OPEN CLOSE CROSSOVER INDICATOR FOR STOCK MARKET PREDICTION

[1]NAMITA PRADHAN, [2]ASMITA DALAI, [3]VINESH SINGODIA, [4]SHUBHAM PATHAK, [5]HIMANSHU KOHLI

[1,2,3,4,5]Final Year B.Tech. Electronics, Department of Electrical Engineering, Veermata Jijabai Technological Institute, H. R. Mahajani Road, Matunga, Mumbai-400019, India
E-mail: [4]srpathak_b14@el.vjti.ac.in

Abstract - Stock Prices are very dynamic and volatile because of the underlying nature of the financial domain and also due to the mix of known parameters like Previous Days Closing Price and unknown factors like sentiments. Analyzing the huge stock market through Technical Indicators helps traders, analysts and investors to understand market sentiment and accordingly make rational decisions. Amongst the two types of analysis possible for prediction, technical and fundamental technical analysis is done primarily using Technical indicators, which are one of the best tools to predict such price movements. In this paper, a new technical indicator for Stock Market Prediction is introduced, calculated using data from Bombay Stock Exchange (BSE). This paper proposes a methodical technical indicator, Open close Crossover (OCC) Indicator which tracks price movement of stocks and give a buy/sell recommendation. This model has used a processed data set of Open Price (O) and Close price (C) for the period of 1 year from February 2017 to February 2018 whose Exponential Moving Average (EMA) is plotted, and inferences are deduced based on the behavior of the graphs for various periods. This paper proposes a technical indicator that outperforms the existing traditional technical indicators like crossover of slow and fast moving EMA and validated.

Keywords – Stock Market, Open Price, Close Price, Open Close Crossover indicator and Exponential Moving Average

I. INTRODUCTION

Predicting the price movements in stock markets has been a major challenge for traders. The primary area of concern for any trader is to hit the ideal time to buy and sell. However, financial time-series is very noisy and volatile and hence very difficult to forecast[1]. In stock market analysis, there are primarily two types of analysis carried out for predicting stock price movement. The first one is fundamental analysis, which looks at the actual facts of the company, market, currency or commodity[1]. On the other hand, technical analysis stands in contrast to the fundamental analysis approach to security and stock analysis[2]. A proper analysis helps in reducing the risk on investment in the share markets and in choosing a less risky and highly rewarding investment avenue[3]. Technical analysis also widely use market indicators of many sorts, some of which are mathematical transformations of price, often including up and down volume, advance/decline data and other inputs. These indicators are used to help determine whether an asset is trending, and the probability of its direction and of continuation.

Examples of various technical indicators include the Relative Strength Index (RSI), and Moving Average Convergence Divergence (MACD). Behavioral economics and quantitative analysis incorporate substantial aspects of technical analysis, which being an aspect of active management stands in contradiction to much of modern portfolio theory. According to the weak-form efficient-market hypothesis, such forecasting methods are valueless, since prices follow a random walk or are otherwise essentially unpredictable. Technical Analysis is based on the principle that a market's price reflects all relevant information, therefore, it looks at the history of a security's trading pattern rather than external drivers such as economic, fundamental and news events. Moreover, as price action also tends to repeat itself because investors collectively tend toward patterned behavior hence analysts focus on identifiable trends and conditions.

Few indicators existing in the market alone are not capable of single handedly giving recommendations based on the price movements, hence there is a need for an indicator alone to give call recommendations. Open Close Crossover (OCC) Indicator is therefore devised which predicts the stock price movement based on the price movement after the crossover point.

II. RELATED WORK

Price and volume are intuitive and timely to describe the market trading. And the relationship between price and volume is the most fundamental and important entry point for being aware and understanding of the stock, stock trading and stock market. In the past, a lot of research has been done to find apt technical indicators for prediction of stock price movement. Open Close Crossover (OCC) Indicator has been developed on the principles of Moving Average Crossover Alert Indicator[3]. With this indicator, one will be able to see clearly when two Moving Average (MA) indicators cross. It will draw on the chart a green arrow when faster MA crosses the slower MA from below to above. On the

other hand, red arrow will appear when faster MA crosses the slower MA from above to below.

III. METHODOLOGY

In this paper, Open Close Crossover (OCC) Indicator is designed by using the exponential moving averages (EMA). Instead of EMA Simple Moving averages can also be used but the results obtained will be inferior as compared to EMA and hence EMA is adopted. The EMA of open and close prices is plotted over the same period (N) and the point where the two EMAs meet is termed as the Crossover point. The behaviour of the graph after the crossover is observed closely. There can be two scenarios based on the movement of the two EMAs. In one case the EMA of close price will be above the EMA of open price which is called as positive divergence. When the EMA of open price will be above the EMA of close price, it is called negative divergence. The period of the EMA's can be set as per the time frame of investment as well as the accuracy demanded. The larger the time period of EMA, more will be the accuracy, Open Close Crossover (OCC) Indicator.

Accuracy ∝ Time period of EMA

The positive divergence indicates BUY recommendation and the negative divergence indicates SELL recommendation. The more the slope of the graph after the crossover point the more strong the recommendation.

IV. OBSERVATIONS

The Open Close Crossover (OCC) Indicator is used to predict the price movement of HDFC wherein EMA of 8 days, 15 days and 50 days is taken into consideration. Open price is denoted by the black line and the close price is denoted by the red line in the graph. The prediction by the OCC Indicator correctly matches with the observed price variation.

Fig. 1 8-Day EMA for HDFC

In Case I, this can be observed in the following manner: At point A in Figure 1, the first significant crossover takes place where the behaviour of the Open Price EMA and Close Price EMA is observed. After Point A, the close price is above the open price which indicates a BUY call for the particular stock. The next crossover is observed at point B after which the open price is above the close price indicating a SELL call. Moreover, as the slope is high in both the cases, the call is strong and the chances of noise occurring is very minimal. After point C, the slope of the open and close price is very less and it intersects many a times in a small time frame. This indicates that the price variation is very volatile and can be considered as noise, hence a call cannot be taken for this particular stock. This in turn indicates a HOLD call. Thus it is observed that the OCC Indicator correctly gives recommendations based on the slope of the Open and Close price for the 8-day EMA.

Fig. 2 15-Day EMA for HDFC

In Case II, a 15 day EMA is taken for predicting the price movement of the stocks. The OCC Indicator help to determine the variation in price movement. At point A in Figure 2, the open price is above the close price which indicates a SELL call. Even though the slope is not very steep, the trend is enough to indicate a SELL call. At point B, the close price is above the open price giving a BUY call. Similarly, the trend can be determined by seeing the behaviour of the graphs after the crossover points. It is closely observed that the slope of the graph in this case is less as compared to that in case I and this also means that the recommendations are not that strong. The reason for this is the time period for which the EMA is taken which is 15 days in case II. The graph smoothens as the time period is increased but the disadvantage is that the recommendations are not very strong.

Fig. 3 50-Day EMA for HDFC

In Case III, 50-day EMA is taken into consideration. The OCC Indicator, in this case cannot really help in determining the variation in price movement. There are only 2 crossovers which are not very significant owing to the increase in the time period for which EMA is considered. The graph has significantly

become smooth at the cost of losing its potential to predict price movement.

Hence, we see that with an increase in the time period of EMA, the performance of the OCC Indicator decreases to a large extent. This indicator will function effectively only when the time period is considerably less (< 20). If the time period is very small (< 3), then the graph will contain more noise due to which conclusions cannot be made.

V. RESULTS

A. Validation

In order to validate the call of the indicator, it is applied to 5 randomly selected stocks for 3 periods viz. N=8, 15, 50. Zerodha Pi platform was used to backtest and the results obtained are as shown in the following table.

Name	Days	Total Trades	Profitable Trades	Losing Trades	% Profit
KPIT Tech	8	37	11	26	22.68
	15	19	7	12	17.204
	50	4	2	2	74.9
TCS	8	39	16	23	33.176
	15	22	7	15	33.805
	50	3	0	3	-229.645
Indian Bank	8	31	12	19	24.038
	15	19	5	14	-32.292
	50	4	1	3	-45.882
TVS Motors	8	33	13	20	28.815
	15	29	9	20	16.281
	50	11	2	9	-313.662
SBIN	8	31	12	19	33.818
	15	19	7	12	42.038
	50	2	0	2	0
ITC	8	38	13	25	36.674
	15	17	5	12	59.335
	50	1	0	1	-1900

TABLE 1
RESULTS OF OCC INDICATOR

There are 3 cases which are obtained with the OCC Indicator. In the first case, OCC Indicator with a period of 8 days is taken, which can give recommendations in short periods of time. Due to a small period, they might contain some noise. In the second case, comparatively higher periods of 15 days are taken which reduces the chances of an accurate call. In the third case which has a period equal to 50 days, the open and close EMA almost overlap and no recommendations can be deduced from the graph. In this case minimum number of trades occur and most of them are negative. Due to the above three cases it is concluded that the period taken for OCC Indicator is of utmost importance and it should be chosen wisely. The period should be such that it should capture almost all the price movement and at the same time should not contain noise as to distort the recommendation. Hence, from the regress testing it was concluded that a period between 6-10 days is optimal for the use of the indicator.

According to the table 1, it can be observed that for period N=8 all profit percentages obtained were positive and were the most consistent and hence the period N=8 is considered to be optimal. Although the indicator is sufficient to give a definitive call, other confirmatory indicators can be used to improve the results.

B. Comparison

Name	Total Trades	Profitable Trades	Losing Trades	% Profit
KPIT	39	16	23	33.176
Indian bank	5	1	4	-30.769
TVS Motors	1	0	1	87
SBIN	10	0	10	-3474.725
ITC	36	9	27	10.024
TCS	6	2	4	1.638

TABLE 2
RESULTS OF SLOW-FAST CROSSOVER INDICATOR

The other indicator which is based on the principle of crossover is Slow-Fast Crossover Indicator. This indicator is also applied to the same 5 stocks for comparison with OCC Indicator. The periods taken for this indicator are 24 and 8 respectively. As observed, the results obtained are of lesser accuracy as compared to OCC Indicator. The number of trade points obtained were low as well as irregular when compared to the OCC Indicator. The Slow-Fast Crossover Indicator does not lay much emphasis on the opening price and restrict themselves to the close price which might be one of the reasons due to which it does not capture the price movement. accurately.

The cases in which OCC Indicator predicted positive results was in all the 6 companies taken for validation whereas in the case of Slow-Fast Crossover Indicator, the results showed loss in investor's money. Therefore, the accuracy obtained for OCC Indicator was 100% whereas in the case of Slow-Fast Crossover Indicator, it was about 66.66% which clearly shows that our indicator is better in terms of performance.

CONCLUSION

This study investigates the role of OCC Indicator in predicting price movement with different time periods. The investors risk exposure on market behaviour is reduced with the help of this indicator especially for shorter periods of time. From our experimental evaluation we concluded that the OCC Indicator captures both the opening as well as closing price and predicts correct price movement of different stocks across varied sectors and gives the investor valuable returns. The OCC Indicator alone is strong enough to give recommendations whereas other indicators are to be used in tandem with confirmatory indicators. However when OCC Indicator is used along with other confirmatory indicators the recommendations obtained will be much more precise.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the contributions of Dr. Meena S. Panse for her constant support, help and guidance.

REFERENCES

[1] Magda B. Fayek, Hatem M. El-Boghdadi, Sherin M. Omran, "Multi-objective Optimization of Technical Stock Market Indicators using GAs", International Journal of Computer Applications (0975 – 8887) Volume 68– No.20, April 2013

[2] HemalPandya,"Technical Analysis for Selected Companies of Indian IT Sector", International Journal of Advanced Research (2013), Volume 1, Issue 4, 430-446

[3] PuchongPraekhaow, "Determination of Trading Points using the Moving Average Methods", GMSTEC 2010: International Conference for a Sustainable Greater Mekong Subregion, 26-27 August 2010, Bangkok, Thailand

[4] Charles D Kilpatrick II, Julie R Dahlquist, "Technical Analysis: The Complete Resource for Financial Market Technicians 2010," Pearson.

[5] RajatSingla ,"Prediction from Technical Analysis- A Study of Indian Stock Market", International Journal of Engineering Technology, Management and Applied Sciences April 2015, Volume 3 Issue 4, ISSN 2349-4476

[6] J SharmilaVaiz, Dr M Ramaswami ,"A Study on Technical Indicators in Stock Price Movement Prediction Using Decision Tree Algorithms", American Journal of Engineering Research (AJER) e-ISSN: 2320-0847 p-ISSN : 2320-0936 Volume-5, Issue-12, pp-207-212

[7] John J. Murphy, "Technical Analysis of the Financial Markets (A comprehensive guide to the trading methods and applications)", New York Institute of Finance 1999.

[8] Antoniou A, Ergul N, Holmes P, Priestley R, " Technical analysis, trading volume and market efficiency: evidence from an emerging market", Applied Financial Economics, 1997, volume 4, p.361 – 365.

★★★