Multivariate Regression: A Tool for Forecasting Stock Prices

R W Rebello* and Y V Reddy**

This paper examines and analyzes the use of Multivariate Regression Analysis (MRA) as a forecasting tool. The authors attempt to test the capability of the multivariate regression model to forecast the prices of stocks classified as 'A-Group' by the Bombay Stock Exchange (BSE). Researchers in the past have applied numerous variables to forecast stock prices; the authors in this study use three variables, namely stock price, operating cash flow and risk-free rate of interest. The results of the study are encouraging and the average variation of 173 stocks is less than 4%. The findings suggest that stock markets do not follow a random walk and there exists a possibility of forecasting stock prices by using operating cash flows and risk-free rate of returns. The authors opine that it is possible to capture nonlinearities contained in the stock prices by using MRA. If MRA is used judiciously, it is possible to forecast stock prices fairly well and this could bring transparency in stock trading and benefit the investors.

Introduction

The history of regression goes back to the 18th century. The earliest form of regression was the method of least squares, which was published by Adrien Marie Legendre in 1805 and by Carl Friedrich Gauss in 1809. According to Dunteman (1984), Multivariate Regression Analysis (MRA) considers the simultaneous effects of many variables taken together. A crucial role is played by multivariate normal distribution, which allows simplifying assumptions to be made, which makes it feasible to develop appropriate models.

A common use of multivariate analysis is to reduce a large number of inter-correlated variables into a much smaller number of variables, preserving as much as possible of the original variation, whilst also having useful statistical properties such as independence. In the case of regression analysis, R^2 measures the strength of the relationship, but an additional R^2 statistic called the adjusted R^2 is computed to counter the basis that will induce the R^2 to keep increasing as more independent variables are added to the regression. Multivariate regression is a powerful tool that allows examining the determinants of any response variable.

* Lecturer (Selection Grade), Sheth L U J College of Arts and Sir M V College of Science and Commerce, Andheri (E), Mumbai 400069, India. E-mail: rebellosir@gmail.com

** Associate Professor, Department of Commerce, Goa University, Goa 403206, India. E-mail: yvreddy3@rediffmail.com

Literature Review

Fama (1991), in his paper, discusses the various hypotheses on efficient markets and their anomalies. The paper also redefines the common definitions of efficient markets and investigates the joint hypothesis problem, the costs of information and various pricing models. In this paper, the author investigates two problems of market efficiency, the first being information and transaction cost, and the second, the joint hypothesis problem. In another paper, Fama (1999) states that stock prices fully reflect the most complete and best information available. However, Fama himself acknowledges that his reading of the market has been a stubborn obstacle for active investors determined to find ways to beat the market.

Palia and Thomas (1997) write that a common belief among practitioners is that unexpected changes in foreign exchange rates shall affect the market value of certain firms. Given this common belief, the inability to document a strong and systematic contemporaneous relation between stock returns and exchange rate changes is puzzling.

Krugman (1999) argues that under the Efficient Market Hypothesis (EMH), at any given time, asset prices fully reflect all available information. This seemingly straightforward proposition is one of the most controversial ideas in all social sciences research, whose implications continue to reverberate through investment practice. The chief corollary to the idea that markets are efficient, and that prices fully reflect all information, is that price movements do not follow any pattern or trend. This means that past price movements cannot be used to predict future price movements. Rather, prices follow what is known as a 'random walk', an intrinsically unpredictable pattern.

Liu and Thomas (1999) have attempted to derive and test a relation between current period unexpected returns and unexpected earnings that incorporates revisions in forecasts of future earnings. Their motivation was to emphasize the misspecification in returns/earnings regressions that omits information currently available about future earnings, and to offer a solution.

Mohanty (2001) believes that there is now considerable evidence in the US that firm-specific characteristics like size, price-to-book value, and market risk premium can capture the common variation in stock returns. However, there is no consensus among researchers on whether an investor can earn risk-adjusted excess returns by investing in small stocks.

Vuolteenaho (2001) had used a Vector Autoregressive (VAR) model to deconstruct an individual firm's stock return into two components—changes in cash flow (expected cash flow news) and changes in discount rates (expected returns news). By definition, a firm's stock returns are driven by shocks to expected cash flows (cash flow news), and/or shocks to discount rates (expected return news). He says that there is a substantial body of research measuring the relative importance of cash flow and expected return news for aggregate portfolio returns, but virtually no evidence is available on the relative importance of these components at the firm level.

Hossein and Björn (2002) have investigated the ability of factor-mimicking portfolios to explain expected returns in multifactor asset pricing models. In particular, the usual manner of constructing factor-mimicking portfolios may result in estimated asset betas (coefficient of the predictor variables) that are quite different from the asset betas against the underlying factors; this may seriously affect the reliability of asset pricing models.

Lubos and Veronesi (2002) show that uncertainty about a firm's average profitability increases the firm's Market-to-Book (M/B) value ratio as well as its idiosyncratic return volatility. They suggest that this uncertainty is especially large for the newly listed firms, but declines over time due to learning. Their model, therefore, predicts that both the M/B and the return volatility of a typical young firm would decline as the firm ages. Moreover, this effect is stronger for firms that pay no dividends, confirming another prediction of the model. The model is also endorsed by the observation that M/B declines faster for younger firms.

Samanta and Bhattacharya (2002) have discussed the issue of whether the spread between Earning to Market Price (E/P) ratio and interest rate contains useful information about the movement of stock market. The results of their study reveal that though the spread seems to have reasonably strong causal influence on returns, the causal model helps in achieving slightly better forecasts than the random walk model. However, they are not clear as to whether the spread can be used as a profitable business strategy or not.

Ang and Liu (2003) have developed a model to consistently value cash flows with changing risk-free rates, predictable risk premiums and conditional betas, in the context of a conditional Capital Asset Pricing Model (CAPM). Practical valuation is accomplished with an analytic term structure of discount rates, with different discount rates applied to expected cash flows at different horizons.

Campbell and Motohiro (2003), in their paper, argue that tests of the predictability of stock returns may be invalid when the predictor variable is persistent and its innovations are highly correlated with returns. They also suggest two methods to deal with the problem. The first one is a pretest that determines predictability of stock, when the conventional *t*-test is misleading. The second is a new test of predictability that always leads to correct inference and is more efficient when compared to existing methods.

Longstaff and Piazzesi (2003) have attempted to quantify the risk premium attached to the standard asset pricing theory. They have emphasized that equilibrium asset values can be expressed as the expected product of a pricing kernel and the cash flows from those assets.

Malkiel (2003), in his paper, presents a defense of passive financial investment (indexing) strategies in all types of investment markets, both nationally and internationally. He justifies the case of such strategies by relying on the theory of efficient market hypothesis and suggests that the information generally available about individual stock or about the market as a whole is reflected in market prices immediately.

Narasimhan and Pradhan (2003) find that the Indian stock market has witnessed drastic changes during the past decade under the broad stock market liberalization measures. In their

study, the authors have tested the validity of conditional CAPM for the Indian stock market and found that the risk premium changes with changing economic conditions. The risk premium varies over time and is negatively correlated with the index of industrial production. They also argue that the risk premium increases during a recessionary phase rather than during an expansionary phase.

Pandey (2003) believes that modeling and forecasting the volatility of capital markets are important areas of inquiry and research in financial economics, with the recognition of time-varying volatility, volatility clustering, and asymmetric response of volatility to market movements. This stream of research has been aided by various conditional volatility (Autoregressive Conditional Heteroskedasticity/Generalized Autoregressive Conditional Heteroskedasticity—ARCH/GARCH-type) models proposed to handle these empirical regularities.

Siegel (2003) defines a bubble as "a sharp rise in the price of an asset or a range of assets in a continuous process, with the initial rise generating expectations of further rises and attracting new buyers—this concerns speculators interested in profits from trading in the asset rather than its use or earnings capacity".

Fama and French (2004) argue that the CAPM is still widely used in applications such as estimating the cost of capital for firms and evaluating the performance of managed portfolios. The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and risk.

Andersen *et al*. (2005) have discussed how markets arrive at prices. There is perhaps no question more central to economics. Their paper focuses on price formation in financial markets, where the question looms especially large. How, if at all, are news about macroeconomic fundamentals incorporated into stock prices, bond prices and foreign exchange rates? Unfortunately, the process of price discovery in financial markets remains poorly understood.

Campbell and Thompson (2005) wrote that towards the end of the last century, financial economists came to take the view that aggregate stock returns are predictable. During the 1980s, a number of papers studied valuation ratios such as the dividend-price ratio, earnings price ratio or smoothed E/P ratio. Around the same time, several papers pointed out that yields on short-term and long-term treasury and corporate bonds were correlated with subsequent stock returns.

Liu and Zhang (2005) state that recent studies have used the value spread to predict aggregate stock returns to construct cash flow betas that appear to explain the size and value anomalies. Their work shows that two related variables—the book-to-market spread (the book-to-market of value stocks minus that of growth stocks), and the market-to-book spread (the market-to-book of growth stocks minus that of value stocks)—predict returns in different directions and exhibit opposite cyclical variations. More importantly, value spread mixes information on the book-to-market and market-to-book spreads and appears less useful in predicting returns.

Pandey (2005) explores the significance of profitability and growth as drivers of shareholders' wealth, as measured by the M/B. The author has studied the relationship between profitability (economic profitability) on the one hand and M/B ratio on the other. He has used panel data, employed Generalized Method of Moment (GMM) estimator, and found that there is a strong positive relationship between profitability and M/B ratio. Growth, on the other hand, is negatively related to M/B ratio.

Jegadeesh and Livnat (2006) state that there are significant positive associations between earning surprises and abnormal returns around the preliminary earnings announcements as well as in the post-earnings announcement period. Since earnings is a summary measure of material economic events that affect a firm in a given period, the intense focus on earning surprises by investors and academics is natural.

Jonathan *et al*. (2006) argue that asset pricing tests are highly misleading in the sense that apparently strong explanatory power, in fact, provides exceptionally weak support for a model. They offered a number of suggestions for improving empirical tests and evidenced that several proposed models do not work as satisfactorily as originally claimed.

Thomas and Zhang (2006) state that their study is motivated by the apparent gap between predictions regarding the determinants of market price to earning ratios (P/E ratio) and the empirical evidence. While P/E ratio should be positively related to expected growth rate and negatively related to risk and the level of interest rates, prior evidence suggests weak relations at the portfolio level.

The Research Problem

The above studies illustrate that diverse attempts have been made to ascertain the prices of stocks by recognizing the unexpected earnings, dividend/price relationship, book value/market value relationship, discounted value of dividends, earning/market value relationship, etc. However, not many attempts have been made to zero down the variables to a few, which could throw up analogous results. Therefore, through this study, the authors attempt to draw a corollary of operating cash flows on stock prices, and use this association as a benchmark to forecast the stock prices. This association could also be collated with the risk-free rate of return as the latter has undergone a radical change vis-à-vis the integration of the Indian economy with the global economy.

Significance

If the research community identifies the germane variables that influence the stock returns and communicates the same to the investing community in specific, and to market participants in general, it will benefit them all in arriving at a fair price of stocks. It will also enable the market participants to bring about transparency in market operations and help to build assurance in the investors. This will bring in stability to the market and make markets less volatile.

Objectives

a. To establish the association between operating cash flows and risk-free rate of return (as independent variables) with market prices (as dependent variable); and

b. To determine the expected stock price based on the relationship established under 'a' above.

Hypotheses

H_1: *There is a significant association between the operating cash flow and risk-free rate of return of the firm on the one hand and stock price on the other.*

H_2: *Operating cash flows and risk-free rate of return influence the stock price.*

Methodology

For the purpose of this study, MRA is used to forecast the price of stocks. The MRA technique is an extension of the simple regression analysis. The regression that measures the relationship between two variables becomes a multiple regression when it is extended to include more than one independent (predictor) variable such as X_1, X_2, X_3, X_4, etc., in trying to explain the dependent variable *Y*. While stock price is taken as the dependent variable (explained variable), operating cash flow and risk-free rate of return are taken as independent variables (explanatory variables). By applying MRA, the estimated values for all the observations are ascertained and then logarithmic growth rates of these estimated values are determined for the entire period for every company included in the sample. In order to capture nonlinearity of stocks, it is essential to use the logarithmic growth rate instead of the simple growth rate. From these quarterly logarithmic growth rates, the geometric mean growth rate is ascertained for the entire period, and such growth rate is used for forecasting the stock prices.

Once the growth rate is ascertained, one should decide the lag period for forecasting the stock prices. The frequency of data, such as a day, week, month or quarter, should be considered while determining the lag period. If frequency of the data is in months, then lag period also should be in months, or any other such frequency. The lag period selected should be incorporated in the model while forecasting the stock price. Using such estimated growth rate, lag period and spot price, forecast price is estimated. The analysis is carried out to verify the validity of the hypothesis set out for study. Software packages such as Statistical Package for Social Sciences (SPSS) and the Data Analysis Tool of Microsoft Excel are used for the purpose of analysis. The models used in the analysis are described below, as stated by Maddala (1977) and Greene (2003).

Step 1

$$Y_i = \beta_{0i} + \beta_1 (X_1)_i + \beta_2 (X_2)_i + u_i \qquad \ldots(1)$$

where,

i = 1, 2, 3, ..., n,

n = Number of observations,

Y = Explained (dependent) variable (market price),

X_1 = Explanatory (independent) variable (operating cash flow),

X_2 = Explanatory (independent) variable (risk-free rate of interest),

β_0 = Intercept,

β_1 = Partial slope coefficient of the first explanatory variable,

β_2 = Partial slope coefficient of second explanatory variable, and

u_i = Stochastic disturbances.

Step 2

$$z_i = \ln\{\ln(x_i / x_{i-1})\} \quad \ldots(2)$$

where,

z_i = Lognormal growth rate of the i^{th} period,

ln = Natural logarithm, and

x_i = Operating cash flow of the i^{th} period.

Step 3

$$\overline{z} = (z_i \ldots\ldots z_n)^{1/n} \quad \ldots(3)$$

where,

$\overline{z}$ = Geometric mean of lognormal growth rate,

z_i = Lognormal growth rate of the i^{th} period (i = 1, 2, ..., n), and

n = Number of periods.

Step 4

$$S_{TF} = S_T * \overline{z} * t_F \quad \ldots(4)$$

where,

S_{TF} = Expected future price,

S_T = Spot price,

$\overline{z}$ = Geometric mean of lognormal growth rate, and

t_F = Forecast lag period (in days/weeks/months).

Sources of Data

Data required for the purpose of study are collected from various sources. Market prices are picked up from published data of BSE, operating cash flows are taken from the Electronic Data Information Filing and Retrieval (EDIFAR) system (National Informatics Centre), and risk-free rate of return is culled from the RBI's website.

Monthly closing price of BSE was used in this study, assuming that it fairly represents the average stock price, which is adjusted for bonus shares, share splits, right shares, Employees' Stock Option (ESOPs), etc., and then converted into average quarterly price. Quarterly operating cash flows are culled from cash flow statements of the companies. Risk-free rate of return is collected from the data published by the RBI. These data are collected for all the companies included in the 'A - Group' stocks of BSE, Mumbai.

Sampling Design

In this study, all the stocks classified as 'A-Group' by BSE Mumbai are identified and the sample was selected by the stratified random sampling procedure. BSE Mumbai classifies a company as 'A-Group' if its turnover is more than Rs. 500 cr per annum. Thus, the sample encompasses only large companies and actively traded stocks. In general, these companies form a base for market movements and for formulating Sensex, Nifty and similar BSE and National Stock Exchange (NSE) indices. These companies broadly represent most of the industries in the Indian economy.

There were 206 listed companies classified as 'A-Group' stocks as on March 31, 2007. Of these, 187 companies are traded on BSE for a period of three years and more. All the remaining companies are traded on BSE for a period of less than three years. Therefore, such companies are excluded from the sample.

As per S&P CNX (Standard & Poor's CRISIL NSE Index) classification, there are 76 types of industries. However, all the 206 'A-Group' companies of BSE Mumbai cover only 54 types of industries out of these 76 types. Nevertheless, these 54 types of industries envelop a majority of industries included in the S&P CNX classification. These 187 companies represent 53 types of industries, broadly encompassing entire 'A-Group' stocks.

However, adequate data are available for only 173 companies out of the 187 selected as sample; therefore, analysis is carried out on these companies only. For the remaining 14 companies, adequate data were not available; therefore, analysis could not be carried out on them. These 173 companies cover 51 types of industries.

Companies listed with the stock exchanges started to file quarterly returns from the year 2001. Therefore, quarterly data are available for a maximum period of seven years. Since several companies are listed with the stock exchanges from the year 2003, the data for these companies are available for a period of five years and less.

Since quarterly cash flow data can be culled from the quarterly data of the listed companies, it is thought prudent to use quarterly data instead of yearly data. At the

same time, quarterly stock prices could be determined from the collected data. Similarly, the quarterly risk-free rate of return (treasury bill return) is derived from the collected data.

Figure 1 depicts the number of firms selected as the population (A-Group), the eligible (> 3 years) and the sample firms. Figure 2 depicts the number of industries covered under the population (A-Group), the eligible and the sample industries. Figure 3 depicts the names of the industry and the number of firms included in each industry included in the sample.

Figure 1: 'A-Group', Eligible and Sample Firms

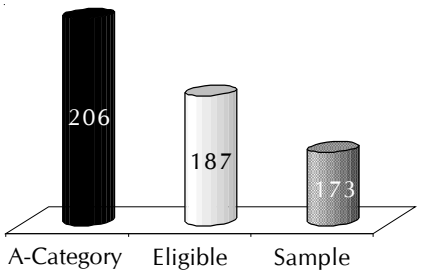


Figure 2: 'A-Group', Eligible and Sample Industries

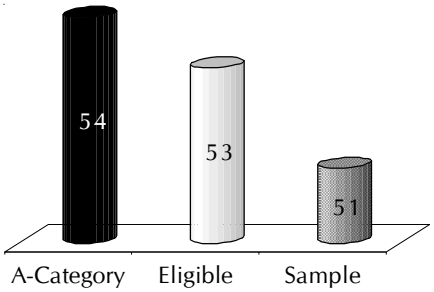
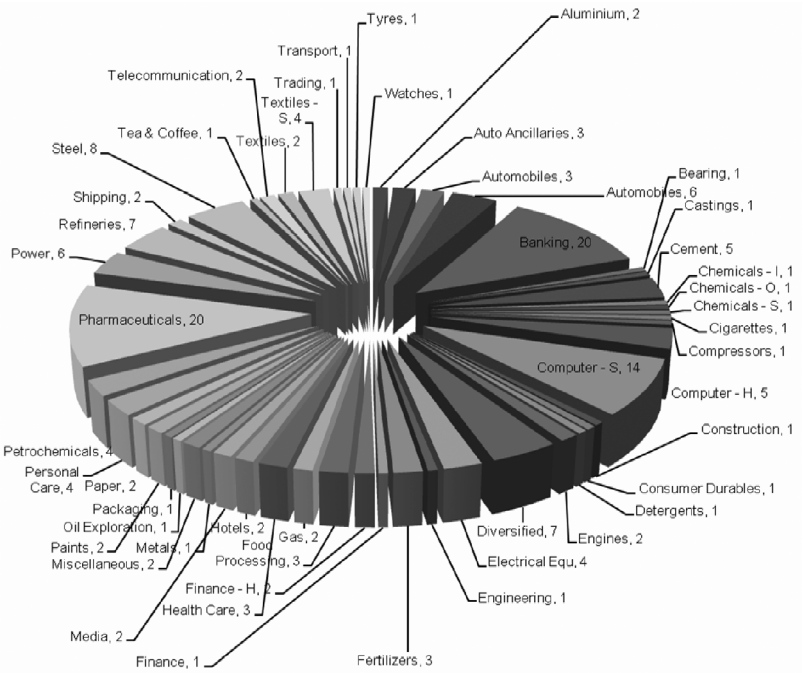


Figure 3: Industry-Wise Classification of the Firms Included in the Sample for This Study (173 Companies)



Data Analysis

This study encompasses 173 companies covering 28 quarters from April 2000 to March 2007. Forecast stock prices are ascertained as on October 31, 2007, allowing a time lag of seven months (see Appendix). These forecast stock prices are compared with the actual prices of the stock on October 31, 2007, and the variation is ascertained to ensure how accurate the prediction can be (Appendix). Results of the analysis of the 173 companies under this technique are shown in tabular form at the end (see Appendix).

The analysis reveals that the average variation of closing price for all the stocks is 3.72%, the maximum variation for any company is 14.83%, and the minimum variation for any company is 0.03% (Table 1). Graphical presentation of the results is given in Figure 4.

After analyzing the variation of all companies and classifying them according to the degree of variations, it is observed that there are 39 companies' variation less than 1%, while variation in the case of stocks of another 27 companies is between 1 and 2%. Variation in the case of stocks of 22 companies is between 2 and 3%, 33 companies is between 3 and 5%, and 52 companies is more than 5%. This shows that there is a good degree of accuracy in forecasting stock prices (Table 2). A graphical presentation is given in Figure 5.

Table 1: Average, Maximum and Minimum Variation ('A-Group' Stocks)

Variation of All Companies	Price (%)
Average	3.72
Maximum	14.83
Minimum	00.03

Note: For details, refer Appendix.

Figure 4: Average, Maximum and Minimum Variation ('A-Group' Stocks)

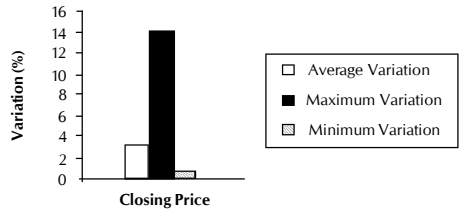
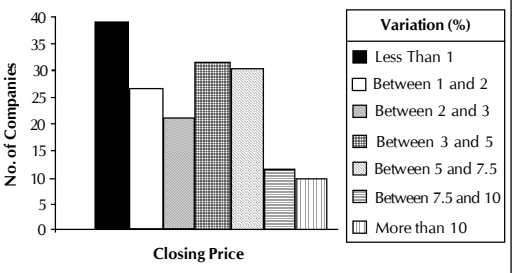


Table 2: Variation of Forecast Stock Prices

Variation (%)	Companies
Less than 1	39
Between 1 and 2	27
Between 2 and 3	22
Between 3 and 5	33
Between 5 and 7.5	30
Between 7.5 and 10	12
More than 10	10
Total	**173**

Note: For details, refer Appendix.

Figure 5: Variation of Forecast Stock Prices



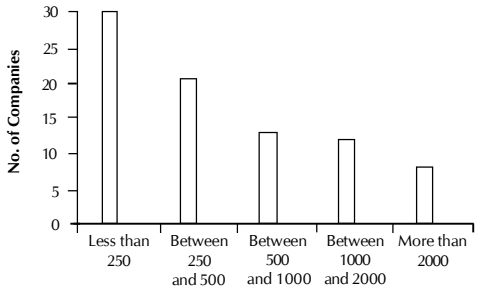
Variations are classified according to the market price of the stock to ensure whether there is any significance attached to it or not. Therefore, stocks are classified on their market price and the number of firms falling under each class is ascertained taking more than 3% variation as benchmark for evaluation. It is observed that if the stock price is less than Rs. 250, there are 30 firms whose variation is more than 3%. If the price of stocks is between Rs. 250 and Rs. 500, there are 22 companies whose variation is more than 3%. When the price is between Rs. 500 and Rs. 1,000, there are 13 companies whose variation is more than 3%. When the stock price is between Rs. 1,000 and Rs. 2,000, there are 12 companies whose variation is more than 3%. When the stock price is more than Rs. 2,000, there are eight companies whose variation is more than 3%. From this analysis, it is noticed that it is possible to forecast the stock prices with reasonable accuracy in all the price segments (Table 3). A graphical presentation is given in Figure 6.

Table 3: Variation in Closing Price (>3%) Based on Stock Prices

Stock Price (Rs.)	Companies
Less than 250	30
Between 250 and 500	22
Between 500 and 1,000	13
Between 1,000 and 2,000	12
More than 2,000	8
Total	**85**

Note: For details, refer Appendix.

Figure 6: Variation in Closing Price (>3%) Based on Stock Prices



In this analysis, the average industry-wise variation is ascertained and classified according to the degrees of variation. From this analysis, it is observed that variation of 39 firms, comprising 24 industries, is less than 1%. Similarly, variation of 27 firms, comprising 14 industries, is between 1 and 2%. Another 22 firms' variation is between 2 and 3%, and these represent 17 industries. On further analysis, it is observed that 33 firms' variation, comprising 22 industries, is between 3 and 5%. Finally, there are 52 firms whose variation is more than 5%, and these represent 39 industries (Table 4).

This table also throws light on the degree of variation within every industry, to show how firms included in the industry are performing. If selective analysis is carried out on industries where number of firms are more than 10 firms, it is possible to observe that out of 20 banking firms, just six have variation more than 5%. At the same time, out of 14 computer software firms, just two have variation more than 5%. Finally, out of 20 pharmaceutical firms, just eight have variation more than 5% (Table 4).

In the industry-wise analysis, the authors have ascertained average variation for all the industries covered in this study; the highest and the lowest variation of each industry is also identified so as to identify the number of firms whose variation is more than the industry average. The authors

Table 4: Industry-Wise Variations ('A-Group' Stocks)									
S. No.	Industry	Closing Price (%)							
		1	2	3	5	7.5	10	15	Total
1.	Aluminium		1		1				2
2.	Auto Ancillaries	1		1	1				3
3.	Automobiles – Two/Three Wheelers	1	3						4
4.	Automobiles – Four Wheelers	1	2		1	1			5
5.	Banking	3	2	3	6	3	1	2	20
6.	Bearing						1		1
7.	Castings							1	1
8.	Cement	1		1	2	1			5
9.	Chemicals – Inorganic		1						1
10.	Chemicals – Organic	1							1
11.	Chemicals – Synthetic					1			1
12.	Cigarettes	1							1
13.	Compressors	1							1
14.	Computer – Hardware	1		1	1	1	1		5
15.	Computer – Software	6	4	1	1		1	1	14
16.	Construction				1				1
17.	Consumer Durables					1			1
18.	Detergents	1							1
19.	Diversified				1		1		2
20.	Electrical Equipments	1		1	3	1		1	7
21.	Engineering	1		1		1	1		4
22.	Engines					1			1
23.	Fertilizers	1		1	1				3
24.	Finance			1					1
25.	Finance – Housing	2							2
26.	Food Processing			2	1				3
27.	Gas			1	1				2
28.	Health Care			2			1		3
29.	Hotels				2				2
30.	Media	1					1		2
31.	Metals				1				1

Table 4 (Cont.)

S. No.	Industry	Closing Price (%)							
		1	2	3	5	7.5	10	15	Total
32.	Miscellaneous				2				2
33.	Oil Exploration		1						1
34.	Packaging					1			1
35.	Paints	1		1					2
36.	Paper Products		1			1			2
37.	Personal Care	1			2	1			4
38.	Petrochemicals	1	1			1		1	4
39.	Pharmaceuticals	5	5	2		7	1		20
40.	Power		2	1		1	1	1	6
41.	Refineries	3		1		3			7
42.	Shipping		1		1				2
43.	Steel Products	1		1	1	2	1	2	8
44.	Tea and Coffee							1	1
45.	Telecommunication				1	1			2
46.	Textiles – Cotton		2						2
47.	Textiles – Synthetic	2	1				1		4
48.	Trading				1				1
49.	Travel and Transport					1			1
50.	Tyres				1				1
51.	Watch	1							1
Total Firms		**39**	**27**	**22**	**33**	**30**	**12**	**10**	**173**
Total Industries		**24**	**14**	**17**	**22**	**19**	**12**	**8**	

Note: For details, refer Appendix.

have identified those industries where the number of firms included in an industry is more than four, in order to detect whether there is any specific pattern or not.

Firstly, the automobile industry (2/3 wheels) is selected for analysis (Table 5 and Appendix). There are four firms included in this industry. The average variation of this industry is 1.40%, whereas there are just two firms (Bajaj Auto and TVS) whose variation is more than industry average. In the case of four wheelers automobile industry, there are five firms included in the industry. The average variation of this industry is 2.53%. Just two firms' (Maruti Suzuki and Tata Motors) variation is more than the average. The banking industry, in which there are 20 firms, is selected for analysis. Its average variation is 4.17%; of these 20 firms, only seven

Table 5: Average, Highest, Lowest and Number of Firms Above the Average Variation ('A-Group' Stocks)						
S. No.	Industry	No. of Firms in the Industry	Variation (%)			No. of Firms Above the Average
			Average	Lowest	Highest	
1.	Aluminium	2	2.28	3.05	1.52	
2.	Auto Ancillaries	3	2.38	4.57	0.03	
3.	Automobiles – Two/Three Wheelers	4	1.40	1.82	0.86	2
4.	Automobiles – Four Wheelers	5	2.53	5.09	0.36	2
5.	Banking	20	4.17	11.24	0.15	7
6.	Bearing	1	9.30	9.30	9.30	
7.	Castings	1	12.43	12.43	12.43	
8.	Cement	5	3.29	6.63	0.14	2
9.	Chemicals – Inorganic	1	5.91	5.91	5.91	
10.	Chemicals – Organic	1	0.72	0.72	0.72	
11.	Chemicals – Synthetic	1	1.82	1.82	1.82	
12.	Cigarettes	1	0.68	0.68	0.68	
13.	Compressors	1	0.43	0.43	0.43	
14.	Computer – Hardware	5	4.17	8.82	0.24	2
15.	Computer – Software	14	2.48	11.45	0.11	3
16.	Construction	1	3.79	3.79	3.79	
17.	Consumer Durables	1	5.12	5.12	5.12	
18.	Detergents	1	0.24	0.24	0.24	
19.	Diversified	2	6.84	9.44	3.73	
20.	Electrical Equipment	7	5.89	11.89	0.40	2
21.	Engineering	4	4.80	8.65	0.18	2
22.	Engines	1	4.23	4.23	4.23	
23.	Fertilizers	3	2.61	4.81	0.48	
24.	Finance	1	2.24	2.24	2.24	
25.	Finance – Housing	2	0.82	0.95	0.70	
26.	Food Processing	3	3.21	4.43	2.35	
27.	Gas	2	3.20	4.18	2.23	
28.	Health Care	3	4.37	8.18	2.07	
29.	Hotels	2	3.34	3.48	3.19	
30.	Media	2	5.16	9.73	1.74	

Table 5 (Cont.)

S. No.	Industry	No. of Firms in the Industry	Variation (%)			No. of Firms Above the Average
			Average	Lowest	Highest	
31.	Metals	1	4.33	4.33	4.33	
32.	Miscellaneous	2	4.57	5.00	4.14	
33.	Oil Exploration	1	1.28	1.28	1.28	
34.	Packaging	1	6.37	6.37	6.37	
35.	Paints	2	1.74	2.70	0.79	
36.	Paper Products	2	3.45	5.03	1.87	
37.	Personal Care	4	3.10	5.21	0.79	2
38.	Petrochemicals	4	5.21	11.72	0.88	2
39.	Pharmaceuticals	20	3.19	8.00	0.04	8
40.	Power	6	5.90	14.83	1.04	3
41.	Refineries	7	2.84	6.35	0.16	3
42.	Shipping	2	2.60	3.28	1.93	
43.	Steel Products	8	6.42	14.06	2.20	5
44.	Tea and Coffee	1	10.18	10.18	10.18	
45.	Telecommunication	2	4.54	5.43	3.66	
46.	Textiles – Cotton	2	1.30	1.56	1.04	
47.	Textiles – Synthetic	4	2.77	8.78	0.32	1
48.	Trading	1	4.52	4.52	4.52	
49.	Travel and Transport	1	7.32	7.32	7.32	
50.	Tyres	1	3.53	3.53	3.53	
51.	Watch	1	0.68	0.68	0.68	
Total		**173**				

Note: For details, refer Appendix.

firms' (Allahabad Bank, Bank of Baroda, Canara Bank, Corporation Bank, Dena Bank, Kotak Bank and ING Vysya Bank) variation is more than the average. Five firms are selected from the cement industry for analysis, in which the average variation is 3.29%. Of these five firms, only two firms' (Birla Cement and India Cement) variation is more than the average. There are five firms selected from the computer hardware industry in which the average variation is 4.17%. Just two firms' (HCL Infosystems and D-Link) variation is more than the average. Then, analysis is carried out on 14 computer software firms, the average variation of which is 2.48%. There are just three firms (GTL, HCL Tech and Satyam) whose variation is more than the average

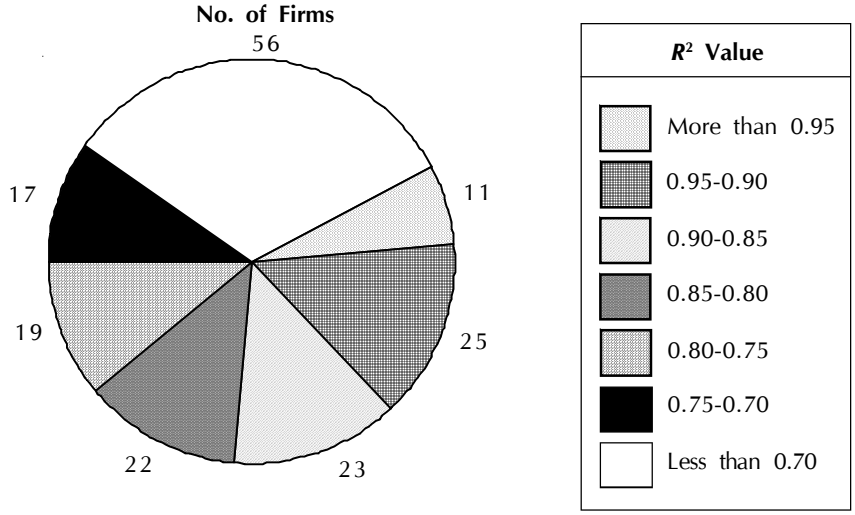
variation. In the electrical equipments industry, there are seven firms whose average variation is 4.80%. Just two firms' (Suzlon and BEL) variation is more than the average. In the engineering industry, there are four firms whose average variation is 4.23%. Just two firms' (BEML and L&T) variation is more than the average. In the personal care industry, there are four firms whose average variation is 3.10%. Just two firm's (Colgate and Dabur) variation is more than the average. In the petrochemicals industry, there are four firms whose average variation is 5.21%. In this industry, there are two firms (Bombay Dyeing and Castrol) whose variation is more than the average. The average variation of 20 firms included in the pharmaceutical industry is 3.19%, of which eight firms' variation is more than the average. The power industry has six firms whose average is 5.90%, of which three firms' (APIL, Neyveli Lignite and NTPC) variation is more than the average. The petroleum refineries industry has three firms whose average is 2.84%, of which three firms' (BPCL, Chennai Petro and MRPL) variation is more than the average. The average variation of eight firms included in the steel industry is 6.42%, of which five firms' (Jindal Saw, Jindal Steel, Jindal Steel and Power, JSW Steel and SAIL) variation is more than the average. Finally, the synthetic textiles industry has four firms whose average is 2.77%. Of these, one firm's (Century Enka) variation is more than the average. This proves that the model works efficiently.

In this analysis, firms are classified based on R^2 in order to ascertain the fitness. It is observed that R^2 values are more than 0.95 in 11 firms, between 0.95 and 0.90 in 25 firms, between 0.90 and 0.85 in 23 firms, between 0.85 and 0.80 in 22 firms, between 0.80 and 0.75 in 19 firms, and less 0.75 for the remaining firms. The average *p*-value in each case is given in Table 6. A graphical presentation of the R^2 values is given in Figure 7.

Table 6: R^2 and *p*-Values of Different Firms ('A-Group' Stocks)

R^2 Values	Average *p*-Value	Companies
More than 0.95	0.0066	11
Between 0.95 and 0.90	0.0118	25
Between 0.90 and 0.85	0.0057	23
Between 0.85 and 0.80	0.0017	22
Between 0.80 and 0.75	0.0123	19
Between 0.75 and 0.70	0.0018	17
Less than 0.70	0.0750	56
Total		**173**

Figure 7: R^2 Values of Different Firms ('A-Group' Stocks)



Results and Interpretations

In this study, the authors have applied MRA to ascertain the estimated stock prices using operating cash flow and risk-free rate of return as independent variables. These estimated stock prices are used to find the exponential growth rate of the entire period and in return, this exponential growth rate is used as a coefficient, together with lag period, for forecasting stock prices of every firm.

This study, encompassing 173 companies, reveals that the average variation of all the firms is 3.72% (Table 1). It indicates that the parameter used in this study undeniably helps in forecasting the stock prices. At the same time, if variation of any firm is more than 10%, it indicates aberration in stock prices of such companies. This distinct and high variation indicates that this may happen in the case of a few firms, but definitely, it is not a regular phenomenon.

The study reveals that the average variation of closing price of stocks is less than 4%. It indicates that, on an average, the variation of all the big firms is hovering around 4%. This, in turn, signifies that the variation of big firms is within manageable limits. At the same time, the highest variation of any company during this period is 14.83% (Table 1). This type of variation is seen in the case of a few companies, and is not a rule. At times, this occurs due to scrip chasing or not having scrip on the radar of investors. There are just 10 such firms whose variation is more than 10% (Table 2). This result is derived despite analyzing 173 firms over a period of seven years.

After analyzing 173 companies, it is also possible to observe that just a few companies have variation above 5%. If 5% significance level is taken as a benchmark, then not more than 52 firms have variation more than 5% (Table 2). This implies that of the 173 companies,

121 have variation less than 5%, which works out to be 70% of the total companies selected for the study. About 52 companies, having variation more than 5%, work out to be around 30%, while 88 companies, having variation less than 3%, is almost 51% of the 173 companies analyzed. Therefore, it is possible to state that the performance of MRA is satisfactory (Table 2).

From Table 3, it is observed that the variation is more than 3% in all price segments. However, when the price is more than Rs. 2,000 per share, the variation is relatively lower. It implies that when the share price is high, investors are more careful in assessing the fair value of shares. At the same time, if the scrip value is small, many investors are attracted towards these stocks as compared to high value scrips.

Variation less than 5% is observed across all industries. Indirectly, it suggests that if an investor invests in any type of industry, his/her returns on investment has less than 5% variation. However, investors are required to analyze the performance of individual firms for getting returns with less than 5% variation. This category constitutes 70% of the total companies and 84% of the industries covered by this study (Table 4). It also connotes that stock prices can be predicted satisfactorily.

Table 5 suggests that most of the firms' variation, barring a few, is less than industry average. This signifies that the model can be used to forecast stock prices.

In the final analysis, the variables selected are tested for their fitness. It is observed that there are 11 firms whose R^2 is more than 0.95, while 89 firms fall in the range of 0.95 to 0.75 (Table 6). This indicates that the variables selected for forecasting stock price are reasonably qualifying the test. This is a conclusive evidence to prove that all these variables are suitable for analysis and forecasting. Therefore, it is possible to conclude that the MRA technique is delivering the results satisfactorily.

Conclusion

From these observations, it is possible to state that it is feasible to forecast stock prices reasonably well using MRA. It is also possible to ascertain the growth rate of a particular industry based on the derived data. It is promising to compare the growth rate ascertained under this method, with the actual growth rate. If this growth rate falls in line with the expected growth rate of an investor, then the investor may decide to enter or exit a particular firm and/or sector.

From this, one can conclude by stating that the multivariate regression model is an effective tool in forecasting stock prices with good accuracy. However, investors should take precautions while identifying variables, which have a direct orientation on the stock price of a particular security; at the same time, frequency in which the data is available should be borne in mind. If the stock price forecasting is done on a daily basis, then it is better to use daily and/or intra-day prices rather than monthly or quarterly prices.■

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Appendix

Results of 'A-Category' Stocks Using Multivariate Regression Model

S. No.	Name	Industry Classification	R^2	*p*-Value	Forecast Closing Price	Actual Closing Price	Variation (%)
1.	ABB	Electrical Equipments	0.9471	0.00000	7,522.26	7,876.00	4.49
2.	ABBOTT	Pharmaceuticals	0.8351	0.00000	582.31	547.35	6.39
3.	ABIRLANUVO	Textiles – Synthetic	0.9144	0.00733	1,571.12	1,542.95	1.83
4.	ACC	Cement	0.9809	0.00000	1,112.86	1,081.70	2.88
5.	ADANIENT	Trading	0.9531	0.00000	318.20	333.25	4.52
6.	ALBK	Banking	0.8259	0.00001	111.53	102.00	9.34
7.	ALFALAVAL	Engineering	0.7681	0.00000	1,017.52	1,045.30	2.66
8.	ALOKTEXT	Textiles – Synthetic	0.6507	0.00520	68.12	67.90	0.32
9.	AMBUJACEM	Cement	0.8564	0.00002	140.25	144.65	3.04
10.	ANDHRABANK	Banking	0.6562	0.00002	92.89	89.45	3.85
11.	APIL	Power	0.9414	0.00000	846.34	993.75	14.83
12.	APOLLOHOSP	Healthcare	0.8561	0.00000	505.23	495.00	2.07
13.	APOLLOTYRE	Tyres	0.8560	0.00016	408.93	395.00	3.53
14.	ARVIND	Textiles	0.8738	0.00071	70.34	71.45	1.56
15.	ASAHIINDIA	Auto Ancillaries	0.8469	0.00021	116.48	116.45	0.03
16.	ASHOKLEY	Automobiles – 4 Wh.	0.9348	0.00000	39.31	40.10	1.96
17.	ASIANPAINT	Paints	0.9140	0.00005	1,004.16	1,032.00	2.70
18.	AUROPHARMA	Pharmaceuticals	0.9284	0.00000	575.42	583.30	1.35
19.	AVENTIS	Pharmaceuticals	0.6622	0.00050	1,147.25	1,168.50	1.82
20.	AXISBANK	Banking	0.9705	0.00000	887.51	918.80	3.41
21.	BAJAJAUTO	Automobiles	0.8892	0.00000	2,429.17	2,474.20	1.82
22.	BALAJITELE	Media	0.8311	0.00033	277.18	307.05	9.73
23.	BANKBARODA	Banking	0.7182	0.00631	306.51	342.35	10.47
24.	BANKINDIA	Banking	0.7073	0.00734	370.87	357.30	3.80
25.	BASF	Chemicals – Synthetic	0.6823	0.00183	233.44	248.10	5.91
26.	BEL	Electrical Equipments	0.9146	0.00000	1,608.26	1,825.35	11.89
27.	BEML	Engineering	0.7396	0.00002	1,424.95	1,559.90	8.65
28.	BHARATFORG	Castings	0.8956	0.00000	423.71	376.85	12.43
29.	BHARTIARTL	Telecommunication	0.9097	0.00245	1,167.98	1,126.75	3.66
30.	BHEL	Electrical Equipments	0.8849	0.00000	2,735.51	2,613.35	4.67

Appendix (Cont.)

S. No.	Name	Industry Classification	R^2	*p*-Value	Forecast Closing Price	Actual Closing Price	Variation (%)
31.	BILT	Paper	0.8819	0.00000	133.86	140.95	5.03
32.	BIRLACORP	Cement	0.8403	0.00002	365.47	352.25	3.75
33.	BOMDYEING	Petrochemicals	0.8492	0.00003	780.65	731.10	6.78
34.	BONGAIREFN	Refineries	0.9342	0.00007	69.79	69.90	0.16
35.	BPCL	Refineries	0.8775	0.12252	321.23	343.00	6.35
36.	BRITANNIA	Food Processing	0.6750	0.00038	1,440.40	1,507.10	4.43
37.	CADILAHC	Pharmaceuticals	0.8295	0.00002	317.11	316.80	0.10
38.	CANBK	Banking	0.6914	0.00086	274.75	292.95	6.21
39.	CASTROL	Petrochemicals	0.4575	0.08663	244.48	276.95	11.72
40.	CENTENKA	Textiles – Synthetic	0.7431	0.00859	153.66	168.45	8.78
41.	CENTEXT	Diversified	0.8981	0.00000	1,096.94	1,057.50	3.73
42.	CHAMBLFERT	Fertilizers	0.7626	0.00001	47.55	49.95	4.81
43.	CHENNPETRO	Refineries	0.7492	0.00002	314.86	331.55	5.03
44.	CIPLA	Healthcare	0.4942	0.00020	193.37	178.75	8.18
45.	CMC	Computer – Housing	0.3548	0.01004	1,079.86	1,044.65	3.37
46.	COLPAL	Personal Care	0.7042	0.00000	371.78	384.65	3.35
47.	CONCOR	Transport	0.9317	0.00000	2,121.84	1,977.15	7.32
48.	CORPBANK	Banking	0.3058	0.05396	400.02	426.10	6.12
49.	CROMPGREAV	Electrical Equipments	0.9368	0.00000	405.68	407.30	0.40
50.	CUMMINSIND	Engines	0.8400	0.00000	379.44	407.30	6.84
51.	DABUR	Personalcare	0.6165	0.00001	101.33	106.90	5.21
52.	DENABANK	Banking	0.9493	0.00000	60.99	65.50	6.89
53.	D-LINK	Computer – Housing	0.2154	0.14357	82.92	76.20	8.82
54.	DREDGECORP	Miscellaneous	0.2796	0.08544	639.77	667.40	4.14
55.	DRREDDY	Pharmaceuticals	0.5592	0.00215	571.28	620.95	8.00
56.	EIHOTEL	Hotels	0.6669	0.00000	134.07	138.90	3.48
57.	ENGINERSIN	Engineering	0.7324	0.00005	827.73	829.25	0.18
58.	ESCORTS	Automobiles	0.7210	0.00320	121.40	119.70	1.42
59.	ESSELPACK	Packaging	0.7835	0.00002	48.87	52.20	6.37
60.	EXIDEIND	Auto Ancillaries	0.7502	0.00000	77.37	75.45	2.55
61.	FDC	Pharmaceuticals	0.3652	0.12935	31.57	29.75	6.13
62.	FEDERALBNK	Banking	0.8035	0.00013	389.68	390.25	0.15

Appendix (Cont.)

S. No.	Name	Industry Classification	R^2	*p*-Value	Forecast Closing Price	Actual Closing Price	Variation (%)
63.	FINPIPE	Petrochemicals	0.9164	0.00005	72.91	74.00	1.47
64.	GAIL	Gas	0.7121	0.00369	402.47	411.65	2.23
65.	GEOMETRIC	Computer – S/W	0.3306	0.24541	96.24	96.90	0.68
66.	GESHIP	Shipping	0.9146	0.00005	474.91	484.25	1.93
67.	GILLETTE	Personalcare	0.7290	0.00076	840.76	847.45	0.79
68.	GIPCL	Power	0.3766	0.15101	64.15	65.05	1.38
69.	GLAXO	Food Processing	0.7173	0.00014	645.85	661.40	2.35
70.	GNFC	Fertilizers	0.7689	0.00000	161.56	165.80	2.55
71.	GODREJCP	Personal Care	0.8506	0.00000	126.97	123.20	3.06
72.	GRASIM	Cement	0.8737	0.00001	3,709.37	3,704.05	0.14
73.	GTL	Computer – S/W	0.8309	0.00001	229.83	259.55	11.45
74.	GUJRATGAS	Gas	0.7250	0.00043	1,638.12	1,709.50	4.18
75.	HCL-INSYS	Computer – H/W	0.2684	0.13110	293.75	311.05	5.56
76.	HCLTECH	Computer – S/W	0.6921	0.00001	215.41	223.10	3.45
77.	HDFC	Finance – H/W	0.7497	0.00000	2,753.83	2,773.20	0.70
78.	HDFCBANK	Banking	0.9665	0.00000	1,657.38	1,653.10	0.26
79.	HEROHONDA	Automobiles	0.9671	0.00000	733.13	726.85	0.86
80.	HEXAWARE	Computer – S/W	0.8125	0.03517	127.42	125.15	1.82
81.	HINDALCO	Aluminium	0.7563	0.00000	190.32	196.30	3.05
82.	HINDPETR	Refineries	0.7736	0.00000	240.03	239.55	0.20
83.	HINDUNILVR	Diversified	0.4801	0.00020	227.19	207.60	9.44
84.	HINDZINC	Metals	0.9555	0.00000	945.52	906.25	4.33
85.	ICI	Paints	0.7774	0.00000	516.88	521.00	0.79
86.	ICICIBANK	Banking	0.9474	0.00000	1,208.04	1,257.00	3.89
87.	I-FLEX	Computer – S/W	0.8687	0.00000	2,230.93	2,204.50	1.20
88.	IGL	Computer – S/W	0.3697	0.06268	354.29	357.00	0.76
89.	INDHOTEL	Hotels	0.7932	0.00000	149.58	144.95	3.19
90.	INDIACEM	Cement	0.6604	0.19787	300.97	282.25	6.63
91.	INDORAMSYN	Textiles – Synthetic	0.4105	0.09275	57.94	57.85	0.15
92.	INDUSINDBK	Banking	0.5996	0.00011	51.80	51.15	1.27
93.	INFOSYSTCH	Computer – S/W	0.9785	0.00000	2,115.43	2,124.55	0.43
94.	INGERRAND	Compressors	0.3608	0.02786	305.55	304.25	0.43

Appendix (Cont.)

S. No.	Name	Industry Classification	R^2	*p*-Value	Forecast Closing Price	Actual Closing Price	Variation (%)
95.	INGVYSYABK	Banking	0.9325	0.25977	289.68	260.40	11.24
96.	IOB	Banking	0.8004	0.00000	136.58	133.40	2.38
97.	IOC	Refineries	0.4575	0.00750	478.47	481.70	0.67
98.	IPCALAB	Pharmaceuticals	0.5833	0.00523	634.56	640.75	0.97
99.	IPCL	Petrochemicals	0.7608	0.00000	478.85	483.10	0.88
100.	ITC	Cigarettes	0.8925	0.00000	177.94	179.15	0.68
101.	JBCHEPHARM	Pharmaceuticals	0.5390	0.00442	72.58	73.15	0.78
102.	JINDALS&P	Steel	0.8902	0.00000	4,838.28	5,191.75	6.81
103.	JINDALSAW	Steel	0.4414	0.41749	897.84	787.20	14.06
104.	JINDALSTEL	Steel	0.5017	0.04354	186.17	166.65	11.71
105.	JPASSOCIAT	Construction	0.9047	0.00003	1,139.24	1,097.60	3.79
106.	JSWSTEEL	Steel	0.9444	0.01312	1,011.78	957.75	5.64
107.	KOTAKBANK	Banking	0.7539	0.00022	1,044.03	1,000.00	4.40
108.	LICHSGFIN	Finance – Housing	0.6049	0.00001	351.05	354.40	0.95
109.	LT	Engineering	0.8080	0.00000	4,014.33	4,244.55	5.42
110.	LUPIN	Pharmaceuticals	0.4735	0.00591	619.71	586.70	5.63
111.	M&M	Automobiles – 4 Wh.	0.6658	0.00016	812.94	828.45	1.87
112.	MAHSEAMLES	Steel	0.8765	0.00000	594.74	608.15	2.20
113.	MARUTI	Automobiles – 4 Wh.	0.8337	0.00002	1,128.20	1,073.55	5.09
114.	MASTEK	Computer – S/W	0.9130	0.00000	331.29	330.70	0.18
115.	MERCK	Pharmaceuticals	0.3872	0.05294	408.82	387.60	5.48
116.	MICO	Auto Ancillaries	0.7272	0.00000	4,447.13	4,252.85	4.57
117.	MICRO	Miscellaneous	0.6540	0.00172	358.11	376.95	5.00
118.	MIRCELECTR	Consumer Durables	0.3892	0.00211	18.60	19.60	5.12
119.	MOSERBAER	Computer – H/W	0.5763	0.00245	291.01	282.95	2.85
120.	MPHASIS	Computer – S/W	0.7550	0.00011	316.97	313.00	1.27
121.	MRPL	Refineries	0.5844	0.00516	56.06	59.05	5.06
122.	MTNL	Telecommunication	0.4250	0.03616	169.81	179.55	5.43
123.	NATIONALUM	Aluminium	0.8841	0.00000	327.49	322.60	1.52
124.	NESTLE	Food Processing	0.6991	0.00022	1,244.97	1,281.45	2.85
125.	NEYVELILIG	Power	0.3163	0.05776	75.60	81.65	7.41

Appendix (Cont.)

S. No.	Name	Industry Classification	R^2	*p*-Value	Forecast Closing Price	Actual Closing Price	Variation (%)
126.	NICOLASPIR	Pharmaceuticals	0.4709	0.03016	306.64	299.95	2.23
127.	NIRMA	Detergents	0.4487	0.02086	151.39	151.75	0.24
128.	NOVARTIS	Pharmaceuticals	0.1210	0.49206	301.50	318.35	5.29
129.	NTPC	Power	0.8642	0.00680	179.30	165.65	8.24
130.	ONGC	Oil Exploration	0.7321	0.00001	1,347.28	1,330.20	1.28
131.	ORCHIDCHEM	Pharmaceuticals	0.6441	0.00001	228.15	228.05	0.04
132.	ORIENTBANK	Banking	0.8038	0.00003	223.07	228.50	2.37
133.	PFIZER	Pharmaceuticals	0.6141	0.00128	690.81	709.50	2.63
134.	PGHH	Health Care	0.7420	0.00004	763.31	741.95	2.88
135.	PIDILITIND	Chemicals – Organic	0.8634	0.00013	206.98	205.50	0.72
136.	POLARIS	Computer – S/W	0.0590	0.51219	112.18	112.05	0.11
137.	PUNJABTRAC	Automobiles – 4 Wh.	0.3864	0.02566	246.08	245.20	0.36
138.	RANBAXY	Pharmaceuticals	0.6896	0.00028	395.24	427.05	7.45
139.	RAYMOND	Textiles	0.8436	0.00001	356.78	353.10	1.04
140.	RCF	Fertilizers	0.3362	0.06969	55.38	55.65	0.48
141.	REL	Power	0.8170	0.00000	1,363.47	1,349.40	1.04
142.	RELCAPITAL	Finance	0.9400	0.00000	1,662.99	1,626.55	2.24
143.	RELIANCE	Refineries	0.8084	0.00000	2,234.16	2,289.35	2.41
144.	ROLTA	Computer – S/W	0.8751	0.00000	686.69	695.10	1.21
145.	SAIL	Steel	0.8886	0.00000	224.79	243.45	7.67
146.	SATYAMCOMP	Computer – S/W	0.6676	0.00002	521.28	477.65	9.13
147.	SBIN	Banking	0.7446	0.00028	2,102.58	2,068.15	1.66
148.	SCI	Shipping	0.6465	0.00000	232.61	240.50	3.28
149.	SIEMENS	Electrical Equipments	0.8827	0.00000	2,041.56	1,953.05	4.53
150.	SKFINDIA	Bearing	0.8105	0.00000	449.34	411.10	9.30
151.	STERLITE	Pharmaceuticals	0.9115	0.00006	1,024.89	1,039.00	1.36
152.	SUNPHARMA	Pharmaceuticals	0.9458	0.00000	1,038.53	1,054.20	1.49
153.	SUZLON	Electrical Equipments	0.6818	0.31824	2,082.40	1,973.65	5.51
154.	SYNDIBANK	Banking	0.9026	0.00000	92.17	89.10	3.45
155.	TATACHEM	Chemicals – Inorganic	0.8090	0.00058	327.75	321.90	1.82
156.	TATAELXSI	Computer – H/W	0.9131	0.00000	315.14	314.40	0.24
157.	TATAMOTORS	Automobiles – 4 Wh.	0.3564	0.64360	783.25	757.70	3.37

Appendix (Cont.)

S. No.	Name	Industry Classification	R^2	*p*-Value	Forecast Closing Price	Actual Closing Price	Variation (%)
158.	TATAPOWER	Power	0.8912	0.00005	952.50	976.65	2.47
159.	TATASTEEL	Steel	0.8146	0.00000	733.55	757.70	3.19
160.	TATATEA	Tea and Coffee	0.7743	0.00000	905.08	821.45	10.18
161.	TCS	Computer – S/W	0.9543	0.00000	1,016.17	1,037.90	2.09
162.	THERMAX	Electrical Equipments	0.9088	0.00000	873.26	855.05	2.13
163.	TITAN	Watches	0.8075	0.00060	1,767.51	1,755.50	0.68
164.	TNPL	Paper	0.6000	0.01620	106.65	104.70	1.87
165.	TORNTPHARM	Pharmaceuticals	0.9628	0.03723	182.88	184.90	1.09
166.	TVSMOTOR	Automobiles	0.7669	0.23311	58.97	58.10	1.49
167.	UNIONBANK	Banking	0.7815	0.00011	170.42	173.95	2.03
168.	VIJAYABANK	Banking	0.7813	0.00001	61.55	61.65	0.16
169.	WELGUJ	Steel	0.9982	0.04216	328.98	328.65	0.10
170.	WIPRO	Computer – S/W	0.9613	0.00000	500.12	504.80	0.93
171.	WOCKPHARMA	Pharmaceuticals	0.7921	0.00004	442.02	420.25	5.18
172.	WYETH	Pharmaceuticals	0.7960	0.00000	454.93	457.00	0.45
173.	ZEEL	Media	0.7696	0.00015	333.68	331.75	0.58

Reference # 09J-2010-01/04-01-01