1380734696000	1165979354000	954616592000
Net Profit		267573150000	210781653000	174867283000
EPS	Basic	48.01	78.65	67.76
	Diluted	47.66	77.87	66.84
<u>Balance Sheet</u>				
Reserves		1704377008000	1486616908000	1057759776000
Total CA		866187180000	813676392000	1229150827000
Total Assets		15305112589000	12445406906000	10639343234000
<u>Cash Flow</u>				
Net Cash from Operating Activities		(166897750000)	(560546699000)	260740657000

Financials of ICICI BANK

Financials of ICICI BANK

<u>Profit & Loss</u>		March 2020	March 2019	March 2018
Total Income		912469386000	1313064993000	1189691015000
Net Profit		79308124000	56891606000	90995447000
EPS	Basic	12.28	6.61	12.02
	Diluted	12.08	6.53	11.89
<u>Balance Sheet</u>				
Reserves		1152061563000	1129592715000	1093383172000
Total CA		1191557389000	873908953000	889991333000
Total Assets		10983651492000	12387938907000	11242810402000
<u>Cash Flow</u>				
Net Cash from Operating Activities		784494378000	486710527000	193829323000

Capital Structure Comparison:



Comparative Capital Structure indicates both banks are highly leveraged. Sector wise advances and asset quality indicate broadly the bank have exposures as per RBI and Government of India Priority sector lending norms. Gross NPAs to Gross Advances is a low 1.27% for HDFC Bank demonstrating good advances and asset management by the bank.

Gross NPAs to Gross Advances is 5.86% for ICICI Bank demonstrating fair quality of advances and asset management by the bank. However, the higher percentage of NPAs in ICICI bank needs more efficient Asset Management.

4.0 DATA ANALYSIS

The mined and compiled data is analysed for key performance and financial ratios . A sample of the data analysis tabulated for past 3 years is given below:

Key Financial Ratios of HDFC Bank (in <u>Rs.</u> Cr.)	Mar 2020	Mar 2019	Mar 2018
<u>Per Share Ratios</u>			
Basic EPS (<u>Rs.</u>)	48.01	78.65	67.76
Diluted EPS (<u>Rs.</u>)	47.66	77.87	66.84
Cash EPS (<u>Rs.</u>)	50.07	81.59	70.88
Net Profit/Share (<u>Rs.</u>)	47.89	77.4	67.38
<u>Key Performance Ratios</u>			
ROCE (%)	3.33	3.34	3.2
Net Interest Margin (X)	3.67	3.87	3.76
Cost to Income (%)	38.52	38.41	39.62
<u>Valuation Ratios</u>			
Enterprise Value (<u>Rs.</u> Cr)	1692584.96	1624316.38	1298053.53

Key Financial Ratios of ICICI Bank (in <u>Rs.</u> Cr.)	Mar 2020	Mar 2019	Mar 2018
<u>Per Share Ratios</u>			
Basic EPS (<u>Rs.</u>)	12.28	5.23	10.56
Diluted EPS (<u>Rs.</u>)	12.08	5.17	10.46
Cash EPS (<u>Rs.</u>)	13.72	6.42	11.76
Operating Revenue / Share (<u>Rs.</u>)	115.54	98.34	85.5
Net Profit/Share (<u>Rs.</u>)	12.25	5.22	10.54
<u>Key Ratios</u>			
ROCE (%)	2.67	2.52	2.91
Net Profit Margin (%)	10.6	5.3	12.33
Cost to Income (%)	45.79	48.98	46.51
<u>Valuation Ratios</u>			
Enterprise Value (<u>Rs.</u> Cr)	1108657.4	1037532.15	889716.2

5.0 PROPOSED TECHNIQUES

The techniques deployed in evaluation and prediction are:

A. Mathematical Models based on historical data extrapolation - Future PE-EPS Method

<u>P&L</u>	-----Growth Rate-----		
	HDFC Bank	ICICI Bank	Weightage
Total Income	20.28%	-10.50%	15.00%
Net Profit	23.74%	1.00%	15.00%
EPS	-38.96%	20.50%	15.00%
<u>Balance Sheet</u>			
Reserves	27.60%	2.50%	15.00%
Total CA	13.68%	17.00%	10.00%
Total Assets	19.98%	-0.50%	20.00%
<u>Cash Flow</u>			
Net Cash from			
Operating Activities	-70.23%	106.00%	5.00%
Weighted Average Growth Rate to be applied for EPS and P/E	6.75%	5.85%	

Estimate Future PE, Future EPS and Future Share Price

Estimation of Future PE:

$$PE_{2021} = \text{Last PE value} \times (1 + \text{weighted Average Growth Rate})$$

$$PE_{2022} = \text{Last PE value} \times (1 + \text{weighted Average Growth Rate})^2$$

$$PE_{2023} = \text{Last PE value} \times (1 + \text{weighted Average Growth Rate})^3$$

Estimation of future EPS:

$$EPS_{2021} = \text{Last EPS value} \times (1 + \text{weighted Average Growth Rate})$$

$$EPS_{2022} = \text{Last EPS value} \times (1 + \text{weighted Average Growth Rate})^2$$

$$EPS_{2023} = \text{Last EPS value} \times (1 + \text{weighted Average Growth Rate})^3$$

Prediction of Share Price (SP)

$$SP_{2021} = PE_{2021} \times EPS_{2021}$$

$$SP_{2022} = PE_{2022} \times EPS_{2022}$$

$$SP_{2023} = PE_{2023} \times EPS_{2023}$$

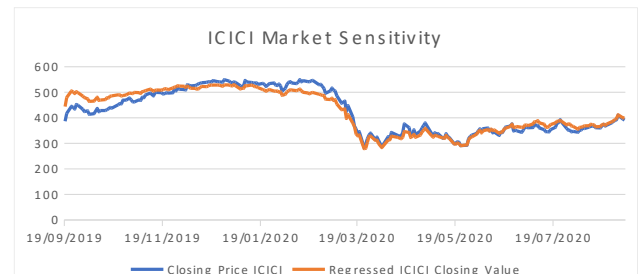
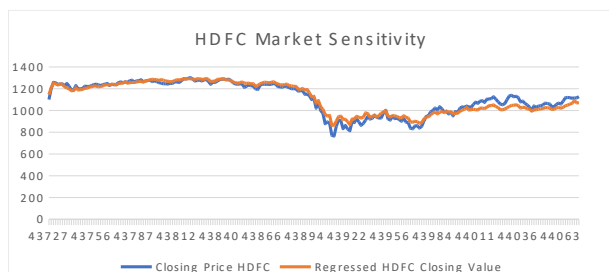
HDFC Bank:	2021	2022	2023
Predicted EPS after	50.88	54.31	57.98
Predicted EPS after	18.63	19.89	21.23
Predicted Share Price	947.85	1080.28	1230.91



ICICI Bank:	2021	2022	2023
Predicted EPS after	12.79	13.53	14.33
Predicted EPS after	27.46	29.07	30.77
Predicted Share Price	351.12	393.45	440.83

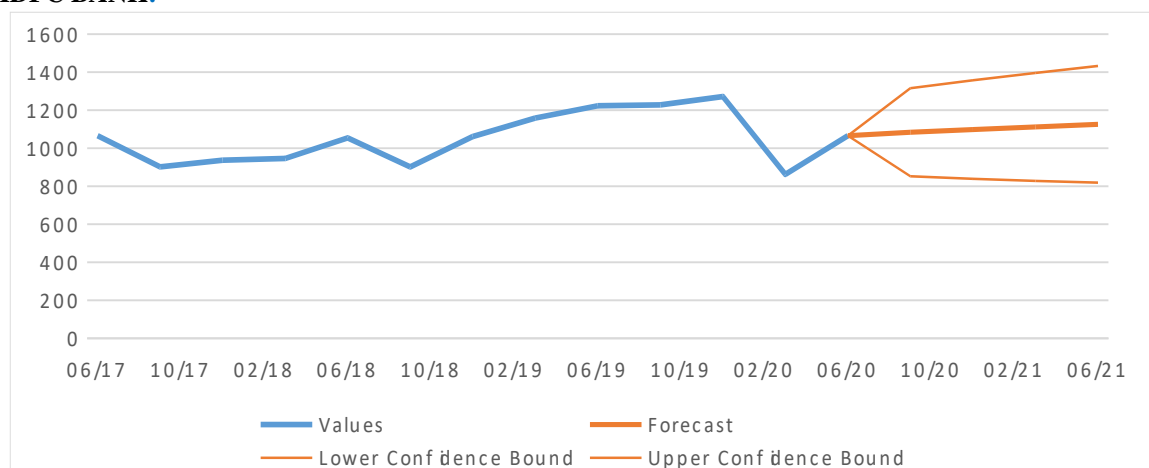
B. Linear Regression Method

Market Sensitivity of Share Price

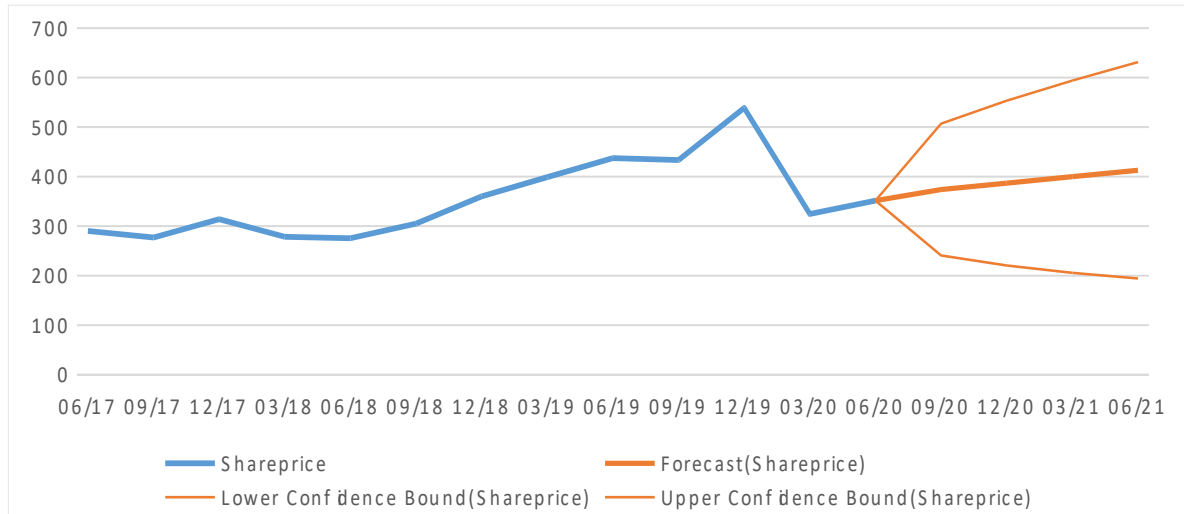


FORECASTING SHARE PRICE BY REREGRESSION ANALYSIS FOR PROJECTION OF STOCK VALUE:

HDFC BANK:



ICICI BANK:



6.0 DISCUSSION & RESULT

A look at the predicted value and comparison with the actual share price on 18.09.2020 of these banks is given below:

	SP ₂₀₂₁	Actual Price (BSE) 18.09.2020	Prediction Accuracy
HDFC Bank	947.85	1057.00	88.47%
ICICI Bank	351.12	370.00	94.62%

High Percentage of Accuracy of Prediction is positive and good for the model.

7.0 CONCLUSION

Share trading in the present digital age is broadly based on Algorithms. BOTs conduct the Trade of Shares on the modern exchanges. Gone are those days when black suited stock brokers would be shouting into their phones standing in front of large Screens displaying the stock information. Algorithms and BOTs play an important role in immediate future as has been already practiced.

Prediction models are built for idealistic situations and fail in the face of sudden and uncontrollable adverse circumstances like pandemics and Natural Calamities. Some models do factor in probability of certain extreme adverse happenings. Whatever may be the models and care taken to predict, Prediction is ALWAYS A PREDICTION. Any Efforts to gain a peep into the future are fraught with risks which some time pay off or some times result in adverse impacts.

However, with advent and increased usage of Algorithms, Deep learning Techniques, Artificial Intelligence and Machine Learning Techniques, Models are increasingly being developed and used.

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3. <https://www.moneycontrol.com>
4. <https://economictimes.indiatimes.com/markets/stocks/earnings>
5. <https://www.financialexpress.com/industry/banking-finance>
6. <https://www.business-standard.com>
7. <https://www.madisonmoorecapital.com>