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Bombay Stock Exchange Portfolio Ranking using Combined Compromise Solution (CoCoSo) Method

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Abstract: *One of the decision problems in the financial domain is portfolio selection in investor's point of view on the other hand portfolio management is in management point of view ,in both the cases ranking of the portfolio will be required.. While facing the complex market competitions, under the extremely competitive business environment financial institutions try their best to make an ultimate policy for portfolio selection to optimize the investor returns. Multi criteria decision making (MCDM) is one of the techniques which can be applied in better way to evaluate portfolio performance and finally decide ranking of the portfolio based on the multiple conflicting criteria of the indices. A portfolio may have many criterion such as low ,high, dividend, yearly return, price earnings ratio (P/E),price-to-book ratio(P/B) etc.. In this research work a popular MCDM method: A combined compromise solution (CoCoSo) is applied to obtain the rank of portfolio for further decision making process. Data of ten portfolios of Bombay Stock Exchange (BSE) namely BSE SENSEX, BSE GREENEX,BSE CARBONEX, BSE AUTO, BANKEX, BSE ENERGY, HEALTHCARE,IT, Power, Gas and Oil financial years: 2022-23 are collected for the study and to find out best portfolio. After applying COCOSO method BSE SENSEX is found to be better than other portfolios as first rank consistently for all three financial years.*

Keywords: Portfolio Combined Compromise Solution (CoCoSo), Bombay Stock Exchange

I. INTRODUCTION

A portfolio is basically a collection of stocks held by an institution or individual which may be more reliable than individual stock. Investment in the portfolio may be less risky with less gain as compare to individual stock, but taking the decision to choose best portfolio by the decision makers as either investor or financial manager. Portfolio selection is a process of choosing which assets and in what proportion will best respect the investor's preferences for achieving an expected return with minimum risk [1].In order to face the complex market competitions under the extremely competitive business environment, financial institutions try their best to make an ultimate policy for portfolio selection to optimize the investor returns. Risk was quantified such that investors could analyze risk return choices. Moreover, quantification of risk, enabled investors to measure risk reduction generated by diversification of investment. So it is essential to diversify the investment that is essential to create an efficient portfolio. A framework for mean-variance portfolio optimization is proposed by Markowitz in 2018[1], the researchers are always investigating to enhance the framework by applying sophisticated quantitative or qualitative techniques. Portfolio selection problem may be considered as multi criteria decision making problem, where the portfolio may consists conflicting nature of criteria. COCOSO is very popular MCDM method utilized by the researchers in many domains like engineering, science etc. Consequently, the CoCoSo method was employed in this study.This study presents a given MAGDM model which determines the objective of the criteria weight through improved CRITIC and selects the most suitable public charging service sections by the CoCoSo in 2022[4]. A novel CoCoSo (Combined compromise solution) method based on Frank operational laws and softmax function is investigated to handle multiple attribute group decision-making problems for T-spherical fuzzy sets in 2022[2].

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In this paper we have used COCOSO method to obtain ranking of the portfolio. A number of functional characteristics make COCOSO a useful methodology. Three years financial data of ten different portfolios are considered for the study. These portfolios consists six different conflicting criterions as shown in Table 1. A year wise comparative rank for three financial yeare show that S&P BSE SENSEX is consistently performing better than other portfolios considered in this study.

Table 1. *Portfolio quantitative criteria*

Criteria	ID	Meaning
High	C1	This contains the highest values of portfolio in a certain year.
Low	C2	This contains the lowest values of portfolio in a certain year.
Close	C3	This contains the closing point at march 31 in a certain year.
P/E ratio	C4	A quantitative ratio of a company current share price compared to its per-share Earnings. It can be define as market price per share divided by annual earnings Per share.
P/B ratio	C5	A ratio used to compare a stock's market value to its book value which is calculated by dividing stock's current closing price by the latest quarter's book value per share.
Dividend	C6	This is a payment made by a corporation to its shareholders, usually as a distribution of profits.

II. FORMULATION OF COMBINED COMPROMISE SOLUTION (COCOSO)

The suggested approach is based on an integrated simple additive weighting and exponentially weighted product model. It can be acompendium of compromise solutions. To solve a CoCoSo decision problem, after determining the alternatives and the related criteria, the following steps are validated:

(1) The initial decision-making matrix is determined as shown below:

$$Xij=\begin{bmatrix} x11.. & x1n \\ xm1.. & xmn \end{bmatrix};I=1,2,...,m; \quad j=1,2,...,n. \qquad (1)$$

(2) The normalization of criteria values is accomplished based on compromise normalization equation [1]:

$$rij = xij-minxij / \ min\ xij - min\ xij: \text{for benefit criterion,} \qquad (2)$$

$$rij = \ min\ xij - xij / \ min\ xij - min\ xij: \text{for cost criterion,} \qquad (3)$$

(3) The total of the weighted comparability sequence and the whole of the power weight of comparability sequences for each alternative sum of the weighted comparability sequence and also an amount of the power weight of comparability sequences for each alternative as Si and Pi, respectively:

$$Si = \sum_{j=1}^{n} (w_j r_{ij}), \qquad (4)$$

this Si value is achieved based on grey relational generation approach:

$$Pi = \sum_{j=1}^{n} (r_{ij}) w_j, \qquad (5)$$

(4) Relative weights of the alternatives using the following aggregation strategies are computed. In this step, three appraisal score strategies are used to generate relative weights of other options, which are derived using Formulas (6)–(8):

$$k_{ia} = \frac{P_i + S_i}{\sum_{i=1}^{m} (P_i + S_i)}$$

$$k_{ib} = \frac{S_i}{min_i \, s_i} + \frac{P_i}{min_i \, r_i}$$

$$Kic = \frac{\lambda (S_i) +}{dx}$$

It is interpreted that Equation (6) expresses the arithmetic mean of sums of WSM and WPM scores, while Equation (7) expresses a sum of relative scores of WSM and WPM compared to the best. Equation (8) releases the balanced

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compromise of WSM and WPM models scores. In Equation (8), λ (usually λ ¼ 0.5) is chosen by decision-makers. However, the flexibility and stability of the proposed CoCoSo can rely on other values.

(5) The final ranking of the alternatives is determined based on ki, values (as more significant as better):

III. PORTFOLIO RANKING USING COCOSO

The portfolio data for the experiment is downloaded from financial site (www.bseindia.com) of BSE. BSE, established in 1875, is Asia's first & fastest stock exchange it has also facilitates the Indian's corporate sector growth by providing it an efficient capital-raising platform.BSE system also processes are designed to safeguard market integrity, drive the growth of Indian capital market and stimulate involution competition across all market all the market segment. There are many popular BSE's equity index like S&P BSE SENSEX, S&P BSE MID CAP, S&P BSE 100 etc. are available [12].

Table 2. Data of ten portfolios with six criterion

S.No	Portfolio	High	Low	Close	PE Ratios	PB Ratios	Dividend Yield
1	BSE SENSEX	63583.07	50921.22	58991.52	22.91	3.32	1.2
2	Greenex	4976.16	3920.67	4342.6	26.86	3.55	0.89
3	Carbonex	3123.36	2505.33	2870.46	21.84	3.16	1.42
4	AUTO	31002.41	23022.61	28246.92	65.57	4.27	1.05
5	BANKEX	50164.43	37242.74	46031.95	17.94	2.35	0.62
6	Energy	9058.39	7268.42	7448.86	11.37	1.71	3.49
7	Healthcare	25129.65	20847.55	21883.5	36.62	4.04	0.68
8	IT	36902.89	26742.69	28478.99	26.24	6.48	1.98
9	Power	5352.94	3235.62	3605.8	20.46	2.88	2.02
10	Gas and Oil	21198.44	16378.92	17383.4	11.41	1.45	4.04
	MIN	**3123.36**	**2505.33**	**2870.46**	**11.37**	**1.45**	**0.62**
	MAX	**63583.07**	**50921.22**	**58991.52**	**65.57**	**6.48**	**4.04**
	RANG	**60459.71**	**48415.89**	**56121.06**	**54.2**	**5.03**	**3.42**

Table 3. Normalized portfolio data applied with COCOSO with six portfolios and six attributes

S. No	Portfolio	High	Low	Close	PE Ratios	PB Ratios	Dividend Yield
1	BSE SENSEX	1	1	1	0.21291513	0.371769	0.169591
2	Greenex	0.0306452	0.029233	0.026231507	0.28579336	0.417495	0.078947
3	Carbonex	0	0	0	0.19317343	0.33996	0.233918
4	AUTO	0.46111783	0.423772	0.452173569	1	0.560636	0.125731
5	BANKEX	0.77805649	0.71748	0.76907831	0.12121771	0.178926	0
6	Energy	0.09816504	0.098379	0.081580783	0	0.05169	0.839181
7	Healthcare	0.36398273	0.378847	0.338786188	0.46586716	0.514911	0.017544
8	IT	0.55871141	0.500608	0.456308737	0.27435424	1	0.397661
9	Power	0.03687712	0.015084	0.013102746	0.16771218	0.284294	0.409357
10	Gas and Oil	0.29896075	0.28655	0.258600604	0.00073801	0	1
	MIN		**0**	**0**	**0**	**0**	**0**
	MAX		**1**	**1**	**1**	**1**	**1**
	RANG		**1**	**1**	**1**	**1**	**1**

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Table 4. Relative importance matrix (pair-wise comparison: Criteria to Criteria)

S.No	Portfolio	High	Low	Close	PE Ratios	PB Ratios	Dividend Yield	Si
1	BSE SENSEX	0.1	0.1	0.1	0.0212915	0.037176938	0.016959	0.375428
2	Greenex	0.00306452	0.002923296	0.002623151	0.0285793	0.041749503	0.007895	0.086835
3	Carbonex	0	0	0	0.0193173	0.033996024	0.023392	0.076705
4	AUTO	0.046111783	0.042377162	0.045217357	0.1	0.056063618	0.012573	0.302343
5	BANKEX	0.077805649	0.071747953	0.076907831	0.0121218	0.017892644	0	0.256476
6	Energy	0.009816504	0.009837865	0.008158078	0	0.005168986	0.083918	0.1169
7	Healthcare	0.036398273	0.037884711	0.033878619	0.0465867	0.051491054	0.001754	0.207994
8	IT	0.055871141	0.050060755	0.045630874	0.0274354	0.1	0.039766	0.318764
9	Power	0.003687712	0.001508368	0.001310275	0.0167712	0.028429423	0.040936	0.092643
10	Gas and Oil	0.029896075	0.028655035	0.02586006	7.38E-05	0	0.1	0.184485
	MIN		**0**	**0**	**0**	**0**	**0**	
	MAX		**1**	**1**	**1**	**1**	**1**	
	RANG		**1**	**1**	**1**	**1**	**1**	

Table 5. Relative importance matrix (pair-wise comparison: Criteria to Criteria)

S. No	Portfolio	High	Low	Close	PE Ratios	PB Ratios	Dividend Yield	Pi
1	BSE SENSEX	1	1	1	0.856684	0.90579	0.837414	5.599888
2	Greenex	0.70572621	0.702405	0.694836	0.882278	0.916358	0.775771	4.677374
3	Carbonex	0	0	0	0.848388	0.897724	0.864781	2.610894
4	AUTO	0.92551016	0.917726	0.923699	1	0.943774	0.812726	5.523436
5	BANKEX	0.97521666	0.967344	0.974085	0.809761	0.841913	0	4.56832
6	Energy	0.7928585	0.793031	0.778321	0	0.743602	0.98262	4.090432
7	Healthcare	0.90387438	0.9075	0.897413	0.926459	0.935779	0.66744	5.238466
8	IT	0.94344971	0.933146	0.92454	0.878681	1	0.911909	5.591726
9	Power	0.71891195	0.657432	0.648241	0.836482	0.881814	0.914556	4.657436
10	Gas and Oil	0.88626055	0.882511	0.8735	0.48619	0	1	4.128462
	MIN	**0**	**0**	**0**	**0**	**0**	**0**	
	MAX	**1**	**1**	**1**	**1**	**1**	**1**	
	RANG	**1**	**1**	**1**	**1**	**1**	**1**	

Table 6. *Obtained rank using COCOSO for the financial years 2022- 2023*

S.No	Portfolio	Weight	Rank
1	BSE SENSEX	3.6728188	1st
2	GREENEX	1.883784093	8th
3	CARBONEX	1.202478673	10th
4	AUTO	3.274417904	3rd
5	BANKEX	2.741209985	4th
6	ENERGY	1.866548988	9th
7	HEALTHCARE	2.697163542	5th

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8	IT	3.380144648	2nd
9	POWER	1.909080079	7th
10	GAS AND OIL	2.232807383	6th

IV. CONCLUSION

For smart and intelligent decision making process in investment point of view, rank of the portfolio must be determined. COCOSO is a popular MCDM method which is used to obtain rank in case of conflicting criteria. Six criterions are selected based on suggestion of financial experts for the study with ten different portfolios. The simulated data for the three consecutive financial years are used to check the performance of these portfolios year-by-year. After going through the COCOSO process it is found that BSE SENSEX is consistently performed well by holding first rank for one financial year, which helps the investors to rely on this portfolio more as compare to other portfolios selected in this study.

REFERENCES

[1] Morteza Yazdani, Pascale Zarate, Zavadskas and Zenonas, A combined compromise solution (CoCoSo) method for multi-criteriadecision-making problems, DOI 10.1108/MD-05-2017-0458.

[2] Wang, Tahir and Ullah, ImprovedCoCoSo Method Based on Frank Softmax Aggregation Operators for T-Spherical Fuzzy Multiple Attribute GroupDecision-Making, 25(3):1275–1310.

[3] Bermúdez J.D.,SeguraJ.V. and Vercher E., A multi-objective genetic algorithm for cardinality constrained fuzzy portfolio selection, 188, 16–26 (2012).

[4] Chang Gou, An Integrated CoCoSo-CRITIC-Based Decision-MakingFramework for Quality Evaluation of Innovation and Entrepreneurship Education in Vocational Colleges withIntuitionistic Fuzzy Information, Volume 2022, Article ID 6071276, 7 pages.

[5] Markowitz H.M., Portfolio selection, Journal of Finance ,7 ,77-91(1952) .

[6] Hota H.S.,Sharma L.K. and Pavani S.,Fuzzy TOPSIS Method Applied for Ranking of Teacher in Higher Education, Intelligent computers, Networking & Informatics, 243,1225-1232(2014).

[7] Sharma L.K. and Pavani S., A Group Experts Evaluation for Teachers by Integrating Fuzzy AHP Fuzzy TOPSIS methods, IEEE MOOC innovation 7 tech. In education (MITE), 85-90(2013).

[8] Hota H. S and Pavani S.Evaluate ,Teachers Ranking in Fuzzy AHP Techniques,IJSCE,2,2231-2307(2013).

[9] Bevilacqua M., D'Amore, A. and Polonara, F, A Multi-Criteria Decision Approach to Choosing The Optimal Blanching-Freezing System, Journal of Food Engineering, 63, 253-263(2004).

[10] Buyukozkan G., Cifci G. and Guleryuz S., Strategic analysis of healthcare service quality using fuzzy AHP methodology, Expert Systems with Applications 38, 9407–9424(2011).

[11] Buyukozkan G. and Cifci G., "A combined fuzzy AHP and fuzzy TOPSIS based strategic analysis of electronic service quality in healthcare industry", Expert Systems with Applications 39,2341–2354(2012).

[12] Saaty T. L., Decision Making with Dependence and Feedback: Analytic Network Process, RWS Publications, Pittsburgh(2001).

[13] Chou Y.,Sun C. and Yen H., Evaluating the criteria for human resource for science and technology (HRST) based on an integrated fuzzy AHP and fuzzy DEMATEL approach, Applied Soft Computing, 12 , 64–71(2012).

[14] Durán O., Computer-aided maintenance management systems selection based on a fuzzy AHP approach, Advances in Engineering Software 42,821–829(2011).

[15] Web source www.bseindia.com last accessed on January 2015.