

Prediction of Market Capitalization Trend through Selection of Best ARIMA Model with Reference to Indian Infrastructural Companies

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Abstract

The Term Market Capitalization represents the combined value of a company's share. Market capitalization has been calculated by multiplying the present share market price to the numbers of outstanding share in the market. Companies use predicting technique to make tactical decisions about market capitalization, productions, sales, etc. The precedent data are used by companies to forecast, anticipating regarding to the future. Time series analysis can be used to predict the future. This study is an effort to examine the best ARIMA model for predicting market capitalization. Quarterly Market Capitalization data series of 21 Infrastructural Sector Companies listed in S&P BSE-200 Index have been used for this study. The finest ARIMA models have been selected on the basis of criteria namely SC, AIC, DW Statistic, RMSE, MAPE and Adjusted R-Square, etc. Best model has been considered on the basis of smallest values of criteria. ARIMA investigation is applied for 21 companies secluded the firms into three categories i.e. companies on an upward trend, linear trend and downward trend. This study also focused on the financial statement of the companies to reveal the rationale for the trend of market capitalization during the study and forecasted period.

Keywords: Market Capitalization, ARIMA, Infrastructure Sector, Stock Market.

1. Introduction

Capital structure is an essential part of economic growth and development and it plays a significant role in the economic premise of manufacturing and distribution. This implicit that capital growth may facilitate faster rate of economic development. The growth of a stock market is measured by its total market capitalization. The growth rate and size of the market capitalization create a major influence on development and growth of the economy [1].

1.1. Market Capitalization

The term, 'Market Capitalization' of a company refers to current market rate of per stock multiplied by the number of outstanding shares. The universal benchmark to quantify the value of the firm is market capitalization. The present market price reflects the present worth and the size has been reflects by total numbers of shares, it give an obvious representation of the market value of a firm. The accomplishment or breakdown

of crucial decision such as M&A, and takeovers has an immense impact on the value of a firm.

1.2. Indian Infrastructural Sector

Infrastructure drives development in the economy. It is also a significant for the efficient performance of the economy. Development in the infrastructure has a direct impact on the sustainability of overall development and growth of the country. In recent years, India made major development in physical infrastructure. Roads, railways, ports, electricity, irrigation, airports, and rural and urban water supply and sanitation with the governments focus on infrastructure development, and amplified investments in the sector. India is facing major infrastructural lacunae and requires more investments. Efficient and extensive infrastructure is a crucial driver of competitiveness. Universal perception on India's infrastructure reflects on the way it is rated vis-a-vis other developing countries such as China & Brazil. "As per the projection of 11thFive Year Plan's Mid-Term appraisal, infrastructure investment should be on an average almost 10 percent of GDP during 12thFive Year Plan in order to attain a 9% real GDP growth rate" (Planning Commission Report, 2012-2017). As per the estimation of Planning Commission this translates into Rs. 41 Lakh Crores in 2006-07 prices (real terms). Converting this investment required into nominal terms (based on expected inflation of 5%) would imply an equivalent to Rs. 65 Lakh Crores in current prices. Planning Commission has projected that an investment of US\$ 1 trillion for the infrastructure sector during the 12thFive-Year Plan (2012–17), with 40 per cent of the funds will invested from the privet sector of the country [2]. India's focus on infrastructure since the turn of the millennium has helped make it the 2ndfastest growing economy in the world. The country's constant growth gives investors, domestic and foreign, a great prospect for investment in its infrastructure sector.

2. Review of Literature

Paulo et al. [3] evaluated the performance of the model ARIMA for time series forecasting of IBOVESPA. They utilized the research methodology of mathematical modeling and Box-Jenkins method. The results were compared with other smoothing models; the parameter of evaluation MAPE was used. The results showed that the model utilized obtained lower MAPE values, thus indicating greater suitability. Therefore, this demonstrates that the ARIMA model can be used for time-series indices related to stock market index forecasting. Devi et al. [4] examined the performance of the trained model is analyzed and it also tested to find the trend and the market behavior for future forecast. In the study the NSE – Nifty Midcap50 companies among them top 4 companies having max Midcap value has been selected for analysis. The stock data for the past five years has been collected and trained using ARIMA model with different parameters. The test criterions like AIC & BIC are applied to predict the accuracy of the model. Paul et al. [5] examined an empirically the best ARIMA model for forecasting. The best ARIMA model have been selected by using the criteria such as AIC, SIC, AME, RMSE and MAPE etc. To select the best ARIMA model the data split into two periods, viz. estimation period and validation period. The model for which the values of criteria are smallest is considered as the best model. Hence, ARIMA (2, 1, and 2) is found as the best model for forecasting the SPL data series.

Uko et al. [6] finds the comparative analytical influence of ECM, VAR, and ARIMA models in predicting inflation of Nigeria. The study reveals that ARIMA is a superior forecaster of inflation at Nigeria and provide a standard model for inflation prediction. Jaya & Sunder [7] applied ARIMA analysis for 19 IT firms. The study independently analyzed the market capitalization of the companies. They found in the research that firms are categorized into three trends i.e. companies on an upward, linear and downward trends. Datta [8] applied ARIMA model for predicting inflation at Economy of Bangladesh. The study examined that ARIMA (1,0,1) model is best for the inflation data on Bangladesh. Merh [9] applied ARIMA and ANN models for next day share market predicting. The study used ARIMA (1,1,1) and ANN (4,4,1) for predicting the future index value of SENSEX. The forecasting precision found for ARIMA (1,1,1) has been superior than ANN (4,4,1). Al-Zeaud [10] examined ARIMA model in modeling & predicting volatility. The study shows that finest ARIMA models at 95% assurance interval for banking sector is ARIMA (2,0,2). Azad et al. [11] applied ARIMA model for predicting Exchange Rates of Bangladesh. The study used Box-Jenkins methodology to found the best model for prediction. The study found that ERNN model shows better results than ARIMA.

Tsitsika et al. [12] applied ARIMA for predict pelagic fish production. The ultimate model chosen were ARIMA (1,0,1) and (0,1,1). Contreras et al. [13] applied ARIMA to forecast next day electricity prices. The study shows that two ARIMA models to forecast hourly prices in the electricity markets of California and Spain. The Spanish model needs 5 hours to predict future prices as opposed to the 2 hours needed by the Californian model.

Results of the studies mentioned above it have been understandable that ARIMA model can be used for prediction. Only some of the authors tried to find the best ARIMA model, but in most of the studies researchers used ARIMA to predict. The current study is proposed to select the best ARIMA model to predict the Market Capitalization of Infrastructural companies in India listed at S & P BSE-200 Index.

3. Objectives of the Study

- To know the Market Capitalization trend of Indian Infrastructural Companies
- To select the best ARIMA model for Indian Infrastructural Companies.
- To Forecast Market Capitalization Trend of Indian Infrastructural Companies.
- To develop ARIMA model for predicting Market Capitalization in Indian Infrastructural Companies.

4. Research Methodology

The current research is focused on the development of model for predicting market capitalization for Infrastructure Sector companies in India. For ARIMA analysis of market capitalization data E-views 7 has been used.

4.1. Universe and Sample of the Research

The attempt has been made by limiting the research universe to listed companies of Infrastructure Sector in Indian in S&P BSE 200 Index. A sample of 21 companies is selected out of total universe of 35 Infrastructural sector companies listed on the BSE 200 Index [14]. In this study companies having a life span of eight years or more in BSE

(Bombay Stock Exchange) are taken as sample based on availability of data of Market Capitalization.

4.2. Data Collection and Period of the Study

Secondary data of Market Capitalization have been collected from the website of BSE India [14]. The period of the study is concentrated to 2006 – 2014. Quarterly Market Capitalization data of twenty one Infrastructural sector companies are used for applying ARIMA models and for prediction.

4.3. ARIMA Analysis

The objective of B–J (Box–Jenkins) [15] also known as the ARIMA (Autoregressive Integrated Moving Average) methodology is to estimate and identify an arithmetic model which can be interpreted as having generated the model data. If, the present projected model is then to be used for prediction, we have to presume that the features of this model having some constants of time, and particularly after potential time periods. Thus, the reason for stationary data is that any model which is conditional from these data can itself be interpreted as stable or stationary, therefore providing a suitable basis for prediction. ARIMA statistics have been applied to all the sample companies by engaging in procedure shown in the figure 1 of the Box–Jenkins Methodology.

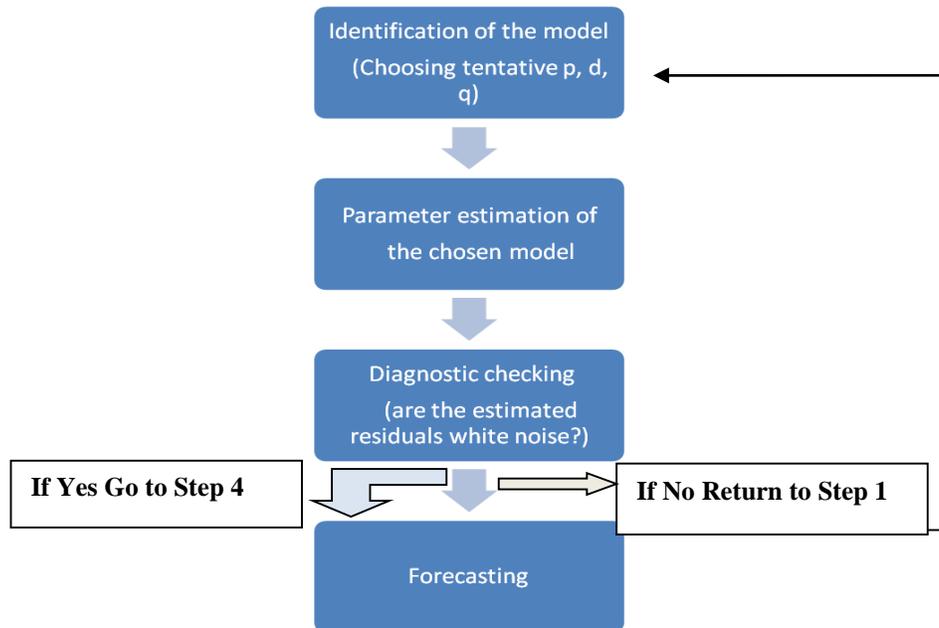


Figure 1. The Box–Jenkins Methodology (Source: Gujarati D. N.: Basic Econometrics, Fourth Edition [16])

ARIMA is the (p,d,q) model, which is the extension of AR model that uses the three components of modeling the serial correlation in time-series data. Autoregressive (AR) term is

the first component. The AR (p) model uses the p lags of the time series in the equation. An AR (p) model has the form:

$$y(t)=a(1)*y(t-1)+...+a(p)*y(t-p)+e(t).....(1)$$

Integration (d) is the second component. Every integration order corresponds to differencing the time series. I (1) mean differencing the data once. I (d) means differencing the data d times. Moving Average (MA) is the third component. The MA (q) model uses the q lags of the forecast errors to improve the forecast. An MA (q) model has the form:

$$y(t)=e(t)+b(1)*e(t-1)+...+b(q)*e(t-q).....(2)$$

Finally, an ARMA (p, q) model has the pooled form:

$$y(t)=a(1)*y(t-1)+...+a(p)*y(t-p)+e(t)+b(1)*e(t-1)+...+b(q)*e(t-q).....(3)$$

The R-Squared, indicates the per cent difference in dependent variables that is accounted & explained by an independent variables in this regression analysis. However, in the multiple regression, Adjusted R2 takes into description continuation of other independent variables or regressors and adjusts this R2 value to a more precise analysis of regression descriptive power.

The Multiple – R shows the correlation between the real dependent variable (Y) and the probable or fitted (Y) based on the regression equation. The Standard Error of the Estimates (SEY) shows the distribution of the data points above and below the regression line. The Akaike Information Criteria (AIC) & Schwarz Criterion (SC) are frequently used for model selection. Generally, models with the lowest value of the SC and AIC should be selected. The Durbin-Watson statistics measures the serial correlation between the residuals. Generally, DW < 2 implies positive serial correlation. The Coefficients presents the probable regression intercept and slopes. The S.E. shows how precise the forecasted Coefficients are, and the 't' Statistics represents the ratios of each forecasted Coefficient to its S.E. [17].

The t-test statistics proves whether an independent variable should linger in the regression or it should be dropped. The Coefficient is statistically significant if its calculated t-Statistics exceeds the Critical t-Statistics at the appropriate degrees of freedom (df). The confidence levels used to test the significance are 90 per cent, 95 per cent and 99 per cent. If a Coefficient's t-Statistic exceed the Critical level, it is considered statistically significant. Alternatively, the p-Value calculates each t-Statistic's probability of occurrence, which means that the smaller the p-Value, the more significant the Coefficient.

5. Results and Discussions

Companies use forecasting techniques to make strategic decisions about sales, production, market capitalization, etc. The past data are used by managers to make prediction about the future. Time series analysis can be used to predict the future. It may be defined as the collection of the numerical values of variable obtained over regular periods of time. In other words it is a bivariate contribution in which one variable is time and the other variable is value of the variable for different time periods.

The best ARIMA models have been selected by using the criteria such as AIC, SC, Adjusted R-Square, DW Statistic, RMSE and MAPE etc. The model for which the values of criteria are smallest is considered as the best model. The diagnose of the best selected ARIMA model have been done through Q-Statistic (for noise checking), t-Test and F-

Test (for significance of model). The ARIMA model applied to the twenty one companies have been shown in the below table no. 1, 2 and 3 and forecast has been prepared for the sample companies for four quarters.

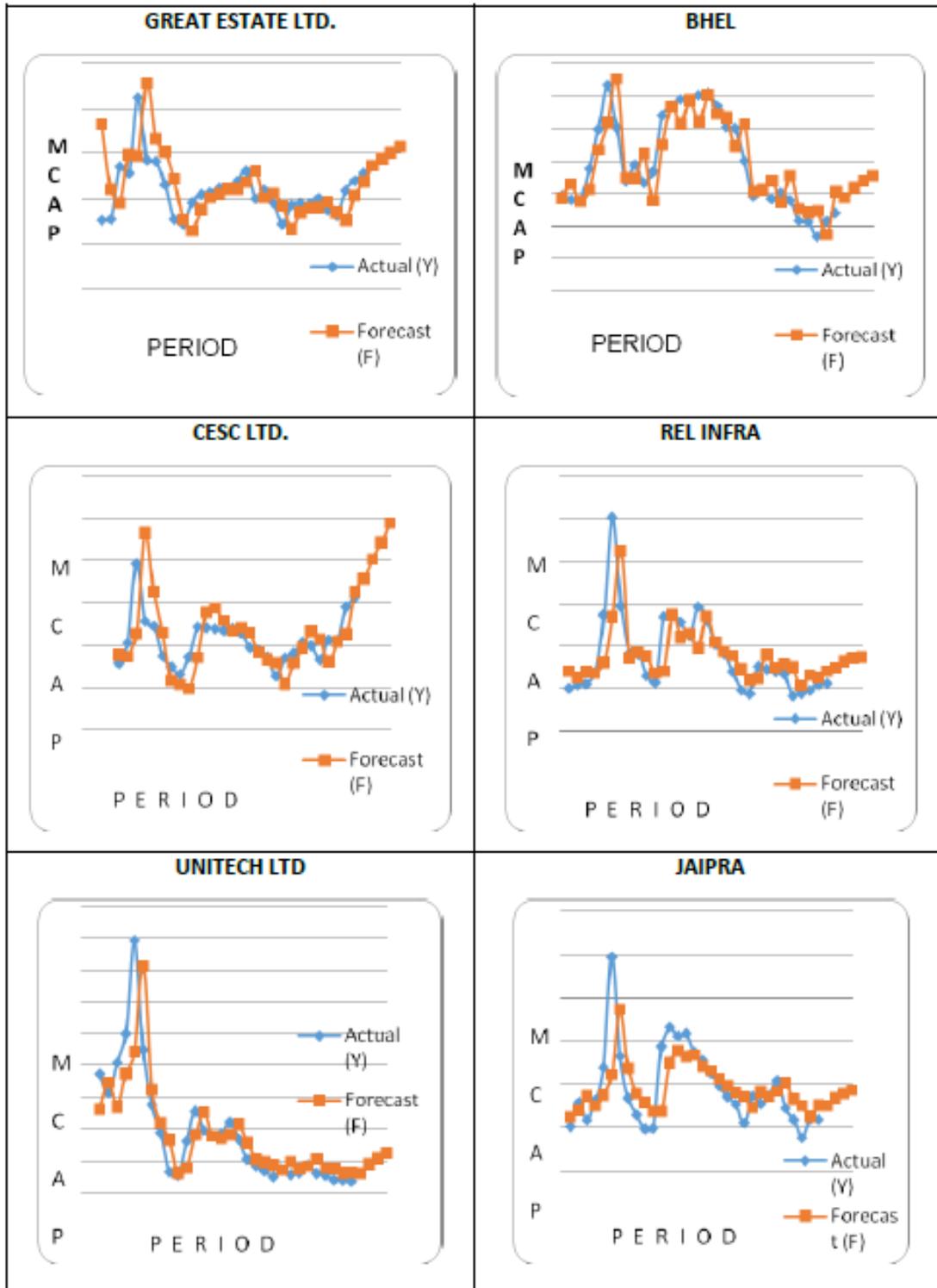
Based on the ARIMA forecast, companies have been bifurcated into upward trend companies, linear trend companies and downhill trend companies. The results further probed into the financial statements of the firms to find out the cause for the trend of market capitalization during the study and forecast period. The ARIMA forecast and its trend movement are revealed in line graphs for straightforward understanding.

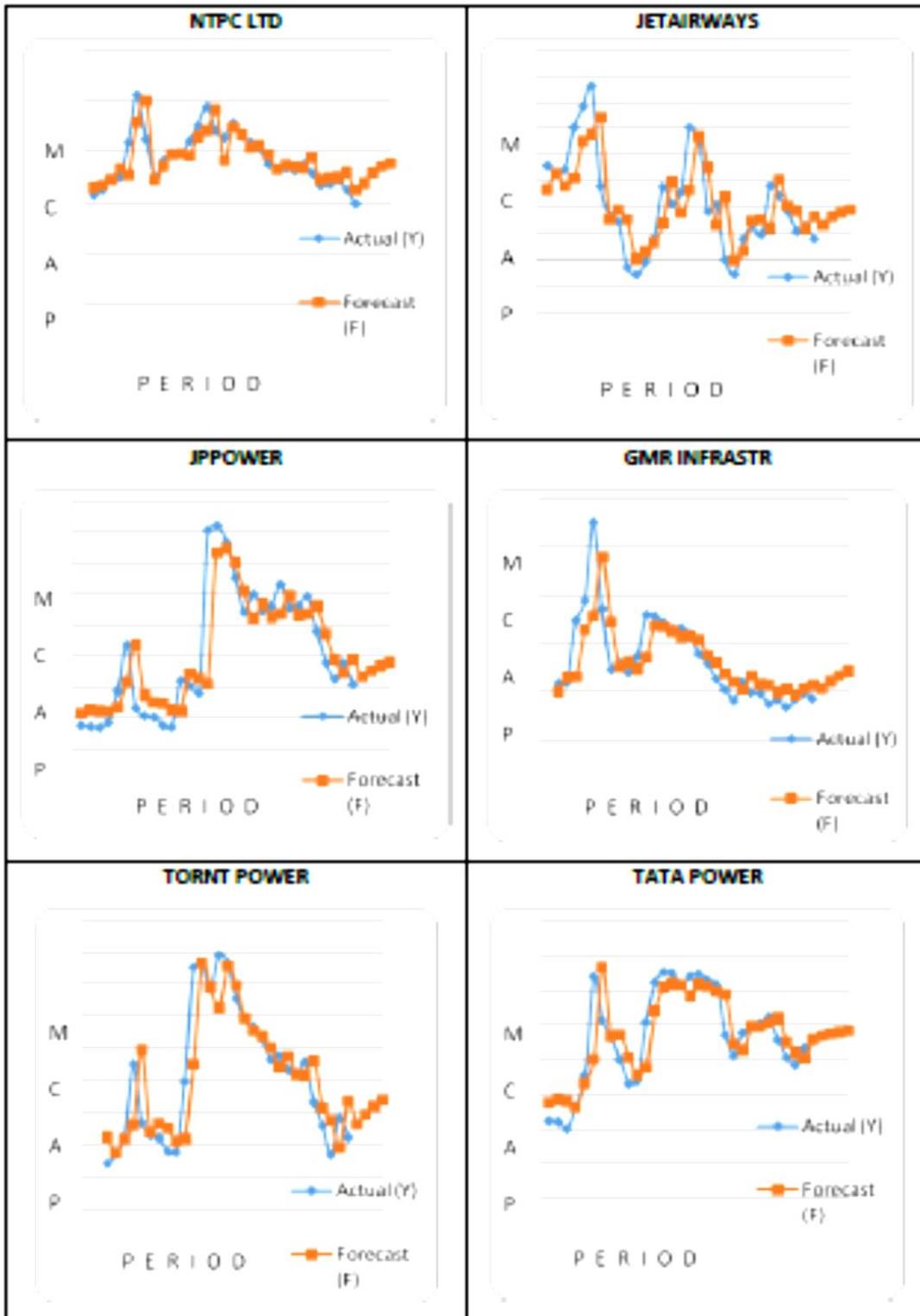
5.1. Upward Trend Companies

Upward trend indicates the forecasted market capitalization of infrastructural sector companies for future development and growth of the economy. The upward trend companies are characterized by a continuous increase in total sales, total assets and profitability, maintenance of the same rate of dividend or higher rate of dividend, sound retained earnings and effective implementation of financial strategies. After applying ARIMA fourteen companies having upward market capitalization for the forecasted period. The results of ARIMA Model for upward trend companies shown in below table 1.

Table 1. ARIMA Model for Upward Trend Companies

S.No.	Name of Company	Adjusted R-Squared	AIC	SC	Durbin-Watson Statistic (DW)	Number of Iterations	Best Selected (P,D,Q) Model	Forecasted Trend
1	GREAT EASTE	0.4703	17.2890	17.6291	1.6944	29	0,2,2	Upward
2	BHEL	0.7814	21.0374	21.3697	2.2777	14	1,0,1	Upward
3	CESC LTD.	0.3382	17.1576	17.5146	2.0682	0	2,2,0	Upward
4	REL INFRA	0.4413	19.7393	20.0716	1.9891	10	1,0,1	Upward
5	UNITECH LTD	0.6527	21.2084	21.5486	2.0407	0	2,0,0	Upward
6	JAIPRA	0.3411	19.9222	20.1437	1.7395	0	1,0,0	Upward
7	NTPC LTD	0.6762	21.2412	21.5735	2.1405	15	1,0,1	Upward
8	JETAIRWAYS	0.5394	16.4530	16.7854	1.9996	10	1,0,1	Upward
9	JPOWER	0.6661	17.7236	17.9451	1.8641	0	1,0,0	Upward
10	GMR INFRASTR	0.5446	20.1277	20.3544	1.6713	0	1,0,0	Upward
11	TORNT POWER	0.7251	17.4947	17.8431	1.9439	5	1,0,1	Upward
12	TATA POWER	0.6932	18.6060	18.9383	1.9441	11	1,0,1	Upward
13	SUZLONENERGY	0.8170	19.7195	19.9410	2.1205	0	1,0,0	Upward
14	REL COM LTD	0.8116	22.1487	22.4888	2.1837	0	2,0,0	Upward





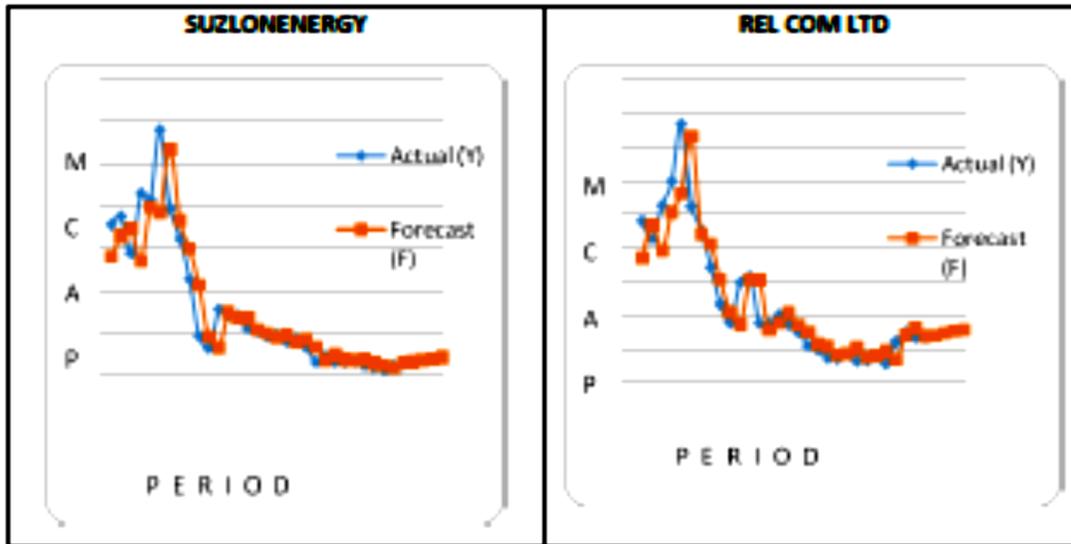


Figure 2. Infrastructural Companies Predicted On Upward Trend

The figure 2 presents the predicted upward trend of Infrastructural companies. From the above ARIMA analysis of upward trend companies we found that Great Estate Ltd., BHEL India Ltd. and CESC Ltd., has a highly upward trend for upcoming quarters due to the adoption of good dividend payout policies of the companies. These companies are also focused on constantly increase in sales, assets and interesting future investment policies. All these favorable features might have resulted in their market capitalization being on an upswing. Companies like Unitech Ltd., NTPC, JET Airways, Jaiprakesh Associates, JP Power, GMR Infrastructure, Torent Power, Tata Power and Reliance Communication are also having upward trends but with not such extreme high. This is due to the downfall in Infrastructure Sector in India, but still these companies are good in development and profitability. Suzlon Energy has very low upward trend on forecasted market capitalization due to no dividend policies and continues decrease in sales and profit.

5.2. Linear Trend Companies

Linear trend indicates the forecasted market capitalization of infrastructural sector companies for future development and growth of the economy. On the other hand, these companies by putting in suitable dividend strategies; sales promotion strategies; cost cutting strategies, capital budgeting strategies manage to be on a linear path. These companies have better prospects to transition from a linear trend to upward trend by aggressively practicing the aforesaid strategies in a recovery environment. After applying ARIMA two companies having linear market capitalization for the forecasted period. ARIMA Model for Linear Trend Companies results are shown in below table 2.

Table 2. ARIMA Model for Linear Trend Companies

S.No.	Name of Company	Adjusted R-Squared	AIC	SC	Durbin-Watson Statistic (DW)	Number of Iterations	Best Selected (P,D,Q) Model	Forecasted Trend
1	TATA COMM	0.5800	17.8207	18.1530	1.8963	13	1,0,1	Linear
2	CROMPT.GREAV	0.7182	17.7032	18.0356	2.0825	16	1,0,1	Linear

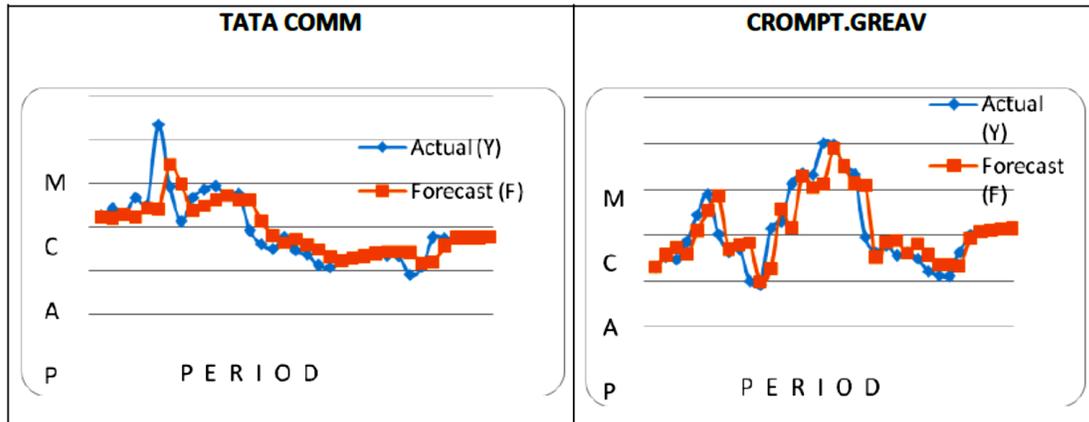


Figure 3. Infrastructural Companies Predicted On Linear Trend

From the above figure 3 predicted linear trends of Infrastructural companies. ARIMA analysis of linear trend companies we found that Tata Communications and Crompt Greaves Ltd. will face linear trend in their market capitalization for forecasted quarters. This is due to the current policies and issues in the infrastructural sector in India. The market capitalization would reach new heights if these companies focus on increasing both the volume of sales and the size of the assets in the years to come. These companies have better prospects to transition from linear trend to upward trend by aggressively practicing the aforesaid strategies in a recovering environment.

5.3. Downward Trend Companies

With respect to companies predicted to be on a downward trend, they were found to be characterized by a decline in sales, assets and profitability; stoppage of dividend payment, erratic profitability, cost escalation, etc. Further firms have to find out means and ways of cost cutting and waste managing and to restart dividend payments to improve their market capitalization. After applying ARIMA five companies exhibited downward market capitalization for the forecasted period. The results are shown in below table 3 of ARIMA model for downward trend companies.

Table 3. ARIMA Model for Downward Trend Companies

S.No.	Name of Company	Adjusted R-Squared	AIC	SC	Durbin-Watson Statistic (DW)	Number of Iterations	Best Selected (P,D,Q) Model	Forecasted Trend
1	ABB LTD.	0.5368	18.8846	19.4515	1.9377	24	2,0,2	Downward
2	LARSEN & TOU	0.4920	21.6602	21.8818	1.7249	0	1,0,0	Downward
3	SIEMENS LTD.	0.5120	18.7679	18.9894	1.7953	0	1,0,0	Downward
4	THERMAX	0.6253	16.9709	17.4244	1.9944	38	2,0,1	Downward
5	VOLTAS LTD	0.5934	16.7542	17.0943	2.0932	0	2,0,0	Downward

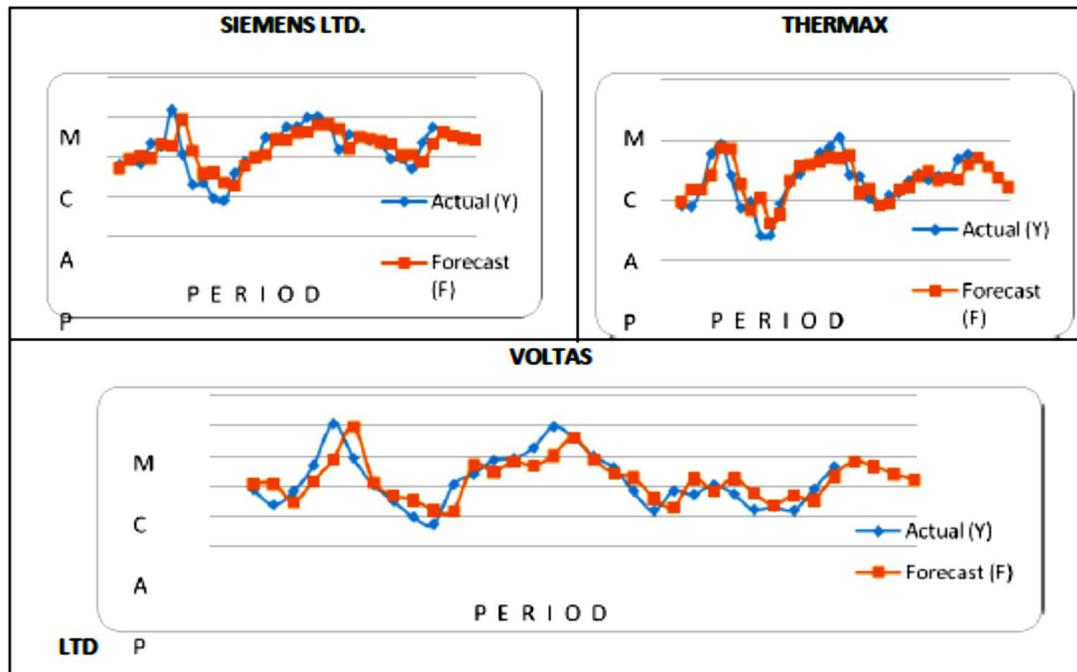


Figure 4. Infrastructural Companies Predicted On Downward Trend

The above figure 4 shows the predicted downward trend of infrastructural companies. ABB Ltd., L & T, Siemens Ltd., Thermax Ltd. and Voltas Ltd. will face downward trend in market capitalization for the forecasted period. This is due to the poor profit performance and their capacity to pay dividend. As such the dividend payout has become a casualty. For the improvement in market capitalization these companies have to do some strategic decisions for increasing sales, profitability and expansion of market.

The ARIMA model applied for 21 companies and the final outcome of the model have been shown in the above tables. This forecast has been made for the sample companies for four quarters. It is advisable for every company to make an ARIMA forecast at the beginning of the financial year using the model identified by the study. The companies can frame appropriate financial strategies according to the outcome of the forecast of the model.

6. Conclusion and Suggestions

This study shows different forecasted trends of 21 infrastructure sector companies in India listed on BSE-200 Index. This trend helps companies as well as investors to make strategic decisions. The companies on an uphill trend have to persist to practice the strategies presently followed to contest the depression and companies on linear and downstairs trends have to reveal the new market; develop present product lines; add innovative products; control present customers with the best possible outcome to come out of the danger. Further, companies have to find out means and ways of cost cutting, and waste managing; and to restart dividend payments to increase their market capitalization. It is wise for every company to make an ARIMA forecast at the beginning of the financial year using the model identified by the study. The companies can frame

appropriate financial strategies according to the outcome of the forecast of the model. Further other studies can also be done by undertaking different companies for predicting market capitalization, sales, profit, share price and more. In other words companies predicted to be in upward trend can frame strategies to strengthen their retained earning so that they can sustain the payment of dividend irrespective of economic conditions.

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Annexure No. 1**List of Infrastructural Sector Companies in BSE-200 Index**

S. No.	Scrip Code	Name of Company	Scrip Name	Industry	Sector	Year of Listing
1	500620	Great Eastern Shipping Co.Ltd	Great Easte	Transport Services	Shipping	1954
2	500002	Abb India Limited	Abb Ltd.	Capital Goods	Heavy Electrical Equipment	2000
3	500103	Bharat Heavy Electricals Ltd.	Bhel	Capital Goods	Heavy Electrical Equipment	2000
4	500084	Cesc Ltd.	Cesc Ltd.	Power	Electric Utilities	2000
5	500093	Crompton Greaves Ltd	Crompt.Greav	Capital Goods	Heavy Electrical Equipment	2000
6	500510	Larsen & Toubro Ltd	Larsen & Tou	Capital Goods	Construction & Engineering	2000
7	500390	Reliance Industrial Infrastructure Ltd	Rel Infra	Power	Electric Utilities	2000
8	500550	Siemens Ltd	Siemens Ltd.	Capital Goods	Heavy Electrical Equipment	2000
9	500483	Tata Communications Ltd	Tata Comm	Telecom	Telecom Service	2000
10	500400	Tata Power Co.Ltd	Tata Power	Power	Electric Utilities	2000
11	500411	Thermax Ltd	Thermax	Capital Goods	Heavy Electrical Equipment	2000
12	507878	Unitech Ltd	Unitech Ltd	Housing Related	Reality	2000
13	500575	Voltas Ltd.	Voltas Ltd	Diversified	Construction & Engineering	2000
14	532532	Jaiprakash Associates Ltd	Jaipra	Housing Related	Construction & Engineering	2004
15	532555	Ntpc Ltd.	Ntpc Ltd	Power	Electric Utilities	2004
16	532617	Jet Airways (India) Ltd	Jetairways	Transport Services	Airlines	2005
17	532627	Jaiprakash Power Ventures Limited	Jppower	Power	Electric Utilities	2005
18	532667	Suzlon Energy Ltd	Suzlonenergy	Capital Goods	Heavy Electrical Equipment	2005
19	532754	Gmr Infrastructure Ltd.	Gmr Infrastr	Power	Electric Utilities	2006
20	532712	Reliance Communications Ltd	Rel Com Ltd	Telecom	Telecom Service	2006
21	532779	Torrent Power Ltd.	Tornt Power	Power	Electric Utilities	2006

(Source: <http://www.bseindia.com/>) (Retrieved on 01-04-2014)