

Elliott Wave formation using combination of CCI and DEMA

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Abstract—Fundamental Analysis combines economic, industry and company analysis to obtain stock's fair value called underlying value. Technical Analysis is the observation of trading opportunities on the basis of market activity. In this work, we use two fundamental parameters, Earnings Per Share and Price-to-Earnings Ratio to identify profitable stock. Commodity Channel Index (CCI) and Double Exponential Moving Average (DEMA) are used to examine the buying and selling opportunities and to identify the trend strength. We try to develop Elliott wave formation through Commodity Channel Index and introduce the concept of combining the two strategies using a live example from the NSE.

Keywords—Elliott Wave theory, Commodity Channel Index, Double Exponential Moving Average

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I. Introduction

There are mainly three types of studies in the financial market: (1) Descriptive (2) Predictive and (3) Prescriptive. Among all these studies, we focus on predictive study of financial market in this research. The financial market forecasting continues to be a core issue for researcher as well as investors. In the financial field, predictions involve information analyses and influence the ways these analyses may drive decision-making processes when buying or selling financial assets. Forecasting is the process of predicting the future based on past data and generally analyzing trends. Forecasting plays a pivotal role in the operations of modern financial management. [1]

There are many forecasting techniques available in the marketsuch as Chart Analysis, Technical Analysis, Fundamental Analysis, etc.Fundamental Analysis and Technical Analysis are used for researching and forecasting the future trends of stock prices. Fundamental Analysis examines the economic environment, industry performance and company performance before making an investment decision. Mainly, the investors use fundamental factors to determine the real value of stocks. The important three tools of fundamental analysis are 1) Financial Report, 2) Earning and 3) Financial Ratio. In this work, we use Earning Per Share (EPS) and Price-to-Earnings Ratio (P/E Ratio). Technical analysis seeks to predict price movements by examining historical data, mainly price and volume. Technical Analysis is used to determine opportunities at which the trader should enter and exit. In this work, we use Commodity Channel Index (CCI) and Double Exponential Moving Average (DEMA).

In this paper, we try to combine Fundamental and Technical forecasting techniques with Elliott Wave Theory and construct a new trading strategy for the investors. Elliott Wave theory is one of the oldest and complex method for the forecasting. Elliott Wave theory is mainly based on crowd psychology and fractal theory. According to crowd psychology, people are scared of losing money and being happy with good returns. Due to this type of psychology, behavior of market mainly depends on traded volume of security. According to fractal theory, security prices always followrepetitive price pattern and this repetitive pattern forms wave in market. If this wave is identified before it occurs than accurate prediction of market is possible. Ralph Nelson Elliott was the first person who introduced Elliott Wave and talked about the accurate market prediction through Elliott Wave Theory.Wave pattern is difficult to identify on security price because it has very complex formulation. But with the help of Oscillator, a technical analysis tool,it is comparatively easy to determine where Elliott Wave ends, and upcoming Wave begins.

The Elliott Wave mainly is divided into two waves: 1)An impulse wave, which net travels in the same direction as the larger trend, always shows five waves in its pattern and 2) A corrective wave, on the other hand, net travels in the opposite direction of the main trend. [6]

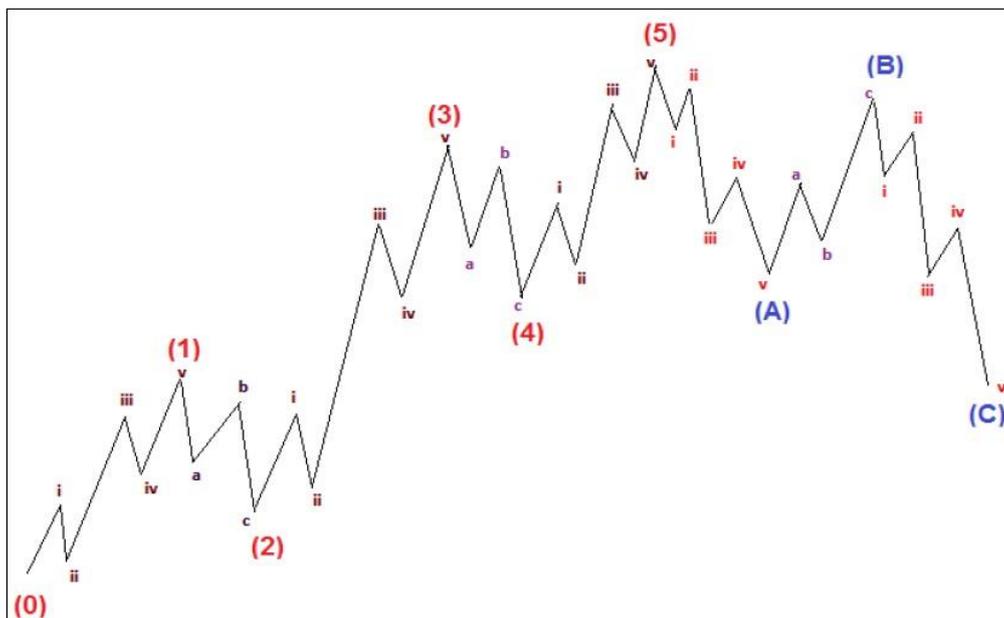


Figure-1: Elliott Wave

As shown in figure-1 the wave formation consists of 5 waves in the direction of primary/impulsive wave marked as 1, 2, 3, 4 and 5. It is followed by three waves in reverse direction of main trend which is called as corrective waves marked as A, B and C. As shown in figure-1, inner wave marked as 1, 3 and 5 are also impulsive waves of smaller degree. So, the wave 1, wave 3 and wave 5 are parts of impulsive wave in upward direction. [6]

Though Elliott waves follow many rules but three basic rules are followed by each wave to interpret Elliott wave. These guidelines are unbreakable. These rules are as follow:

- Rule 1: Wave 2 is not retracted more than 100% of wave 1.
- Rule 2: Wave 3 can never be the shortest wave among the 5 waves of impulse.
- Rule 3: Wave 4 cannot touch Wave 1 [6]

• **Fundamental Factors**

Earnings Per Share (EPS): Earnings Per Share is calculated as a company's profit divided by the outstanding shares of its common stock. The resulting number serves as an indicator of a company's profitability. Earnings Per Share indicates that how much money a company makes for each share of its stock. A higher EPS indicates more value because investors will pay more for a company with higher profits. EPS is a major component to calculate the Price-to-Earnings (P/E) ratio, where E in P/E denotes the EPS.

$$EPS = \frac{Net\ Income - Preferred\ Dividends}{End\ of\ Period\ common\ share\ outstanding}$$

Price-to-Earnings Ratio (P/E Ratio): The Price-to-Earnings Ratio is the relationship between a company's stock price and Earnings Per Share. P/E Ratio indicates the current investor demand for company shares. High P/E ratio suggests that demand of investor is high and in future the company's growth is high.

$$P/E\ Ratio = \frac{Market\ Value\ per\ Share}{Earnings\ per\ Share}$$

• **Commodity Channel Index (CCI)**

The Commodity Channel Index is momentum-based oscillator. The CCI was originally developed in Commodity magazines in 1980 by Donald Lambert. CCI was designed for the seasonal commodities. As the popularity of the CCI grew, it was adapted for use in the trade of equities, currencies and futures products. CCI was originally developed for long-term trend changes but today traders use it on all markets or timeframes because trading with multiple time-frame gives more signals to traders. CCI measures the difference between the current price and the historical average price.

CCI is an unbounded oscillator which generally fluctuates between -100 and 100. A bullish signal occurs when the indicator moves from the negative range into the positive range and bearish signal occurs when

it falls from the positive range to the negative range. The standard setting on the CCI indicator is 14, meaning that it will measure recent price changes against average price changes over 14 time periods.

Calculation:

$$CCI = \frac{TP - MA}{(0.15 \times MD)}$$

Where,

$$Typical\ Price\ (TP) = \sum_{i=1}^p \frac{(High + Low + Close)}{3}$$

$$Moving\ Average\ (MA) = \frac{\sum_{i=1}^p Typical\ Price}{p}$$

$$Mean\ Deviation\ (MD) = \frac{\sum_{i=1}^p |Typical\ Price - MA|}{p}$$

$p = \text{number of period}$

- **Double Exponential Moving Average (DEMA)**

The Double Exponential Moving Average is a trend indicator in Technical Analysis. Double Exponential Moving Average was introduced by Patrick Mulloy in his February 1994 article “Smoothing Data with Faster Moving Averages” in “Technical Analysis of Stocks and Commodities” magazine. DEMA is a calculation based on both the single Exponential Moving Average (EMA) and a Double Exponential Moving Average (DEMA). The DEMA responds quicker to price changes than a normal Exponential Moving Average.

Calculation:

$$DEMA = [2 \times EMA(N)] - SMA\ of\ EMA(N)$$

Where,

$N = \text{Look - back period}$

$SMA = \text{Simple Moving Average}$

$EMA = \text{Exponential Moving Average}$

$$EMA = [price(t) \times k] + [EMA(y) \times (1 - k)]$$

Where,

$t = \text{today}$

$y = \text{yesterday}$

$N = \text{Number of days in EMA}$

$k = \frac{\text{smoothing}}{n + 1}$

II. Literature Review

Collins (1938) first published the concepts of wave theory, based on the original work presented to him by the founder of the wave principle, R. N. Elliott. [6]

Elliott (1946) published his definitive work on the wave principle. Using stock market data as his main research tool, Elliott had isolated thirteen patterns of movement, or "waves," that recur in market price data. [7]

Suresh A(2013) studied the effect of fundamental factors and technical analysis on investment strategy. [10]

Bala& Sundar (2014) attempted to identify the regulatory framework of indices of Crude oil in India. The researcher found the overbought and oversold positions in crude oil using Commodity Channel Index. [13]

Naved (2015) examined the profitability of various kinds of oscillator used in technical analysis on market index of NSE (National Stock Exchange) S & P, CNX, Nifty 50 During 2004- 2014. The researcher concluded that Stochastic, RSI and CCI almost generate same profitability with CCI marginally giving higher profit. [5]

Maitah et. al (2016) focused on evaluating the trading rule of commodity channel index (CCI) indicator using selected agricultural commodities. They evaluated that CCI was suitable indicator for volatile markets such as commodity markets. [4]

Pathade (2017) studied the impact of fundamental factors such as Earning Per Share (EPS), Current Ratio, Profit Ratio and Turnover Ratio on two major Indian two-wheeler manufacturers. [9]

Kumar (2017) examined the effect of Earning Per Share (EPC) and price earnings ratio on market price of eight companies of nifty auto index. The researcher found that earning per share have

very strong forecaster of market price, while price ratio impact significantly on the prediction of market price of select companies of auto sector. [12]

Silpa et. al (2017) studied fundamental analysis of selected IT companies listed at NSE. They studied various parts of fundamental analysis like Economic analysis, Industry analysis and Company analysis. They concluded that the IT Sector companies were one most promising platform of investment in capital market. [8]

Vaghela and Gor (2020) worked on the combination of Elliott Wave theory and sentiment indicator to identify future market direction. They tried to reduce the complexity of Elliott Wave theory by using sentiment indicator. [1]

Panchal and Gor (2020) converted chart pattern of technical indicators which followed mean reversion into numeric form and determined buy and sell signal of investment without having to test the chart pattern. They tried to describe the hold phenomenon in the stock market. [2]

Panchal and Gor (2020) constructed a hybrid strategy of Exponential Moving Average and Parabolic Stop and Reversal which follows Mean Reversion process. They concluded that the hybrid strategy provides better long and short positions in the market and good strength of trend rather than individual indicator. [16]

Singh and Gor (2020) developed a solution for derivative pricing a European put option under the assumption that the distribution returns follows Gumbel distributed at maturity and also checked its relevancy to the actual market. [3]

III. Modeling the Hybrid Strategy of CCI and DEMA

In this work, we mainly focus on combining two different indicators and try to identify wave formation through that. CCI is oscillator type technical indicator and DEMA is trend indicator. DEMA is calculated using closing price and lookback period. CCI is calculated using Typical price and mean deviation. The reason behind making the combined strategy of CCI and DEMA is that in strong trend CCI generates many overbought or oversold region i.e. CCI generates many false signals in strong trend. We use Double Exponential Moving Average to eliminate the false signals of CCI. As CCI measures price oscillation through mean deviation so it can measure every fluctuation of security price. Because of this CCI will not be able to provide sufficient assistance in the construction of the wave. But this does not mean that wave formation by CCI cannot be understood. We can observe this from the following figure.

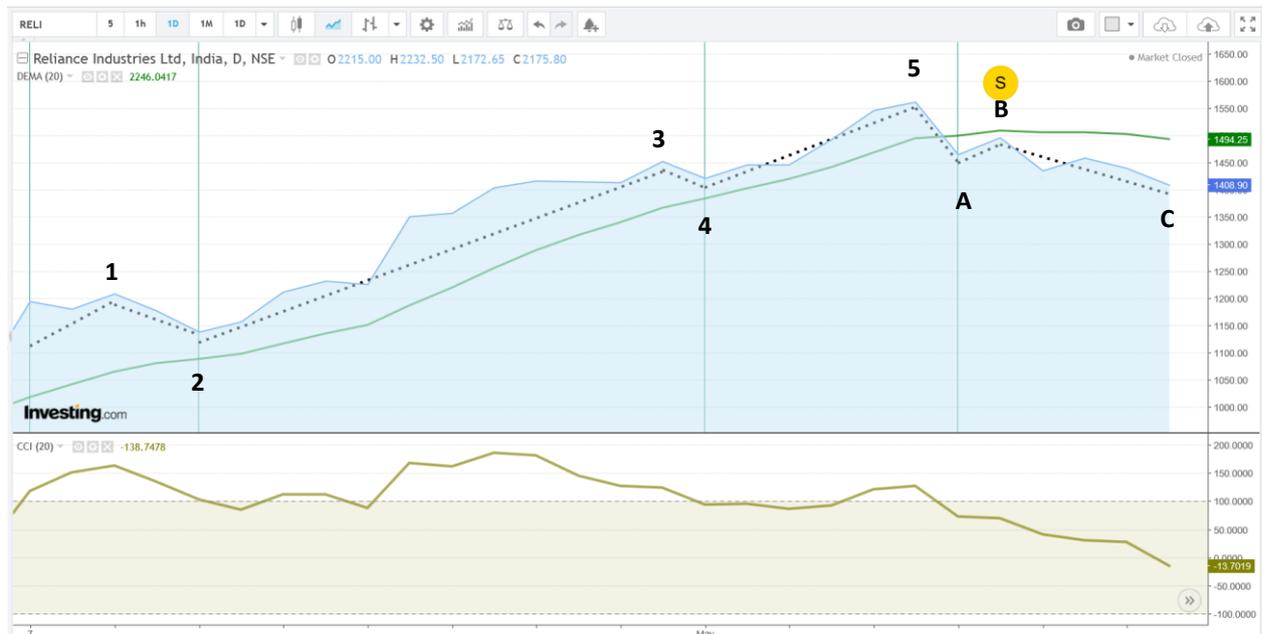


Figure 2: Wave formation through CCI carried out on investing.com

In figure 2, the shaded area represents the price of security. There are two lines on security price, the dotted line represents Elliott Wave, and the other line represents DEMA. The bottom side of figure 2 is graph of CCI.

IV. Research Methodology

1. Data Collection:

The data from 01-01-2018 to 01-01-2020 was collected from the National Stock Exchange website.

2. Computation:

• Fundamental factors:

We used Fundamental factors for selection of companies. We selected 10 companies from NIFTY 50 index by using fundamental factors namely EPS and P/E Ratio. The companies and its fundamentals are given in table 1.

Company name	EPS	P/E Ratio
Tata Consultancy Services Ltd	86.39	24.6
Reliance Industries Ltd	68.41	19.17
HDFC Bank Ltd	47.93	24.02
Infosys Ltd	38.39	19.66
ITC	12.19	15.43
Kotak Mahindra Bank	45.63	36.19
ICICI Bank	14.66	34.41
State Bank of India	15.8	18.26
Bajaj Finance Ltd	91.27	25.45
Axis Bank	17.93	37.89
Oil & Natural Gas Corporation	16.98	5.47

In table 1, there are two companies Tata Consultancy Services Ltd. and Bajaj Finance Ltd. that have high Earnings Per Share (EPS). From these two companies, we selected Bajaj Finance Ltd. because it had high Price-To-Earnings Ratio (P/E Ratio) as compared to Tata Consultancy Services Ltd.

• Commodity Channel Index (CCI):

$$CCI = \frac{TP - MA}{(0.15 \times MD)} \dots \dots (1)$$

Where,

$$Typical\ Price\ (TP) = \sum_{i=1}^p \frac{(High+Low+Close)}{3} \dots \dots (2)$$

$$Moving\ Average\ (MA) = \frac{\sum_{i=1}^p Typical\ Price}{p} \dots \dots (3)$$

$$Mean\ Deviation\ (MD) = \frac{\sum_{i=1}^p |Typical\ Price - MA|}{p} \dots \dots (4)$$

p = number of period

➤ Calculations of CCI for 14 period using excel:

- Step 1: Use High, Low and Close prices of 14 periods to calculate the Typical Price using equation (2).
- Step 2: Calculate the Moving Average of the Typical Price using equation (3).
- Step 3: Calculate the Mean Deviation using equation (4).
- Step 4: Calculate 14-period CCI using equation (1).
- Step 5: Now we insert the following formula in excel sheet to get the outcomes of CCI
=IF(CCI >= 100,"SELL", IF(CCI <= -100,"BUY","HOLD"))

5 th column	Typical price. Calculated by using equation (2)
6 th column	Moving Average of Typical Price
7 th column	Mean deviation of Typical price from Moving Average.
8 th column	Values of 14-period CCI by using equation (1)
9 th column	Outcomes. When 14-period CCI is greater than 100, indicates selling time of securities and 14-period CCI less than -100, indicates buying time of securities. And whenever 14-period CCI between -100 to 100, indicates hold period.

Date	High	Low	Close	Typical Price	Moving Average	Mean Deviation	CCI	CCI OUTCOMES
27-Nov-19	4124.9	4095	4118.35	4112.75	4152.9928	29.463263	-91.057665	HOLD
28-Nov-19	4139.05	4065	4102.05	4102.0332	4144.7273	28.073445	-101.38677	BUY
29-Nov-19	4135	4062.35	4074.2	4090.5167	4138.1583	29.248773	-108.58941	BUY
02-Dec-19	4077.35	3920.1	3950.45	3982.6334	4125.0143	37.426153	-253.62099	BUY
03-Dec-19	3995	3886.5	3964.55	3948.6834	4110.5976	48.774485	-221.31003	BUY
04-Dec-19	4004.1	3935	3990.85	3976.6501	4095.7881	56.108138	-141.55762	BUY
05-Dec-19	4034	3968	3990.85	3997.6167	4081.0845	59.82208	-93.017845	HOLD
06-Dec-19	4027.8	3927.4	3951.65	3968.95	4066.7333	65.590457	-99.38781	HOLD
09-Dec-19	3971.45	3880.25	3944.85	3932.1834	4051.3143	71.595559	-110.92954	BUY
10-Dec-19	3995	3945.5	3986.85	3975.7834	4038.9191	69.990461	-60.137423	HOLD

11-Dec-19	4055	3984.05	4036.8	4025.2834	4031.3048	63.236381	-6.3480427	HOLD
12-Dec-19	4065	4010.05	4057.15	4044.0667	4028.1881	59.674479	17.739063	HOLD
13-Dec-19	4089.25	4041.1	4071.95	4067.4334	4024.5964	55.667847	51.300599	HOLD
16-Dec-19	4087.95	4031.55	4039.45	4052.9833	4019.8262	50.8976	43.429843	HOLD
17-Dec-19	4155	4046.95	4135.75	4112.5667	4019.8131	50.884504	121.52167	SELL
18-Dec-19	4158.85	4101.05	4119.35	4126.4167	4021.5548	52.62618	132.83869	SELL
19-Dec-19	4145	4085.3	4091.85	4107.3834	4022.7595	53.830944	104.80198	SELL
20-Dec-19	4145	4081	4135.6	4120.5334	4032.6095	57.588088	101.78474	SELL
23-Dec-19	4184	4130	4160	4158	4047.5607	58.913092	124.97423	SELL
24-Dec-19	4180.7	4125.65	4139.5	4148.6167	4059.8441	60.291673	98.159096	HOLD
26-Dec-19	4196.45	4133.25	4187.1	4172.2668	4072.3191	62.79287	106.11364	SELL
27--Dec-19	4260	4192	4252.65	4234.8833	4091.3143	64.307488	148.83596	SELL
30-Dec-19	4281.55	4230	4243.3	4251.6165	4114.131	59.059518	155.19438	SELL
31-Dec-19	4266.4	4218.6	4234.75	4239.9167	4132.9976	58.187747	122.49892	SELL
01-Jan-20	4252	4221	4231.3	4234.7666	4147.9607	57.763085	100.18612	SELL
02-Jan-20	4295.75	4235	4246.05	4258.9333	4163.3083	58.933311	108.17305	SELL
03-Jan-20	4234.8	4173	4193.45	4200.4167	4172.8071	54.81289	33.580339	HOLD

- **Double Exponential Moving Average (DEMA):**

$$DEMA = [2 \times EMA(N)] - SMA \text{ of } EMA(N) \quad \dots \dots (5)$$

Where,

N = Look – back period
SMA = Simple Moving Average
EMA = Exponential Moving Average

$$EMA = [price(t) \times k] + [EMA(y) \times (1 - k)] \quad \dots \dots (6)$$

Where,

t = today
y = yesterday
N = Number of days in EMA
k = $\frac{\text{smoothing}}{n + 1}$

- Calculations of DEMA using excel.
 - Step 1: Choose any look back period, here we choose 14 periods.
 - Step 2: Calculate the EMA for 14 periods using equation (6).
 - Step 3: Compute the SMA of 14-period EMA.
 - Step 4: Calculate the 14-period DEMA using equation (5).
 - Step 5: Put the following formula in excel sheet to get the outcomes of DEMA.
 =IF(Closing price > DEMA, "UP", IF(Closing price < DEMA, "DOWN"))

For Table 3	
6 th column	EMA of 14 days. Calculated by using equation (6).
7 th column	SMA of EMA.
8 th column	DEMA of 14 days. Calculated by using equation (5).
9 th column	Trend determined by 14-period DEMA. When 14-period DEMA < closing price we consider up trend and vice versa.

Table-3: Observation table of 14-period DEMA.								
Date	Open	High	Low	Close	EMA	SMA of EMA	DEMA	DEMA OUTCOMES
27-Nov-19	4121	4124.9	4095	4118.35	4124.24	4122.46	4126.02454	DOWN
28-Nov-19	4120	4139.05	4065	4102.05	4121.28	4124.83	4117.74122	DOWN
29-Nov-19	4095	4135	4062.35	4074.2	4115.01	4126.06	4103.94762	DOWN
02-Dec-19	4075	4077.35	3920.1	3950.45	4093.07	4125.06	4061.07508	DOWN
03-Dec-19	3939.95	3995	3886.5	3964.55	4075.93	4122.47	4029.39318	DOWN
04-Dec-19	3958	4004.1	3935	3990.85	4064.59	4118.13	4011.04126	DOWN
05-Dec-19	3990.85	4034	3968	3990.85	4054.75	4112.5	3997.01007	DOWN
06-Dec-19	4010	4027.8	3927.4	3951.65	4041.01	4105.68	3976.33203	DOWN
09-Dec-19	3969.6	3971.45	3880.25	3944.85	4028.19	4097.96	3958.41588	DOWN

10-Dec-19	3950	3995	3945.5	3986.85	4022.67	4089.82	3955.53331	UP
11-Dec-19	4001.5	4055	3984.05	4036.8	4024.56	4081.93	3967.18221	UP
12-Dec-19	4050	4065	4010.05	4057.15	4028.9	4074.9	3982.90598	UP
13-Dec-19	4070	4089.25	4041.1	4071.95	4034.64	4068.14	4001.14422	UP
16-Dec-19	4087.95	4087.95	4031.55	4039.45	4035.28	4061.72	4008.84497	UP
17-Dec-19	4056.95	4155	4046.95	4135.75	4048.68	4056.33	4041.03326	UP
18-Dec-19	4140.45	4158.85	4101.05	4119.35	4058.1	4051.81	4064.39171	UP
19-Dec-19	4113.05	4145	4085.3	4091.85	4062.6	4048.07	4077.13427	UP
20-Dec-19	4107	4145	4081	4135.6	4072.34	4046.59	4098.08115	UP
23-Dec-19	4138.6	4184	4130	4160	4084.02	4047.17	4120.88032	UP
24-Dec-19	4158	4180.7	4125.65	4139.5	4091.42	4049.08	4133.75723	UP
26-Dec-19	4149.95	4196.45	4133.25	4187.1	4104.18	4052.61	4155.74153	UP
27--Dec-19	4198	4260	4192	4252.65	4123.97	4058.54	4189.40787	UP
30-Dec-19	4274.85	4281.55	4230	4243.3	4139.88	4066.52	4213.24962	UP
31-Dec-19	4247	4266.4	4218.6	4234.75	4152.53	4075.79	4229.27158	UP
01-Jan-20	4237.8	4252	4221	4231.3	4163.04	4085.69	4240.38484	DOWN
02-Jan-20	4240	4295.75	4235	4246.05	4174.1	4096.06	4252.15062	DOWN
03-Jan-20	4220	4234.8	4173	4193.45	4176.68	4106.2	4247.16393	DOWN

3. Observation

Data analysis of combined strategy of CCI and DEMA with 14 periods.

To get the combined outcomes we apply the following formula,

=IF(AND(CCIoutcome="buy",DEMAoutcome="Down"),"Buy",IF(AND(CCIoutcome="sell",DEMAoutcome="up"),"Sell","Hold"))

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For Table 4	
3 rd column	Trend determined by 14-period DEMA.
5 th column	Buying, selling and holding time determined by CCI.
6 th column	Combined Outcomes. When both the indicators are in same direction than it makes strong decision. Buy: when DEMA indicates down trend and CCI indicates buy. Sell: when DEMA indicates up trend and CCI indicates sell. Hold: when both indicators are in opposite direction.

Table-4 Observation table of combined strategy					
DATE	DEMA	DEMA OUTCOMES	CCI	CCI OUTCOMES	COMBINED OUTCOMES
27-Nov-19	4126.024542	DOWN	-91.058	HOLD	Hold
28-Nov-19	4117.741222	DOWN	-101.39	BUY	Buy
29-Nov-19	4103.947624	DOWN	-108.59	BUY	Buy
02-Dec-19	4061.075076	DOWN	-253.62	BUY	Buy
03-Dec-19	4029.393177	DOWN	-221.31	BUY	Buy
04-Dec-19	4011.041256	DOWN	-141.56	BUY	Buy
05-Dec-19	3997.010067	DOWN	-93.018	HOLD	Hold
06-Dec-19	3976.332032	DOWN	-99.388	HOLD	Hold
09-Dec-19	3958.415881	DOWN	-110.93	BUY	Buy
10-Dec-19	3955.53331	UP	-60.137	HOLD	Hold
11-Dec-19	3967.18221	UP	-6.348	HOLD	Hold
12-Dec-19	3982.905981	UP	17.7391	HOLD	Hold
13-Dec-19	4001.144216	UP	51.3006	HOLD	Hold
16-Dec-19	4008.844974	UP	43.4298	HOLD	Hold
17-Dec-19	4041.033264	UP	121.522	SELL	Sell
18-Dec-19	4064.391711	UP	132.839	SELL	Sell
19-Dec-19	4077.134267	UP	104.802	SELL	Sell
20-Dec-19	4098.081148	UP	101.785	SELL	Sell
23-Dec-19	4120.880324	UP	124.974	SELL	Sell
24-Dec-19	4133.75723	UP	98.1591	HOLD	Hold
26-Dec-19	4155.741527	UP	106.114	SELL	Sell
27--Dec-19	4189.407866	UP	148.836	SELL	Sell
30-Dec-19	4213.249621	UP	155.194	SELL	Sell
31-Dec-19	4229.271577	UP	122.499	SELL	Sell
01-Jan-20	4240.384841	DOWN	100.186	SELL	Hold
02-Jan-20	4252.150624	DOWN	108.173	SELL	Hold
03-Jan-20	4247.163927	DOWN	33.5803	HOLD	Hold

V. Conclusion

A combined strategy of DEMA and CCI is applied on a stock which is selected by using fundamental factors, Earnings Per share (EPS) and Price-to-Earnings Ratio (P/E Ratio). CCI is a momentum oscillator that was originally developed for commodity market but in stock market it is helpful to identify overbought or oversold levels or trend reversals. CCI measures every fluctuations of market, this is the biggest shortcoming. This shortcoming can overcome by DEMA which is a trend indicator that can be used to identify uptrend and downtrend. Hence the combined strategy of DEMA and CCI is effective. With this strategy we try to understand the creation of Elliott Wave. But CCI being a weak oscillator, this strategy cannot explain wave formation effectively. Further research can be considered on other robust strategies.

References

- [1]. Vaghela V.&Gor, R. (2020) Market Direction by combining Elliott Wave Theory with Sentiment Indicator. *Alochnachakra*, Vol 9(6), 5794-5797.
- [2]. Panchal M.&Gor, R. (2020) Numeric form of Technical Analysis based on Mean Reversion. *Alochnachakra*, Vol 9(6), 5789-5793.
- [3]. Singh, A., &Gor, R. (2020) Relevancy of pricing European put option based on Gumbel distribution in actual market. *Alochanachakra*. Vol 9(6), 4339-4342.
- [4]. Maitah, M., Prochazka, P., Cermak, M., &Šrédli, K. (2016). Commodity channel index: Evaluation of trading rule of agricultural commodities. *International Journal of Economics and Financial Issues*, 6(1), 176-178.
- [5]. Naved, M., & Srivastava, P. (2015). Profitability of Oscillators used in Technical Analysis for Financial Market. *Advances in Economics and Business Management (AEBM) Print ISSN*, 2394-1545.
- [6]. Collins, C.J.(1938), *The Wave Principle*
- [7]. Elliott, R.N.(1946), *Nature's Law - The Secret of the Universe*
- [8]. Silpa, K. S., ARYA, M., & AS, A. (2017). A study on Fundamental Analysis of Selected IT companies Listed at NSE. *Journal of Advanced Research in Dynamical and Control Systems*, 9(5), 1-10.
- [9]. Pathade, V. P. (2017). Equity research: Fundamental analysis for long term investment. *IJAR*, 3(4), 678-682.
- [10]. AS, S. (2013). A study on fundamental and technical analysis. *International Journal of Marketing, Financial Services & Management Research*, 2(5), 44-59.
- [11]. Kowsalya, P., &Valarmathi, A. (2018). A Study on the Technical Analysis of NSE Towards it Stocks with Reference to Indian Stock Market. *International Journal of Advances in Agriculture Sciences*.
- [12]. Kumar, P. (2017). Impact of earning per share and price earnings ratio on market price of share: a study on auto sector in India. *International Journal of Research-Granthaalayah*, 5(2), 113-118.
- [13]. Bala, M & Sundar, D., (2014). Commodity Channel Index of Crude Oil in India – An Analytical View. *International Journal of Management and Social Science Research Review*, 1(6), 125-130.
- [14]. <https://www.nseindia.com>
- [15]. <https://www.investing.com>
- [16]. Panchal, M., &Gor, R. (2020) A hybrid strategy using Mean Reverting Indicator PSAR and EMA. *IOSR Journal of Mathematics (IOSR-JM)* e-ISSN: 2278-5728, p-ISSN: 2319-765X. Volume 16, Issue 5 Ser. III, PP 11-22.

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