A STATISTICAL STUDY OF VOLATILITY OF A PROPOSED MODEL USED FOR PREDICTION OF STOCK MARKET VOLATILITY

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Accepted: 14.04.2023 **Published**: 01.05.2023

Keywords: Stock markets, Volatility.

Abstract

Stock markets are used to raise the funds by corporate sectors and government organizations. Stock market volatility is an important phenomenon which helps in deciding the mature of market that it is high or low volatile. A predictive model was proposed for stock market volatility using big data analytics and the exclusive big data analysis is required to observe and conclude the trend of market. Both fundamental and technical analyses were used in that model. In fundamental analysis, sentiment analysis was used to find the sentiment score and in case of technical analysis classification and regression techniques were used to predict the future value of a stock. This paper further analyzes the predictive results of the model [1] and calculate the volatility.

Paper Identification

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PROPOSED MODEL: A model [1] was proposed to predict the values for Stocks basically SBIN.NS and FB. Regression i.e. linear regression (LR) and support vector regression (SVR)

techniques are used to predict the values [1]. The prediction results given by the model for FB Stock by using LR and SVR are as follows

The next 20 day's predictions for support vector regressor are shown below:

Output-

[188.66146166 188.79436926 189.44374473 188.75431263 189.26559167 188.10016591 189.45973471 189.26559167 188.6924403 189.07072919 189.41755307 189.15267455 188.48864647 188.29017535 188.28954551 188.28957156 188.28961465 188.29108058 188.40872562 188.33090582]

The next 20 day's predictions for linear regressor are shown below:

Output-

[196.27580475 196.02957844 194.61377718 193.93665484 194.3059943 193.62887195 194.73689033 194.3059943 196.21424817 195.5986824 194.98311664 195.47556925 196.70670078 199.23052042 200.58476511 200.15386907 199.90764277 198.92273754 197.01448367 197.56849286]

The predicted values can also be found for SBIN.NS stock and results calculated are shown below:

The next 20 day's predictions for linear regressor are shown below:

[251.11357582 255.07351068 258.53845369 258.82130618 261.50840484 257.6191831 250.90143645 244.32511605 240.57732055 241.63801739 238.10236126 243.5472717 241.56730427 239.87018933 241.85015676 244.46654229 244.11297668 239.44591059 239.7994762 237.39523004]

The next 20 day's predictions for Support Vector Regressor are shown below:

[251.55148294 243.27102211 247.70574922 255.13978187 251.25048088 234.40700321 250.09272404 248.62375258 252.95448555 249.41568351 254.37778129 244.18658328 249.73509763 253.91588966 248.40963673 249.68121627 247.09216926 254.16973054 253.97056845 254.38770961].

In the results of the this prediction model, based on the confidence value or accuracy value, we can predict which stock to invest in and it is shown that the confidence of SVR is greater than LR, hence it can be a better option over Linear Regression [2].

VOLATILITY CALCULATION:

Moreover, the volatility can be calculated by using these predicted values. In case of SVR (FB), First of all the average of predicted values is calculated by finding sum of predicted values and divided by the number of days for which prices are predicted. In this case, the values are added and the result is 3774.66 and it is divided by 20 (forecast days in this case). The average calculated is 188.733. Now, difference is calculated by subtracting average value from the prices as shown in table. The result of difference column is squared and added to get the result i.e. 4.07202 in this case. Now, Variance is calculated by dividing the sum of squared difference by the number of days or predicted values. So by dividing 4.07202 by 20, the result found is 0.203601. At last, the standard deviation can be calculated by finding square root of variance value. Hence, volatility calculated in case of FB stock by using Support Vector Regressor is 0.451221675.

Table : Volatility of Predicted Values of SVR for FB Stock

S. No.	Predicted Prices	Difference (Price-Average)	Squared Difference	Variance	Standard Deviation
1	188.66	-0.073	0.005329	4.07202/20= 0.203601	Square root of Variance = 0.451221675
2	188.79	0.057	0.003249		
3	189.44	0.707	0.499849		
4	188.75	0.017	0.000289		
5	188.26	0.527	0.277729		
6	188.10	-0.633	0.400689		
7	189.45	0.717	0.514089		
8	189.26	0.527	0.277729		
9	188.69	-0.043	0.001849		
10	189.07	0.337	0.113569		
11	189.41	0.677	0.458329		
12	189.15	0.417	0.173889		
13	188.48	-0.253	0.064009		

14	188.29	-0.443	0.196249		
15	188.28	-0.453	0.205209		
16	188.28	-0.453	0.205209		
17	188.28	-0.453	0.205209		
18	188.29	-0.443	0.196249		
19	188.40	-0.333	0.110889		
20	188.33	-0.403	0.162409		
TOTAL	**3774.66**		**4.07202**		
AVERAGE	**3774.66/20= 188.733**				
Volatility of Support Vector Regressor for FB Stock is 0.451221675					

The volatility for predicted prices by using Linear Regressor can be calculated in the same way and at last the volatility found is 2.14607409, which is greater than Support Vector Regressor. Hence, result found by SVR is more efficient.

Table : Volatility of Predicted Values of LR for FB Stock

S. No.	Predicted Prices	Difference (Price-Average)	Squared Difference	Variance	Standard Deviation
1	196.27	-0.234	0.054756	92.11268/20= 4.605634	Square root of Variance = 2.14607409
2	196.02	-0.484	0.234256		
3	194.61	-1.894	3.587236		
4	193.93	-2.574	6.625476		
5	194.30	-2.204	4.857616		
6	193.62	-2.884	8.317456		
7	194.73	-1.774	3.147076		
8	194.30	-2.204	4.857616		
9	196.21	-0.294	0.086436		

10	195.59	-0.914	0.835396		
11	194.98	-1.524	2.322576		
12	195.47	-1.034	1.069156		
13	196.70	0.196	0.038416		
14	199.23	2.726	7.431076		
15	200.58	4.076	16.613776		
16	200.15	3.646	13.293316		
17	199.90	3.396	11.532816		
18	198.92	2.416	5.837056		
19	197.01	0.506	0.256036		
20	197.56	1.056	1.115136		
TOTAL	**3930.08**		**92.11268**		
AVERAGE	**3930.08/20=196.504**				
Volatility of Linear Regressor for FB Stock = 2.14607409					

Also, Volatility can be calculated for SBIN.NS Stock by using both regressors.

Table : Volatility of Predicted Values of SVR for SBIN.NS Stock

S. No.	Predicted Prices	Difference (Price-Avg)	Squared Difference	Variance	Standard Deviation
1	251.55	1.838	3.378244	465.24072/20= 23.262036	Square Root of Variance = 4.82307329
2	243.27	-6.442	41.499364		
3	247.70	-2.012	4.048144		
4	255.13	5.418	29.354724		
5	251.25	1.538	2.365444		
6	234.40	-15.312	234.457344		
7	250.09	0.378	0.142884		
8	248.62	-1.092	1.192464		

9	252.95	3.238	10.484644		
10	249.41	-0.302	0.091204		
11	254.37	4.658	21.696964		
12	244.18	-5.532	30.603024		
13	249.73	0.018	0.000324		
14	253.91	4.198	17.623204		
15	248.40	-1.312	1.721344		
16	249.68	-0.032	0.001024		
17	247.09	-2.622	6.874884		
18	254.16	4.448	19.784704		
19	253.97	4.258	18.130564		
20	254.38	4.668	21.790224		
TOTAL	**4994.25**		**465.24072**		
AVERAGE	**4994.25/20= 249.712**				
Volatility of Support Vector Regressor for SBIN.NS Stock is 4.82307329					

Table : Volatility of Predicted Values of LR for SBIN.NS Stock

S. No.	Predicted Prices	Difference (Price-Average)	Squared Difference	Variance	Standard Deviation
1	251.11	4.6015	21.1738022	1179.66325/20= 58.9831625	Square root of Variance = 7.68004964
2	255.07	8.5615	73.2992822		
3	258.53	12.0215	144.516462		
4	258.82	12.3115	151.573032		
5	261.50	14.9915	224.745072		

6	257.61	11.1015	123.243302		
7	250.90	4.3915	19.2852722		
8	244.32	-2.1885	4.78953225		
9	240.57	-5.9385	35.2657822		
10	241.63	-4.8785	23.7997622		
11	238.10	-8.4085	70.7028722		
12	243.54	-2.9685	8.81199225		
13	241.56	-4.9485	24.4876522		
14	239.87	-6.6385	44.0696822		
15	241.85	-4.6585	21.7016222		
16	244.46	-2.0485	4.19635225		
17	244.11	-2.3985	5.75280225		
18	239.44	-7.0685	49.9636922		
19	239.79	-6.7185	45.1382422		
20	237.39	-9.1185	83.1470422		
TOTAL	**4930.17**		**1179.66325**		
AVERAGE	**4930.17/20= 246.5085**				
Volatility of Linear Regressor for SBIN.NS Stock = 7.68004964					

Here, the volatility for LR is 7.68004964 and for SVR is 4.82307329. Hence, the result predicted by SVR is more efficient as it has less volatile result. Hence it is better to use support vector regression in spite of linear regression for prediction of stock market volatility.

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