Are the Financial Ratios better discriminator between Market Out-Performers, Market Performers and Market Under-Performers?

Abstract

The stock market is the information driven market. The information for a retail investor is never as detailed, especially in qualitative aspects about this market, as it is for a big time speculator or to an equity analyst. In the absence of contemporary information the investor is left with a company's annual report to make his investment decisions. He arrives at different financial ratios and selects the important ones so as to invest wisely to maximize his returns. However the main issue facing him is whether these financial ratios are able to discriminate the under-performers from performers and out-performers in the stock market. An attempt has been made in this paper to address this issue and develop selection criteria for the retail investor by using the techniques of discriminant analysis. It was found that dividend payout ratio has a power to significantly discriminate the under-performers from market out-performers. The other five variables (financial ratios) failed to discriminate across market performers, under-performers and out-performers.

This paper is based upon the author's Course of Independent Study under the guidance of Dr. Suranjan Das, Goa Institute of Management. The author is indebted for the assistance given by Dr. Suranjan Das towards the completion of the paper. Errors and omissions, if any, are author's own.

Introduction

Investors face a problem when deciding about their investments in various financial products. All the investors are not educated enough to make a rational decision about the market, given the current market conditions. Various controllable and uncontrollable factors have affected financial markets over time. This has hindered the efficient investment decisions of the investors. In the process of seeking information the investor does get a blur idea about the various financial products and the risk and return associated with them. However, the credit ratings about various financial products are available to discriminate between two instruments in the same category. Rating agencies like ICRA, CARE, S&P etc rate various instruments like Commercial Papers, Corporate bonds, Debentures, FD's, Commercial Deposits, Mutual Funds etc. But no rating is done about the equity shares. The reason is simple that no rating agency wants to degrade its credibility by rating an instrument whose worth is volatile like the waves of the ocean. But the fact remains that the investor is left alone to decide about investment on the most volatile financial instrument.

The retail investor does not have the access to in-depth information that is available to speculators and equity analysts. Therefore, he is left with the financial ratios to compare between companies to invest wisely. The information is derived from the annual reports of the companies. He also has the access to the company specific research on the Internet. Nevertheless, the understandability of the research report suffers because of the dominance of technical analysis.

Objective of the research

The main interest of this study is to find out whether there exist different financial characteristics of a firm that are individually and incrementally important economic determinants of the stock returns. The study is aimed at identifying the financial ratio(s), which significantly discriminates between Market Out-performers, Market Performers and Market Under-performers.

A stock is said to be MOP when the return on the stock exceeds the index (BSE Sensex) by more than 20% over a period of 12 months.

A stock is said to be MUP when the return on the stock is less than the index (BSE Sensex) by 20% over a period of 12 months.

A stock is said to be MP when the return on the stock is in between the return of MOP and MUP.

Description about the research

The main focus of the paper is to investigate the relationship between financial ratios and stock returns. The paper attempts to determine the ability of financial ratios in significantly discriminating between the Market Out-performer (MOP), Market Performer (MP) and Market Under-Performer (MUP).

The paper will also analyse various variables, which will assist in discriminating between the MOP's (Market Out-performing stocks), MP's (Market Performing stocks), and MUP's (Market Under-performing stocks). If it is found that financial ratios can

significantly discriminate between the MOP's, MP's and MUP's, then the investor's investment decisions based upon the financial ratios can yield better results.

Null hypothesis: There is no statistically significant difference between the average scores (values of each variable) of the MOP's, MP's and MUP's.

$$Ho: \grave{l}_{MOP} = \grave{l}_{MP} = \grave{l}_{MUP}$$

Research hypothesis: There is a statistically significant difference between the average scores (values of each variable) of the MOP's, MP's and MUPs.

$$H_1: \div_{MOP} =! \div_{MP} =! \div_{MUP}$$

The Data

The data can be studied under the following heads:

Sample: For the purpose of the study sample size is taken as 69. The characteristics of the sample are:

- The entire sample has been derived from only one sector to minimize the uncontrollable intra-industry factors. Cement sector has been chosen for this study.
- The sample consists of 14 chosen companies for 5 years. The list of companies is demonstrated in the Exhibit –1, Appendix. All the companies selected are listed in Bombay Stock Exchange.
- The data on each company is collected from PROWESS (CMIE); the data is spread from FEB 1996 to FEB 2002.
- A sample consists of the returns on holding the stock for a year. For example, the return on ACC is said to be a sample when it is held for a year. Say from FEB 2000 to FEB 2001(February has been selected because the annual report is published between May to July).
- Return is calculated on the unadjusted price of a particular stock. For example: The price of a share of ACC is Rs.200 at the beginning of the year say in February

1998 (The 7 day average period is calculated from February 20 to February 27). Similarly, BSE Sensex is at 3000 points at the beginning of the year in February 1998 (The 7 day average period is calculated from February 20 to February 27). The price of a share of ACC is Rs.240 at the end of the year say in February 1999(The 7 day average period is calculated from February 20 to February 27). Similarly, BSE Sensex is at 3300 points at the end of the year in February 1999 (The 7 day average period is calculated from February 20 to February 27).

If an investor holds the stock for the period of one year from FEB 1998 to FEB 1999, he gets a Market Adjusted Return (MAR) of 10%. MAR is calculated on the excess of stock return (20% in this case) on the BSE Sensex (10% in this case).

- Market adjusted return (MAR) is calculated on the excess of stock specific return on the BSE Sensex in order to nullify the effect of uncontrollable market factors on the stock price.
- If the MAR for a sample is above 20% then the sample is said to be a part of categorical group MOP.
- If the MAR for a sample is below -20% then the sample is said to be a part of the categorical group MUP.
- If the MAR for a sample is between 20% and –20% then the sample is said to be a part of categorical group MP.
- Total sample is calculated to be at 70(14 companies for 5 years), only 69 samples are taken into account because the data for Kalyanpur Cement Industries is not available for a year.
- The entire sample is divided into two samples. They are:
    - Analysis sample: This sample size comprise of 56 samples for the first four years i.e. 1997 to 2000. This sample size will help in deriving the discriminant function
    - Holding sample: This sample size comprise of 13 samples for the last year i.e. 2001. This sample will be utilized for the testing of the discriminant function.

Discriminating variables: The discriminating variables are nothing but the financial ratios. Financial ratios has been collected and calculated for each sample from PROWESS (CMIE). Financial ratios have been selected from the traditional classification presented by Lev (1974, p.12). One of the important ratio, profitability ratio is added; Barnes (2000, p 147) has concluded that profitability ratio is key determinant in predicting mergers sand acquisitions.

The number of financial ratios has been limited to six. This is because of three reasons:

1. The six ratios are assumed to be the representative of important financial ratios.
2. While these six ratios move towards same direction, some of the ratio's move towards other direction, i.e., less they are better for the company. The Discriminant function does not take into consideration the inverse relationship.
3. Ratios like debt equity ratio or PE ratio cannot be metrically mapped. Meaning high debt equity ratio for an industry or company can be better. Where as for some industries or companies lower the debt equity ratio, better is the prospect.

The financial ratios are listed in the Table. 1

Table. 1: Selected financial ratios

Financial ratios
Return on Investment (in %age)
Profit after tax (in %age)
Dividend Payout Ratio (in %age)
Current Ratio (in times)
Interest coverage ratio (in times)
Debtors turnover ratio (in times)

Return on Investment (in %age): A measure of a corporation's profitability, equal to a fiscal year's income divided by common stock and preferred stock equity plus long-term debt.

Profit after tax (in %age): A measure of the company's profitability after deducting the tax. PAT is the percentage of after tax return on the total sales.

Dividend Payout ratio (in %age): Dividend Payout ratio depicts the annual dividend paid to the shareholders for a period of one year. Dividend Payout ratio is the percentage of total dividend paid upon profit after tax.

Current Ratio (times): Defined as the ratio of current asset and current liabilities. We include that part of the secured and unsecured loans that are due for redemption in the next one-year in current liabilities.

Interest coverage ratio (in times): Defined as the ratio of profit before interest and taxes upon the interest payments. The interest coverage ratio demonstrates the number of times the profit of the company can pay the taxes.

Debtors' turnover ratio (in times): Debtors' turnover ratio is equal to total credit sales divided by average accounts receivable. The debtors' turnover ratio demonstrates the efficiency of the company to cash the receivables as soon as possible.

Discriminant analysis

Discriminant analysis is generally used in social science research to find variables that can discriminate two or more groups. The most celebrated study in finance is the one by Altman (1968, p589), where he used discriminant analysis to predict the corporate bankruptcy. Charabji, Hamdi, Mrrash(1993) used Discriminant analysis for rescheduling external debt of less developed countries with the help of variables like debt burden, foreign exchange balance, and GDP growth.

The discriminant analysis works on the basis of building the classification function for each group (in our case it is 3 groups). We use Fishers linear discriminant functions for estimating the classification function coefficients.
We adopt this method to derive discriminant score for each group

$DK¼ = a + b_1*x_1 + b_2*x_2 + ... + b_m*x_m$ …… (1)

- DK is the discriminant score for the group "¼".
- "a" is the constant or intercept
- "$x_1, x_2,\ldots x_m$" are the discriminating variables
- "$b_1, b_2, ... b_m$ " are the coefficients the discriminating variables.

On the whole we need to calculate three discriminant scores. To obtain a classification score for each sample, multiply each coefficient by the value of the corresponding variable, sum the products, and add the constant to get the score. A sample is predicted as being a member of the group in which the value of its classification function is largest.

The method used to analyse and compute the discriminant function is Stepwise method. The stepwise approach begins by choosing the single best discriminating variable. The initial variable is then paired with each of the other discriminating variables one at a time, and a second variable is chosen. The second variable is the one that is best able to improve the discriminating power of the function in combination with the first variable.

The statistics chosen for the stepwise approach is Wilks' Lambda; it is the ratio of the within-groups sum of squares to the total sum of squares. The variable that reduces Wilks' Lambda the most, would be selected for the next step.

Table. 2: Tests of Equality of Group Means

Variables	Wilks' Lambda	F	df1	df2	Sig.
ROI	0.97218	0.758347	2	53	0.473455
PAT	0.93426	1.864659	2	53	0.164972
DP	0.85175	4.612446	2	53	0.014232
CR	0.91882	2.341333	2	53	0.106074
INCO	0.91738	2.386569	2	53	0.101759
DTR	0.93509	1.839534	2	53	0.168892

It is evident from the Table- 1, that DP (Dividend Payout ratio) is the one, which reduces the Wilks' Lambda the most. Wilks' lambda ranges from 0 to 1. Small values indicate strong group differences. Values close to 1 indicate no group differences. To support this we also have the F statistic. The F statistic is a ratio of between-groups variability to the within-groups variability.

In the stepwise approach a variable is included when the F statistic is above 3.84. Similarly a variable is removed if the F statistic is below 2.71. Based upon the nature of the data and the sample size the SPSS software calculates the F statistics.

If the significance value is small (smaller than say, 0.10) this indicates that the group differences are significant. If the significance value is large (larger than say, 0.10) this indicates that the group differences are not significant.

As no other variable has considerably better power to reduce the Wilks' Lambda the F statistics does not support other variables

In Fishers model we obtain a linear equation in terms of one variable and an intercept (constant) in the form of equation (1) for each group. Thus we obtain 3 discriminating equations (one for each group MOP, MP, MUP) in the Table. 3.

Table. 3: Classification Function Coefficients

Ratios	MOP	MP	MUP
DP	0.00367	0.03110	0.01367
(Constant)	-1.14390	-1.77678	-1.15359

Fisher's linear discriminant functions

Testing the model on the holdout sample

Once we obtain the discriminating equations for the 3 groups, the next step is to apply the discriminating equations on the holdout sample.

As mentioned earlier, the size of the holdout sample is 13. The discriminating equations are calculated on the basis 56-analysis samples spread over the 4 years from 1997 to 2000, whereas the holdout sample is for the year 2001.

Table. 4, demonstrates the discriminating variable. i.e. the dividend payout ratio for the hold out sample.

Table. 4: Discriminant scores of the holdout sample

Company	DP (%)
ACC	66.77
Birla	0
Gujarat Ambuja	42.36
Hemadri	0
Madras Cements	16.54
Mysore Cements	0
Narmada Cements	0
Priyadarshini Cements	0
Raasi Cements	0
Sri Vishnu Cements	0
India Cements	57.05
Dalmia Cements	14.65
Deccan Cements	28.81

The zeros in the Table: 4 indicate that the particular company has not declared the dividend for the year.

Determination of cut off

A model is said to be effective when the success of prediction exceeds the probability of the success. For example f the prediction is 100% true, i.e., the model predicts that all the samples belong to the actual group. Since we have three groups we can say that the success rate would be 33.33% by chance. If the model can predict the success less than 33.33% we can conclude that the discriminating variables selected are incapable of discriminating the groups. Success rate beyond 50% can be considered as reasonably good.

The following table gives the discriminating scores for each sample.

Table.5: Calculation of the discriminant scores

Company	DP (%)	MOP	MP	MUP	Predicted group	Actual group
ACC	66.77	-0.89915	0.299541	-0.24105	MP	MP
Birla	0	-1.1439	-1.77678	-1.15359	MOP	MP
Gujarat Ambuja	42.36	-0.98863	-0.45953	-0.57466	MP	MOP
Hemadri	0	-1.1439	-1.77678	-1.15359	MOP	MP
Madras Cements	16.54	-1.08327	-1.26244	-0.92754	MUP	MP
Mysore Cements	0	-1.1439	-1.77678	-1.15359	MOP	MP
Narmada Cements	0	-1.1439	-1.77678	-1.15359	MOP	MUP
Priyadarshini Cements	0	-1.1439	-1.77678	-1.15359	MOP	MP
Raasi Cements	0	-1.1439	-1.77678	-1.15359	MOP	MP
Sri Vishnu Cements	0	-1.1439	-1.77678	-1.15359	MOP	MOP
India Cements	57.05	-0.93478	-0.00272	-0.37389	MP	MUP
Dalmia Cements	14.65	-1.0902	-1.32121	-0.95337	MUP	MP
Deccan Cements	28.81	-1.0383	-0.88089	-0.75985	MUP	MP

Now we make an attempt to find the maximum value for each company for each group. We find that the maximum value for ACC comes under the group MP. Similarly, we find that the maximum value for ACC comes under the group MOP.
It is clear from the table that the prediction has been true for only two companies.

Decision

We found under the stepwise method that the dividend payout ratio is the highest discriminating variable. All other variables have failed to discriminate between the MOP, MP and MUP.

Moreover, after testing discriminant equations on the hold out sample we have found that the model has predicted only two samples correctly. According to the probability the minimum success rate should have to be 33.33%. But the successful prediction rate has been 15.38%.
Since, the discriminating variables are unable to prove that there is a difference between the average scores of MOP, MP, and MUP, we accept that the null hypothesis is true.

Implications for the investors

As it has been tested that the financial ratios are no more capable of discriminating between the under-performers and the out-performers, investors has to look out for some other models to master the investment decisions. Lot of research has been done on the Bayesian model, i.e, the probability of success or failure changes as the quality and the quantity of the information increases. Based upon the Bayesian model, the investor has to factor the information into the buying decision as soon as he gets the information. In the Bayesian approach the investor has to be more market oriented. He should look out for the best and most reliable information as soon as possible.
The only variable that has been successful to discriminate between the under-performers and the out-performers is the dividend payout ratio. Investors can expect some good returns based upon the dividend payout ratio. But even then the success is not guaranteed.

Implications for the company

For the management of a company there is a trade off between the dividend paid and the profits retained. One stream leads to the cash outflow and the other stream is the investment for generating future cash inflows. There has been a considerable debate on the percentage of the profit to be retained and the percentage of the profits to be disbursed to the owners of the company. Again it depends upon industry to industry. For example a company in a high growth industry would require more funds for building the capital assets, where as for a company in the low growth industry paying dividends might be the best option to create value. To conclude as the cement industry is a low growth industry paying high dividends can create good value on the whole.

Appendix

Exhibit -1

Company
ACC
Birla
Dalmia Cements
Deccan Cements
Gujarat Ambuja
Hemadri
India Cements
Kalyanpur cements
Madras Cements
Mysore Cements
Narmada Cements
Priyadarshini Cements
Raasi Cements
Sri Vishnu Cements

References

- Hair,Jr., Anderson., Tatham., 1990, *Multivariate Data Analysis*(2nd Edn), Macmillan, Canada.
- Tacq., 1997, *Multivariate Analysis Techniques in Social Science Research*, Sage Publication, London.
- Raj, G.C., 1999, *Discriminant Analysis for Lending*, "ICFAI: Research Papers in Applied Finance" , 1999, ICFAI Press.
- Mohanty., Sahoo., 2002, *An Alternative to Crisil Credit Rating: Using Discriminant Analysis* , " The ICFAI Journal of Applied Research", ICFAI Press.
- Salkind,J., 2000, *Statistics for the people who (think they) hate statistics* , Sage Publications, London.
- Lev.B.,1974, *Financial Statement Analysis A New Approach* , Englewood Cliffs, Printice Hall , 1974.
- Barnes, 2000, *The identification of UK takeover targets using published historical cost accounting data: some empherical evidence comparing logit with linear analysis and raw financial ratios with industry relative-returns,* in "International Review of Financial Analysis", United States.
- Altman, E.I, 1968, *Discriminant Analysis and the prediction of corporate bankruptcy*, in " Journal of Finance"
- Charabji., Hamdi., Mrrash., 1993, *Predicting the government's decision to seek rescheduling of external debt,* in " Applied Economics", 1993.