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Classification and a Critical Comparison of Different Company Shares under Consideration through Analysis of Means Technique

[1]K. V. Narasimha Murthy, [2]S. Ismail
[1]*Assistant professor Department of Mathematics Madanapalle Institute of Technology and Science, Madanapalle-517325*
[2]*Assistant professor Department of Management Studies Madanapalle Institute of Technology and Science, Madanapalle-517325*

Abstract: *Share prices are the most crucial factors in marketing and frequent changes in these prices will occur with respect to time "t". In order to analyse these share prices we require most sophisticated statistical techniques like Stochastic Process (SP), Factor Analysis (FA), and Analysis of Means (ANOM) and so on. In this paper we have considered the analysis of comparing '25' different Company shares value in the market. Even though share prices varying independently of each company, there are common factors influencing all the shares in the market. For instance, natural calamities like earthquakes, floods, and draughts and so on. The aim of present paper is to analyse these share prices with respect to such common factors affecting of all shares.*

In this paper we have applied a latest statistical tool namely ANOM to analyse the data relevant to the '25' shares based on the data collected for the period January-2012 to May-2013. By applying ANOM and graphical representation of results of '25' shares are critically analysed and conclusions are drawn based the results and graphs obtained. Similar type of analysis can be applied any company shares under consideration.

Keywords: *ANOM Graphical Method, Share Prices (Variable Data), Upper Decision Line (U.D.L.), Central Line (C.L.), Lower Decision Line (L.C.L.), Multiple Comparisons*

I. Introduction:

Determination of prices of an item is the most important factor in marketing and is mainly depending upon market trends of the performance of the company, goodwill and market trends. Analysis and prediction of the price of a share is the latest trend of research in marketing. There are many methods available in literature and can be seen in daily newspapers, some common techniques like weekly averages, monthly averages, moving averages and so on.

In the present paper we have proposing a new statistical technique known as Analysis of Means (ANOM) for classification and to study the behaviour of Company Shares under consideration. This technique is on similar lines of control charts used in Quality Control which contains three lines, namely Upper Decision Line (U.D.L.), Central Line(C.L.) and Lower Decision Line(L.D.L.).Sample averages are plotted on the graph paper and decisions are taken based on the spread of these points in the graph paper. ANOM technique is explained in the following lines.

II. Analysis of Means (ANOM):

During this era of enhanced awareness of the importance of Statistical methods for solving the economic problems of industry, the advocacy of the effective technique of analysis of means (ANOM) seems especially appropriate. The Analysis of Means (ANOM) is a useful alternative to the Analysis of Variance (ANOVA) as a method of comparing a group of treatments. Attractive attributes of ANOM include the inherent ease of interpretation and graphical presentation. An ANOM chart, conceptually similar to a control chart, portrays decision lines, so that magnitude differences and Statistical significance of the treatments may be assessed simultaneously.

The ANOM technique was developed by Prof. Ott (1967) for comparing a group of treatment means to see if any one of them differs significantly from the overall mean. This technique was extended by Schilling (1973) to what he called the analysis of means for treatments effects (ANOME). It is important to note that the Analysis of Means procedure is appropriate for factors involving fixed effects but is inappropriate for factors involving Random effect. For fixed effects the model assumes factor level means are constant. However, for random effects, the factor level means are random variables and in that case the aim is estimation of variance rather than mean effects.

Variables Data

The one-way classification model results when an experimenter obtains 'k' independent random samples of size n_i $(i = 1,2,3,.....k)$ each from a different population. These 'k' populations might, for example, represent 'k' treatments, 'k' methods of production, or 'k' groups. The data consist of a quantitative measurement of some characteristic for each experimental unit sampled from the different populations.

For comparison of the mean responses by the ANOM procedure let us consider the simplest case of 'k' groups of equal size 'n'. The 'k' means $\bar{X}_i$ are assumed to be from normally distributed populations with common variance σ^2. Let $\bar{\bar{X}}$ represent the grand mean and s^2 the pooled estimate of the common but unknown variance. These quantities are defined mathematically by

$$\bar{\bar{X}} = \frac{1}{k}\sum_{i=1}^{k} \bar{X}_i \qquad (1)$$

$$s^2 = \frac{1}{k}\sum_{i=1}^{k} s_i^2 \qquad (2)$$

where $s_i^2 = \sum_{j=1}^{n} (X_{ij} - \bar{X}_i)^2 \Big/ (n-1)$ (3)

X_{ij} = j^{th} observation from i^{th} population.

Other estimates of σ^2 have been considered acceptable. In particular, Ott (1967) and Schilling (1973) use one based on ranges. However, s^2 shall be preferred in the applications that follow:

The steps to carry out ANOM are:

1. Compute the group means, $\bar{X}_i, (i = 1,2,3,.....k)$.
2. Compute the grand mean, $\bar{\bar{X}}$, using equation (1).
3. Compute s, an estimate of the standard deviation of an individual observation. This is the square root of s^2 is computed using equations (2) and (3).
4. Obtain the value h_α from the table in L.S. Nelson (1983a) for Type I risk level α, number of means k, and degrees of freedom $(n-1)k$.
5. Compute the upper and lower decision lines, UDL and LDL, where

   UDL = $\bar{\bar{X}} + h_\alpha s\sqrt{(k-1)/kn}$ (4)

   C.L. = $\bar{\bar{X}}$

   LDL = $\bar{\bar{X}} - h_\alpha s\sqrt{(k-1)/kn}$ (5)

Plot the means against the decision lines. If any mean falls outside the decision lines conclude there is a statistically significant difference among the means.

ANOM with Unequal Sample Sizes

For sets of means each of which is based on the sample size, equations (4) and (5) together with the tabled values provided here will give exact results. When the means are based on unequal sample sizes their deviations from the grand mean are no longer equicorrelated and decision limits, the following equation (6) should be computed using critical values that are upper bounds on the true but not available values of h. The decisions limits in this case are

$$\bar{\bar{X}} \pm h^*_{\alpha,k,\nu} s\sqrt{(k-1)/kn} \qquad (6)$$

where N = total number of observations

n_i = number of observations in the i^{th} mean.

Following Sidak (1967), the necessary values of h^* can be calculated as the upper $\alpha^*/2$ percentage points of a 't-distribution', where

$$\alpha^* = 1-(1-\alpha)^{1/k} \quad (7)$$

$\alpha =$ desired significance level

$k =$ number of means.

The upper bounds obtained by the use of equation (7) are slightly less than the factors given by L.S.Nelson (1974). Remember that in the use of equation (6) it is necessary to calculate as many pairs of decision lines as there are different sample sizes.

Advantages of graphical Analysis of Means

1. Analysis of Means provides a direct study of possible effects of the factors by dealing with means instead of variances. The Analysis of Means thus provides a comparison of the relative importance and magnitude of the factors, as well as their Statistical significance.
2. It provides a graphical comparison of effects. A primary function of industrial experimentation is not only to obtain information, but to present it in a way which will be accepted as a basis for decision and action by appropriate technical administrative personnel. The graphical presentation encourages the translation of conclusions into scientific action; this is a critical advantage.
3. Analysis of Means provides a pin-pointing of source of non-randomness.
4. A graphical presentation of data is almost a necessity when interpreting the meaning of interactions whose presence has been indicated by an Analysis of variance.
5. The Analysis of Means frequently provides a bonus by suggesting the unsuspected presence of certain types of non-random variability; these suggestions can then be included in subsequent experiments for study.
6. The graphical Analysis of Means has frequently indicated errors in calculation in an Analysis of Variance. These errors are often apparent in a graphical presentation even to the untrained.

In literature Analysis of Means (ANOM) was applied to the data in the following situations:

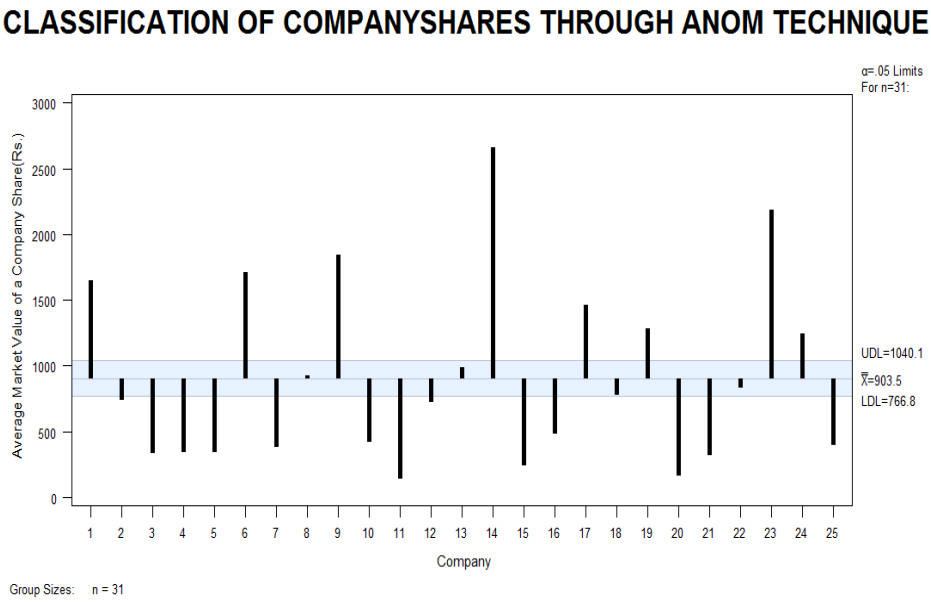
ANOM was applied to the data from Walpole and Mayers (1972). The data resulted from an experiment which studied how mean absorption of moisture in concrete is affected by different aggregates. Five different concrete aggregates were studied by exposing six samples of each to moisture for 48 hours. Schilling (1979) incorporated the ANOM technique in the grand-lot scheme of Simon to verify the homogeneity of a grand lot. This resulting approach simplifies application of the grand-lot scheme can be applied to attributes or variable data, is easy to use, and provides high levels of protection economically and a reduction in sample size of 80%.

Enrick (1976) applied ANOM to wire-life data obtained from a three way factorial design. Ott and Snee (1973) applied the ANOM method to identify the differences in a circular multiple-head speed machine, which runs continuously. All the heads are intended to perform the same operation, which may be filling a bottle, can, or box to a desired average or minimum. Tomlison and Lavigna (1983) gave an application of ANOM for percent defective data obtained from silicon crystal growing, the first processing step in semiconductor manufacturing. Ullman (1989) has expanded the area of application by providing factors for ANOM on ranges suitable for use in the analysis of Taguchi signal-to-noise ratio. Parra and Loaiza (2003) applied the ANOM technique to a case study data from chemical and pharmaceutical industries and demonstrated the value of the application of ANOM as a powerful visualization and communication tool, to complement the conventional analysis of nested designs.

III. Approach and Implementation:

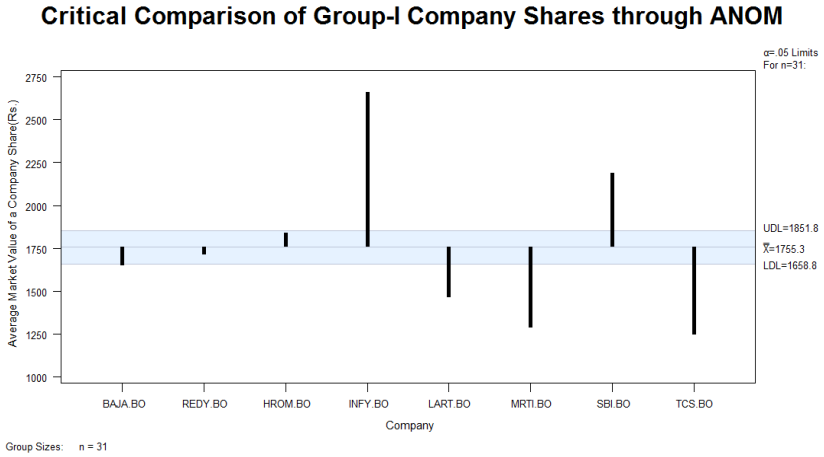
For studying purpose we have to collect market values of 25 Company Shares namely 1.Bajaj Auto Ltd, 2.Bharat Heavy Electricals Ltd, 3. Bharti Airtel Ltd, 4. Cipla Ltd, 5. Coal India Ltd, 6.Dr.Reddy's Laboratories Ltd, 7. GAIL (India) Ltd, 8. HDFC Bank Ltd, 9.Hero Moto Corp Ltd, 10.Hindustan Unilever Ltd, 11.Hindalco Industries Ltd., 12.Housing Development Finance Corporation Ltd, 13. ICICI Bank Ltd, 14.Infosys Ltd, 15. ITC Ltd, 16. Jindal Steel And Power Ltd, 17.Larsen & Toubro Ltd, 18. Mahindra and Mahindra Ltd, 19. Maruti Suzuki India Ltd, 20. NTPC Ltd, 21. Oil and Natural Gas Corporation Ltd, 22. Reliance Industries Ltd, 23. State Bank of India, 24.Tata Consultancy Services Ltd & 25.Wipro Ltd., from January-2012 to May-2013 on daily basis. Next we have to calculate monthly averages of Company Shares and apply the ANOM technique for classification purpose. Company Shares above Upper Decision line are considered high value

Shares, Shares on and between UDL and LDL are considered as medium value shares and Shares which are below LDL are considered as Low value shares.



From the above ANOM Chart for classification, 1.Bajaj Auto Ltd, 6.Dr.Reddy's Laboratories Ltd, 9.Hero Moto Corp Ltd, 14.Infosys Ltd, 17.Larsen & Toubro Ltd, 19. Maruti Suzuki India Ltd, 23. State Bank of India and 24.Tata Consultancy Services Ltd., are considered as high value shares. Company shares 8. HDFC Bank Ltd, 13. ICICI Bank Ltd, 18. Mahindra and Mahindra Ltd, and 22. Reliance Industries Ltd., are considered as medium value shares. While the remaining Company shares 2.Bharat Heavy Electricals Ltd, 3. Bharti Airtel Ltd, 4. Cipla Ltd, 5. Coal India Ltd, 7. GAIL (India) Ltd, 10.Hindustan Unilever Ltd, 11.Hindalco Industries Ltd., 12.Housing Development Finance Corporation Ltd, 15. ITC Ltd, 16. Jindal Steel and Power Ltd, 20. NTPC Ltd, 21. Oil and Natural Gas Corporation Ltd, & 25.Wipro Ltd., are considered as low value shares.
After classifying the Company shares under consideration, we can study behaviour of each Company share in each category by the same ANOM technique as follows:

Behaviour of High Value Company Shares by ANOM technique:
Now we apply ANOM technique for monthly averages of high value company shares for 31 months, we get the following ANOM chart.

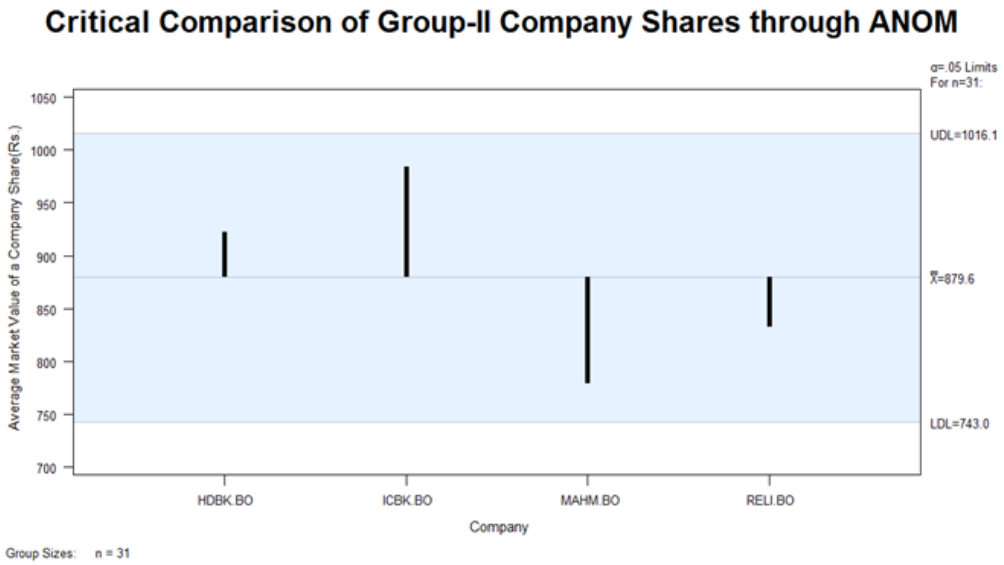


From the above ANOM chart one can conclude as follows:

The company shares Hero Motors Corporation Ltd., Infosys Ltd., and State Bank of India shows upward tendency. Among the three company shares, Infosys Ltd., is the most prosperous and shows remarkable growth, next State Bank of India then Hero Motors Corporation Ltd. Also conclude that Hero Motors Corporation Ltd., shows average upward performance. While the company shares Bajaj Auto Ltd, and Dr.Reddy's Laboratories Ltd, shows average downward tendency. The remaining company shares Hero Moto Corp Ltd, Larsen & Toubro Ltd, Maruti Suzuki India Ltd and Tata Consultancy Services Ltd., Downward tendency, among these shares TCS poor performance. From the above chart, we can also identify the company shares Bajaj Auto Ltd., Dr.Reddy's Laboratories Ltd., and Hero Motors Corporation Ltd., as consistent in high value category.

Behaviour of Medium Value Company Shares by ANOM technique:

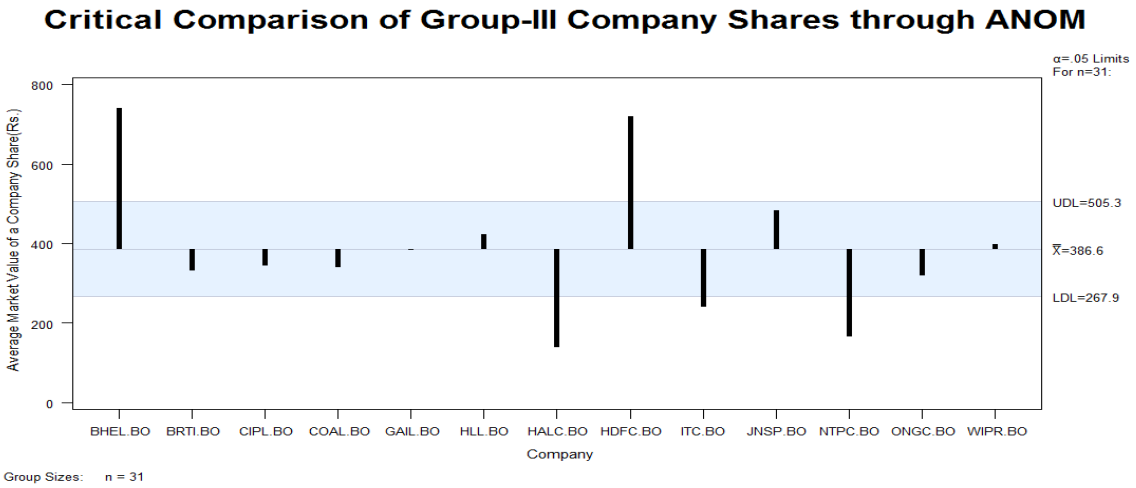
Now we apply ANOM technique for monthly averages of medium value company shares for 31 months, we get the following ANOM chart.



The above ANOM chart enables us the company shares ICICI Bank and HDFC Bank shows average upward tendency. Between these two shares ICICI Bank shows better performance. The company shares Mahindra and Mahindra Ltd, and Reliance Industries Ltd., shows average downward tendency. Between these two company shares Mahindra and Mahindra Ltd, shows least performance. From the above chart, all the four company shares HDFC Bank Ltd., ICICI Bank Ltd., Mahindra and Mahindra Ltd, and Reliance Industries Ltd., are considered as consistent in medium value category.

Behaviour of Low Value Company Shares by ANOM technique:

Now we apply ANOM technique for monthly averages of low value company shares for 31 months, we get the following ANOM chart.



From the above ANOM chart for Low value Company shares we can conclude as follows:

The company shares Bharat Heavy Electricals Ltd., and Housing Development Finance Corporation Ltd, shows upward tendency, both will show up remarkable performance. Hindustan Unilever Ltd., Jindal Steel and Power Ltd., and Wipro Ltd., shows average upward performance. GAIL (India) Ltd., shows exactly an average. The shares Bharti Airtel Ltd., Cipla Ltd., Coal India Ltd., and Oil and Natural Gas Corporation Ltd., shows average downward tendency. Hindalco Industries Ltd., ITC Ltd., and NTPC Ltd., company shares shows poor performance, among these Hindalco Industries Ltd., performs least. Here the Company shares Bharti Airtel Ltd., Cipla Ltd., Coal India Ltd., GAIL (India) Ltd., Hindustan Unilever Ltd., Jindal Steel and Power Ltd., Oil and Natural Gas Corporation Ltd, & Wipro Ltd., are considered as consistent shares in Low value category.

IV. Conclusions:

Based on ANOM chart we can classify high value, medium value and low value shares under consideration. Further in each category, critically we can study the behaviour of each company share, particularly, prosperous shares, consistent shares and poor performance shares. From ANOM chart, one can conclude about the behaviour of company shares in a single glance. By using SAS software, the job can be done very easy and it is a continuous process. Certainly the technique ANOM will be helpful for classification and studying behaviour of company shares under consideration to a common investor and ultimately investor can be benefited.

References:

[1] ENRICK, N.L. (1976). "An Analysis of Means in a Three-Way Factorial". Journal of Quality Technology 8, pp.189-196.
[2] GUIRGUIS, G.H. and TOBIAS, R.D. (2004). "On the Computation of the Distribution for the Analysis of Means". Communications in Statistics-Simulation and Computations 33, pp.861-887..
[3] MASON, R.L.; GUNST, R.F.; and HESS, J.L. (1989). "Statistical Design and Analysis of Experiments". John Wiley & Sons, New York, New York.
[4] NELSON, L.S. (1974). "Factors for the Analysis of Means". Journal of Quality Technology 6, pp. 175-181
[5] NELSON, L.S. (1983a). "Exact Critical Values for Use with the Analysis of Means". Journal of Quality Technology 15, pp.40-44.
[6] NELSON, L.S. (1983b). "Transformations for Attribute Data". Journal of Quality Technology 15, pp.55-56.
[7] OHTA, H. (1981). "A Procedure for Pooling Data by the Analysis of Means". Journal of Quality Technology 13, pp. 115-119.
[8] OTT, E.R. (1967). "Analysis of Means-A Graphical procedure". Industrial Quality Control 24, pp.101-109.
[9] OTT, E.R. and SNEE, R.D. (1973). "Identifying Useful Differences in a Multiple-Head Machine". Journal of Quality Technology 5, pp.47-57.
[10] OTT, E.R. (1975). "Process Quality Control". McGraw-Hill Kogakusha Ltd., Tokyo.
[11] PARRA, M.G. and LOAIZA, P.R. (2003). "Application of Analysis of Means (ANOM) to Nested Designs for Improving the Visualization and Understanding of Sources of Variation of Chemical and Pharmaceutical Processes". Quality Engineering 15, pp.663-670.
[12] RYAN, T.P. (1989). "Statistical Methods for Quality Improvement".John Wiley & Sons, New York, NY.
[13] SCHILLING, E.G. (1973). "A Systematic Approach to the Analysis of Means". Journal of Quality Technology 5, pp.93-108, 147-159.
[14] SCHILLING, E.G. (1979). " A Simplified Graphical Grand Lot Acceptance Sampling Procedure". Journal of Quality Technology 11, pp.116-127.

[15] SIDAK, Z. (1967). "Rectangular Confidence Regions for the Means of Multivariate Normal Distributions". Journal of the American Statistical Association 62, pp. 626-633.
[16] SNEE, R.D. (1983). "A Tribute to Ellis. R. Ott". Journal of Quality Technology 15, pp.1-2.
[17] TOMLISON, L. H. and LAVIGNA, R.J. (1983). "Silicon Crystal Termination-An Application of ANOM for Percent Defective Data". Journal of Quality Technology 15, pp.26-32.
[18] ULLMAN, N.R. (1989). "The Analysis of Means (ANOM) for Signal and Noise". Journal of Quality Technology 21, pp.111-127
[19] WADSWORTH, H. M.; STEPHENS, K.S.; and GODFREY, A.B. (1986). "Modern Methods for Quality Control and Improvement". John Wiley & Sons, New York, New York.
[20] WESCOTT,M.E. (1983). "In Memoriam-Ellis Raymond Qtt 1906-1981". Journal of Quality Technology 15, pp.5-7.
[21] WHEELER, D.J. (1987). "Understanding Industrial Experimentation". SPC Press, Knoxville, TN.