

AN EXPLORATORY STUDY OF ELLIOTT WAVE THEORY IN INDIAN STOCK MARKETS

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INTRODUCTION:

R. N. Elliott propounded the Elliott Wave Theory, which states that stock prices are governed by cycles founded upon the Fibonacci series (1-2-3-5-8-13-21...). Specifically, Elliott believed the market moved in four distinct up-movements and three distinct down-movements. The basic shape of the wave is shown in Fig.1.

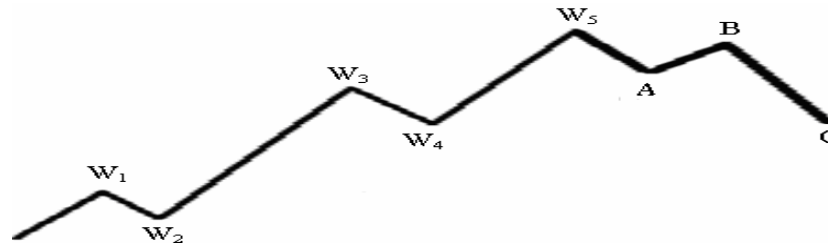


Fig: 1: Elliott wave

Wavefronts W₁, W₃ and W₅ represent the 'impulse', or minor up-waves in a major bull move. Wavefronts W₂ and W₄ represent the 'corrective or minor down-waves in the major bull move. B represents the one up-wave in a minor bear wave. (Fibonacci ratios?)

Elliott proposed that the waves were fractal in nature- meaning there could be waves within waves. This means that the chart above not only represents the primary wave pattern, but it could also represent what occurs just between points W₂ and W₄.

Elliott Wave theory ascribes names to the waves in order of descending size: Grand Supercycle; Supercycle; Cycle; Primary; Intermediate; Minor; Minute; Minuette; and Sub-Minuette. The major waves determine the major trend of the market, and minor waves determine minor trends, similar to the way Dow Theory postulates primary and secondary trends.

Fig. 2 presents an example of a classic Elliott Wave cycle that occurred in the NASDAQ Composite in late 2003.²



Fig: 2: an example of an Elliott wave

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² <http://www.elliottwaveindia.com/elliottwave-theory2.asp>
http://www.market-harmonics.com/elliott_wave1.htm

Trading using Elliott Wave patterns is quite simple. The trader identifies the main wave or Supercycle, enters long, and then sells or shorts, as the reversal is determined. This continues in progressively shorter cycles until the cycle completes and the main wave resurfaces. The caution to this is that much of the wave identification is taken in hindsight and disagreements arise between Elliott Wave technicians as to which cycle the market is in.

LITERATURE REVIEW:

There have been two main approaches to analyse the securities market - the fundamental approach and the technical approach. The fundamental approach stresses the influence of a firm's basic earnings and risk on the market price of its shares, whereas the technical approach concentrates on the patterns of stock market prices. The technical approach states that past share prices and volumes tend to follow a pattern and they can be used to predict future price movements. Forces of demand and supply determine the share prices; however, the fundamentalists think that they are a function of rational factors, while technicians attribute it to psychological factors.

Technical analysis involves searching for recurrent and predictable patterns in stock prices. This type of analysis has a long history and dates back to the Japanese rice traders trading on the Dojima Rice Exchange in Osaka as early as 1600s. It evolved into Chartism in the early 20th century with mechanical trading rules to generate signals. This development has since been aided by the introduction of electronics which took the tedium out of complex mathematical manipulations. More recently, concepts like chaos theory, fuzzy logic, artificial neural network, genetic algorithms, and so on, have been applied to the financial markets. This could well be the next stage of the evolution of technical analysis.

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. Elliott himself published his work much later; Elliott (1946), 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. Elliott described how these structures link together to form larger versions of those same patterns, how those in turn link to form identical patterns of the next larger size, and so on. Thus the wave principle can be described as a catalog of price patterns and an explanation of where these forms are likely to occur in the overall path of market development. Bolton (1953) applied these principles in U. S. markets.

According to Prechter and Kendall (1996), wave theory postulated that price movements in the markets have impulse waves and corrective waves which can be viewed through the lens of crowd psychology – market sentiment. They suggested that wave theory reveals that mass psychology swings from pessimism to optimism and back in a natural sequence, creating specific and measurable patterns, and that wave analysis measures investor psychology, which is the real underlying factor behind markets: when people are optimistic about the future of a given issue, they bid the price up.

Further literature includes classic writings (Prechter, 1994a; Prechter, 1994b), expansions of the theory (Prechter & Frost, 2001), and trading use (Prechter, 2003; Walker, 2001; Poser, 2003).

The technical analysis approach to capital market evaluation has received little attention and acceptance in the literature as compared to fundamental analysis. However, in recent years the popularity of technical school of thought is increasing amongst academicians and practitioners. There has been some empirical research on technical analysis for developed capital markets; however similar empirical work for developing markets especially India is limited. In this light, an empirical testing of technical indicators for Indian stock market is considered important.

The Indian stock market has given varied returns in the past. NIFTY in particular has lost more than 65% from the peak within a period of ten months, leaving no scope for explanation from fundamental analysis. In this rapidly changing complex business world where the market dynamics are changing minute by minute, hour by hour, all market participants are exposed to the changing dynamics and thereby its inherent price risk.

The present study is an exploratory study on Elliott waves. The primary objective of the study is to find whether there is significant occurrence of defined patterns, particularly Elliott waves, in Indian stock markets.

DATA AND METHODOLOGY:

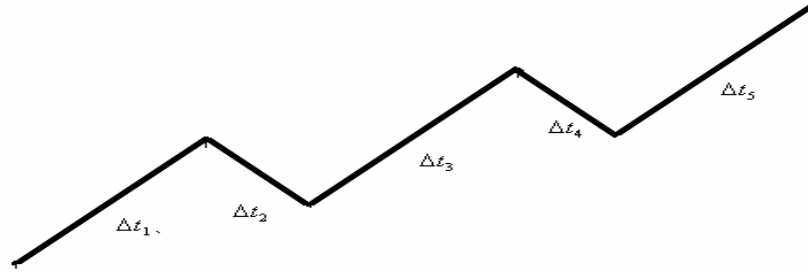
The data for the study consisted of the closing prices of a sample of thirty-six of the fifty scrips constituting the NSE NIFTY index in the period Jan. 1, 2001 to Dec. 31, 2008, comprising a series of two thousand and three trading days. Only those scrips which were traded in the entire study period were selected in the sample.

The following patterns were investigated in the study:

PATTERN1: a four-day pattern, with alternating gains and losses, i.e. “+ - + -,” where ‘+’ signifies gain in the scrip on that day, and ‘-’ signifies loss in the scrip on that day.

PATTERN2: a seven-day pattern resembling the movement of an Elliot wave, viz. “+ + - + - + -,” where ‘+’ and ‘-’ are defined as before.

TREND: a pattern in which five time intervals are considered, in Fibonacci ratio to the previous interval: $\Delta t_2 \approx 0.382\Delta t_1$, $\Delta t_3 \approx 1.618\Delta t_1$, $\Delta t_4 \approx 0.382\Delta t_3$, and $\Delta t_5 \approx 1.618\Delta t_3$.



For example, if Δt_1 were 200 days; Δt_2 would be taken as $0.382 \Delta t_1 = 76$ days; Δt_3 would be taken as $1.618 \Delta t_1 = 324$ days; Δt_4 would be taken as $0.382 \Delta t_3 = 123$ days; and Δt_5 would be taken as $1.618 \Delta t_3 = 324$ days.

WAVE: a pattern similar to TREND1, with similar ratios of time intervals, with the additional condition that Δt_2 and Δt_4 should have negative returns.

ELLIOTT-WAVE: a pattern resembling the general Elliot wave, with time intervals similar to those considered in the patterns TREND1 and WAVE1, and with the additional condition that the retracements (i.e. in time intervals Δt_2 and Δt_4) would lie in the range 30% to 50%.

The study used the lognormal model to analyse wave behaviour in stock prices. The model was calibrated using the estimates of the drift and volatility parameters obtained from the closing NIFTY index values in the study period. With these estimates, stock prices were simulated using the Monte Carlo method for five hundred runs. In each simulation run, the number of “waves” of each type were counted, yielding the sampling distribution of the number of “waves” of each type in the simulated sample.

This was used to test for the presence of each pattern by the construction of z-scores, using the formula $z = \frac{N - \bar{N}}{s_N}$, where N is the observed number of “waves” of a particular pattern detected in a scrip, \bar{N} is the sample mean number of “waves” of that particular

pattern from the sampling distribution, and s_N is the sample standard deviation of the number of “waves” of that particular pattern from the sampling distribution. If the z-score is positive and significant (right tail), the occurrence of the given pattern is high in the considered scrip; while if the z-score is negative and significant (left tail), the occurrence of the given pattern is low in the considered scrip. If the z-score is insignificant, the occurrence of that pattern in the considered scrip is consistent with the occurrence of the pattern in a random series of stock prices.

ANALYSIS & INTERPRETATION:

The descriptive statistics of the numbers of “waves” of different patterns generated in five hundred iterations of the simulation are presented in Table 1. The occurrence and significance of the patterns in the sample scrips and in the index is presented in Table 2.

Table 1: descriptive statistics of the number of "waves" of different patterns in the simulated sample

	PATTERN1		PATTERN2		TREND			
					5 days	21 days	55 days	200 days
Mean	123.83		0.00		60.37	89.32	145.44	229.76
Std. Dev.	12.06		0.00		11.12	31.94	81.98	181.91
	WAVE				ELLIOTT-WAVE			
	5 days	21 days	55 days	200 days	5 days	21 days	55 days	200 days
Mean	11.94	13.99	16.69	12.56	0.16	0.25	0.45	0.67
Std. Dev.	4.00	6.13	10.96	16.97	0.39	0.52	0.81	2.61

It was found that PATTERN1 appeared very frequently in the simulated sample. The lower 95% confidence limit for PATTERN1 suggests that for 97.5% of the scrips, at least one hundred occurrences of PATTERN1 would be expected. However, it was found that PATTERN1 was significantly less prevalent than expected for 38.89% of the sample scrips, and for the index. Thus, PATTERN1 was found to be significantly less prevalent than expected.

It was found that PATTERN2 did not appear at all in the simulated sample, while it was found to be quite prevalent in all of the sample scrips and in the index. Thus, PATTERN2 was found to be significantly more prevalent than expected in all the sample scrips.

It was found that TREND appeared very frequently in the simulated sample, increasing with length. However, mixed results were obtained for the sample scrips. It was found that TREND (5dy) was significantly less prevalent than expected for 5.56% of the sample scrips, while it was found to be significantly more prevalent than expected for 11.11% of the sample scrips; TREND (21dy) was significantly more prevalent than expected for 13.89% of the sample scrips; TREND (55dy) was significantly more prevalent than expected for 2.78% of the sample scrips; and TREND (200dy) was not significant for all the sample scrips. Also, TREND was found to be not significant for the index.

It was found that WAVE appeared moderately frequently in the simulated sample. It was found that WAVE (5dy) was significantly more prevalent than expected for 8.33% of the sample scrips; WAVE (21dy) was significantly more prevalent than expected for 11.11% of the sample scrips; WAVE (55dy) was significantly more prevalent than expected for 8.33% of the sample scrips; and WAVE (200dy) was significantly more prevalent than expected for 8.33% of the sample scrips. Also, for the index, WAVE (5dy) was found to be significantly less prevalent than expected, while WAVE (200dy) was found to be significantly more prevalent than expected.

It was found that ELLIOTT-WAVE appeared very rarely in the simulated sample. It was found that ELLIOTT-WAVE (5dy) was significantly more prevalent than expected for 19.44% of the sample scrips; ELLIOTT-WAVE (21dy) was significantly more prevalent than

expected for 16.67% of the sample scrips; ELLIOTT-WAVE (55dy) was significantly more prevalent than expected for 8.33% of the sample scrips; and ELLIOTT-WAVE (200dy) was not significant for all the sample scrips. Also, ELLIOTT-WAVE was found to be not significant for the index.

DISCUSSION:

The results of the study show that patterns do exist in the market. In particular, PATTERN1 was significantly absent for several scrips; PATTERN2 was significantly present for all scrips; short-length TREND was significantly present across several scrips; WAVE over all lengths was seen across several scrips; and short- and medium-length ELLIOTT-WAVE was seen across several scrips. The results of the study thus tend to support Elliott Wave Theory, especially for short- and medium-length waves.

The present study has introduced an innovation whereby charting patterns are translated into logical expressions, thus removing the subjectivity of charting. This technique can be used to detect patterns for any technical chart, and it can be customized to the analyst's own requirements, either with exact values or with bounded ranges.

There were certain limitations inherent in the study. The study was based on the lognormal model of stock prices; and the sampling distributions are based on a limited number (five hundred only) of simulation runs. Also, the study covers only thirty-six scrips of NSE NIFTY, over a limited study period (Jan'01 to Dec'08). Finally, all the results are based on historical data, and may not be applicable for future states.

There is a tremendous potential for further research in line with the present study. Many other patterns and waveforms can be investigated by similar methods. Other models of stock prices can be used instead of the lognormal model. A more detailed analysis would cover a larger set of scrips, over a longer time period. Finally, the results would be expected to be better if a larger number of simulation runs were used.

Another issue where a similar methodology would perhaps yield interesting insights is that of market reaction to announcements. The actual pattern of stock price movements for particular types of announcements could be compared with what would be expected in order to identify significant patterns of reactions.

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Table 2: occurrence and significance of the different patterns in the sample scrips

		PATTERN	TREND				WAVE				ELLIOTT-WAVE			
			5 dy	21 dy	55 dy	200 dy	5 dy	21 dy	55 dy	200 dy	5 dy	21 dy	55 dy	200 dy
ABB	freq	108	66	163	192	517	23	23	15	28	0	3	0	0
	p-value	0.0947	0.3063	0.0105	0.2851	0.0572	0.0028	0.0708	0.4386	0.1816	0.3431	0.0000	0.2875	0.3989
ACC	freq	105	69	64	203	282	16	4	47	39	1	0	0	0
	p-value	0.0593	0.2189	0.2140	0.2413	0.3870	0.1549	0.0516	0.0029	0.0597	0.0157	0.3136	0.2875	0.3989
Ambuja Cements	freq	98	79	117	151	225	13	20	41	48	0	2	0	0
	p-value	0.0161	0.0469	0.1930	0.4730	0.4896	0.3953	0.1634	0.0133	0.0184	0.3431	0.0004	0.2875	0.3989
BHEL	freq	112	65	192	190	418	14	32	5	52	0	0	0	0
	p-value	0.1633	0.3386	0.0007	0.2934	0.1504	0.3030	0.0017	0.1430	0.0101	0.3431	0.3136	0.2875	0.3989
BPCL	freq	116	61	80	69	100	14	8	12	4	1	0	0	0
	p-value	0.2581	0.4775	0.3852	0.1756	0.2378	0.3030	0.1642	0.3343	0.3069	0.0157	0.3136	0.2875	0.3989
Cipla	freq	118	56	99	78	8	11	7	9	1	0	0	0	0
	p-value	0.3143	0.3471	0.3809	0.2054	0.1114	0.4073	0.1271	0.2414	0.2478	0.3431	0.3136	0.2875	0.3989
GAIL	freq	122	69	109	153	96	11	24	22	0	0	1	1	0
	p-value	0.4396	0.2189	0.2689	0.4633	0.2311	0.4073	0.0502	0.3142	0.2296	0.3431	0.0769	0.2501	0.3989
Grasim	freq	101	60	105	152	232	13	19	34	16	0	0	1	0
	p-value	0.0292	0.4867	0.3117	0.4681	0.4951	0.3953	0.2069	0.0572	0.4198	0.3431	0.3136	0.2501	0.3989
HCL	freq	110	41	60	85	79	8	14	4	2	0	0	1	0
	p-value	0.1258	0.0492	0.1793	0.2305	0.2036	0.1624	0.4993	0.1234	0.2669	0.3431	0.3136	0.2501	0.3989
HDFC Bank	freq	105	53	84	141	183	13	20	4	7	0	0	1	0
	p-value	0.0592	0.2536	0.4339	0.4784	0.3986	0.3953	0.1634	0.1234	0.3715	0.3431	0.3136	0.2501	0.3989
HDFC	freq	102	69	104	116	335	13	17	22	6	0	0	0	0
	p-value	0.0352	0.2189	0.3229	0.3597	0.2815	0.3953	0.3117	0.3142	0.3495	0.3431	0.3136	0.2875	0.3889
Hero Honda	freq	128	60	145	42	21	13	20	9	6	0	1	0	0
	p-value	0.3453	0.4867	0.0406	0.1035	0.1256	0.3953	0.1634	0.2414	0.3495	0.3431	0.0769	0.2875	0.3989
Hindalco	freq	100	71	83	66	21	21	15	18	0	0	1	0	0

	p-value	0.0241	0.1695	0.4216	0.1663	0.1256	0.0117	0.4346	0.4526	0.2296	0.3431	0.0769	0.2875	0.3989
HUL	freq	120	47	46	33	5	12	7	6	5	1	0	0	0
	p-value	0.3753	0.1145	0.0875	0.0851	0.1083	0.4938	0.1271	0.1647	0.3279	0.0157	0.3136	0.2875	0.3989
ICICI Bank	Freq	110	57	104	98	291	15	17	9	55	2	1	0	3
	p-value	0.1258	0.3808	0.3229	0.2814	0.3682	0.2219	0.3117	0.2414	0.0062	0.0000	0.0769	0.2875	0.1855
Infosys	freq	105	51	104	103	173	16	16	0	12	0	0	0	0
	p-value	0.0161	0.1996	0.3229	0.3023	0.3775	0.1549	0.3715	0.0639	0.4867	0.3431	0.3136	0.2875	0.3989
ITC	freq	123	55	118	174	210	14	27	15	17	0	2	0	0
	p-value	0.4724	0.3145	0.1846	0.3638	0.4567	0.3030	0.0169	0.4386	0.3969	0.3136	0.0004	0.2875	0.3989
L &T	freq	92	69	183	316	413	17	25	57	0	0	1	4	0
	p-value	0.0042	0.2189	0.0015	0.0187	0.1569	0.1028	0.0362	0.0001	0.2296	0.3136	0.0769	0.0000	0.3989
M&M	freq	84	82	115	148	212	10	5	24	16	1	0	2	0
	p-value	0.0005	0.0259	0.2107	0.4876	0.4611	0.3140	0.0712	0.2526	0.4198	0.0157	0.3136	0.0281	0.3989
Nalco	freq	128	53	57	98	109	6	8	27	1	0	0	3	0
	p-value	0.3649	0.2536	0.1558	0.2814	0.2534	0.0688	0.1642	0.1736	0.2478	0.3431	0.3136	0.0008	0.3989
ONGC	freq	101	40	58	144	156	8	10	28	0	0	0	0	0
	p-value	0.0292	0.0334	0.1634	0.4930	0.3426	0.1624	0.2576	0.1512	0.2296	0.3431	0.3136	0.2875	0.3989
Ranbaxy	freq	127	61	64	86	64	19	13	8	15	0	0	1	0
	p-value	0.3965	0.4775	0.2140	0.2342	0.1811	0.3140	0.4358	0.2139	0.4429	0.3431	0.3136	0.2501	0.3989
RIL	freq	135	83	109	220	147	12	17	3	7	0	1	0	0
	p-value	0.1773	0.0209	0.2689	0.1816	0.3246	0.4938	0.3117	0.1058	0.3715	0.3431	0.0769	0.2875	0.3989
Rel Infra	freq	112	67	125	102	74	15	21	19	0	0	0	0	0
	p-value	0.1633	0.2755	0.1319	0.2981	0.1960	0.3319	0.1264	0.4167	0.2296	0.3431	0.3136	0.2875	0.3989
Satyam	freq	108	44	98	90	74	11	14	7	20	1	0	0	2
	p-value	0.0947	0.0704	0.3929	0.2494	0.1959	0.4073	0.4993	0.1883	0.3307	0.0157	0.3136	0.2875	0.3047
Siemens	freq	104	71	134	207	456	24	12	14	48	0	0	0	0
	p-value	0.0501	0.1695	0.0909	0.2264	0.1068	0.0013	0.3727	0.4029	0.4029	0.3431	0.3136	0.2875	0.3989
SBI	freq	133	63	90	101	240	14	22	11	12	1	2	0	1
	p-value	0.7763	0.4066	0.4915	0.2939	0.4776	0.3030	0.0957	0.3017	0.4867	0.0157	0.0004	0.2875	0.4493

SAIL	freq	87	75	83	117	159	12	19	27	0	0	0	0	0
	p-value	0.0011	0.0941	0.4216	0.3643	0.3486	0.4938	0.2069	0.0599	0.2296	0.3431	0.3136	0.2875	0.3989
Sterlite	freq	96	92	136	162	282	9	18	16	0	0	2	0	0
	p-value	0.0105	0.0022	0.0719	0.4200	0.3870	0.2313	0.2565	0.4748	0.2296	0.3431	0.0004	0.2875	0.3989
Sun Pharma	freq	136	49	84	140	336	11	21	16	0	0	1	1	0
	p-value	0.1566	0.1532	0.4339	0.4735	0.2796	0.4073	0.1264	0.4748	0.2296	0.3431	0.0769	0.2501	0.3989
Tata Comm	freq	109	54	45	92	38	14	10	26	0	0	0	0	0
	p-value	0.1094	0.2833	0.0826	0.2572	0.1459	0.3030	0.2576	0.1980	0.2296	0.3431	0.3136	0.2875	0.3989
Tata Motors	freq	99	68	144	193	151	9	14	30	0	0	0	0	0
	p-value	0.0198	0.2463	0.0434	0.2612	0.3325	0.2313	0.4993	0.1124	0.2296	0.3431	0.3136	0.2875	0.3989
Tata Power	freq	104	65	129	134	156	12	31	9	0	0	2	0	0
	p-value	0.0501	0.3386	0.1070	0.4445	0.3426	0.4938	0.0028	0.2414	0.2296	0.3431	0.0004	0.2875	0.3989
Tata Steel	freq	94	68	80	59	151	14	12	19	1	0	0	0	0
	p-value	0.0067	0.2463	0.3852	0.1458	0.3325	0.3030	0.3727	0.2104	0.2478	0.3431	0.3136	0.2875	0.3989
Wipro	freq	132	50	102	71	46	12	16	5	31	0	0	0	0
	p-value	0.2492	0.1754	0.3456	0.1819	0.1562	0.4938	0.3715	0.1430	0.1387	0.3431	0.3136	0.2875	0.3989
Zee	freq	111	48	44	78	51	11	7	32	32	0	0	0	0
	p-value	0.1437	0.1329	0.0780	0.2054	0.1629	0.4073	0.1271	0.0813	0.1261	0.3431	0.3136	0.2875	0.3989
NIFTY	freq	81	65	118	113	158	3	16	18	48	0	0	0	2
	p-value	0.0002	0.3386	0.1846	0.3461	0.3466	0.0127	0.3715	0.4526	0.0184	0.3431	0.3136	0.2875	0.3047