Comparison of Selected Performance of Portfolio Investment Companies by Using of Grey Forecasting and Johnson's Index in Tehran Stock Exchange Market

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ABSTRACT

The purpose of resent research is to analysis and compares performance evaluation models of selected investment companies in Tehran Stock Exchange Market in the field of their portfolio management. The duration of research was between years 2009-2014. Statistical society the research is consisting of all active investment companies in in Tehran Stock Exchange Market which were 30 companies. Volume of research sample is by using of omit systematic method and also is by considering time of accepting in stock consisting of 14 companies. Data of research which are done based on compare couple and also gathered by financial ratio. Analysis process technic is used for compare couple analysis and used criteria weight determine in ash analysis. For determining company's priority based on financial ratio and weights of any of these companies; grey analysis is used. In present research all of the relations are approved by gain results. The result shows that there is no significant difference between obtained rankings by using of grey Forecasting Johnson ranking; it could be claim that there is no priority between grey forecasting and Johnson ranking. Results based on ranking of tested companies showed that criteria that used in this research were in same direction with liquidity criteria, so it is a confirmation of the fact that economic and accounting criteria could be a good and appropriate base for investors in selecting portfolio; and also that used criteria in the research is very powerful criteria for companies' performance assessment.

1. Introduction

The fast growth of economic and technology in recent years, changed the human's life and faced the modern society complex problems, main characteristic of these problems is existence of criteria or non-homogeneous and incompatible targets such as coast, reliability, operation, safety and productivity [1-18]. Multi criteria decision making is one of the approaches that could be used in problems solving in different areas of human activity, from human sciences to social sciences, economic, and management [31]. One of the basic problems of individuals, commercial units, financial institutions, banks and countries is optimal resource allocation, and one of the important sources is capital. If consider economic development as a collection of a country operation for improving the life's quality and increase the national income, it is obvious that the most important mission is investment. So capital is the main core of the economics'

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development. Although capital is necessary condition for economic development but it's not sufficient condition. And that's investment factor which by restoration whatever coast in production; could guarantee growth and economic development. One of the important problems in evaluating operation is tendency to return on a portfolio and ignore risk related to obtain intended output. So proceed is consist of determining concurrent output and investment risk [20-30].

Gaining long term growth and sustainable economic needs optimal equip and allocation of references in level of national economic, and this would not happen without helps of national markets, especially wide and efficient capital market. In a healthy economic, existence of financial efficient system in good distribution has important role. Basically, one of main goal in analysis economic is true forecast of economic variables, so it will be helpful for policy makers in order to obtain true and proportional decision in front of forecast volumes. Economic markets are system which is different from other systems, and that's because of its complex feedback and mechanism. Basically, financial markets are uncertain places which individuals are exchange and trade risk, if it would be possible to forecast future therefore there is no risk, or it will decrease. In fact, in financial markets we are looking for future for seeing what will happen. Information related to decision makers' preferences is told about criteria and based on their quality of judge, it also in practice judge of decision makers were uncertain and couldn't be explained by exact numbers of volume. Therefor because of complexity of such problems of decision making, it is necessary to use new approaches and interdisciplinary [32-45].

In other meaning, there are methods and indexes for evaluating portfolio such as phase model, grey model, Sharp index, trainer index, Johnson index and etc. Evaluating performance of mutual funds and their ranking, is important because rolling's stocks could decision about keep, buy, or sell of stocks. It's natural that potential investor looking for stocks of boxes that has better function and better markets. Judge of decision makers often were uncertain and couldn't be explained by exact number volumes. Therefor because of complexity of such problems of decision making, it is necessary to use new approaches and interdisciplinary. Grey theory and Johnson index are methods which used for studying uncertainty insufficient of information. And using of these methods in math analysis systems with incomplete information has up growth process [46-60].

Because the history's activity of investments funds in Iran is scanty, and there isn't lots of information available, therefore in this article, grey theory along with Johnson index is used for analysis data. Also comparison between two index and their properties, is important for investors and companies.

2. Theoretical and background of research

2.1. Grey Forecasting Method

Dong [14] establishes concept of grey equation which was based on systems theory. The method is search for correlation among parts of a system and reference series. The theory is use for vague problems and also for problems which have imperfect information, therefore by very limit information and high mutability in criteria creates good and favorable outputs. The theory is used in different background and in context of decision making problem multi criteria is used with title analysis of grey relationship. Analysis of grey equation is a part of grey theory which used for salving problems of complex equation between their factor and variables. The theory of grey systems is an algorithm that analysis uncertain

equation of members of system with a reference member and also has the ability for using in multi criteria decision making problems.

2.2. Johnson Index

The index is consisting of difference between output rate of interest portfolio and what is expected if portfolio stay on stock market line.

2.3. Investment Funds

Investment funds or common investment funds are financial intermediaries which sell capital to all common people and invest the gain money in different portfolio in worthy documents. Every unit which sold in investment funds is a proportional representative of worthy documents portfolio, which manage by investment funds on behalf of the shareholders.

Levels of Grey Theory Analysis are as follow:

   A- Calculate level of grey ranking:

If Xu reference series with k input (criterion) $X_1, X_2, ..., X_N$, therefore it will be:

$$X_0 = \{X_0(1), X_0(2), ..., X_0(j), ... X_0(k)\}$$

$$X_1 = \{X_1(1), X_1(2), ..., X_1(j), ... X_1(k)\}$$

$$X_i = \{X_0(1), X_0(2), ..., X_0(j), ... X_0(k)\}$$

$$X_N = \{X_0(1), X_0(2), ..., X_0(j), ... X_0(k)\}$$

Correlation of Grey equation for difference between X_i series, and reference series X_0 for input K_{th} is gained by fellow equation:

$$\gamma_{oi} = \frac{\min_i \min_k |X_o(k) - X_i(k)| + \varepsilon \max_i \max_k |X_o(k) - X_i(k)|}{|X_o(k) - X_i(k)| + \varepsilon \max_i \max_k |X_o(k) - X_i(k)|}$$

For better understanding it could be rewrite as follow:

$$\gamma_{oi} = \frac{\Delta\min + \varepsilon\Delta\max}{\Delta X_{oi} + \varepsilon\Delta\max}$$

So that ΔX_{0i} is absolute value between X_0 and X_i in $K_{th.}$ Therefore it is $\Delta\gamma_{oi} = |X_o(k) - X_i(k)|$ for $\Delta\max = \max_i \max_j \Delta X_{oi}(k)$ so the equation is right for $\Delta min = min_i min_k \Delta X_{0i}$ there is ε that is value of determination coefficient which is equal to. /5.

For calculating ranking of grey equation uses follow:

$$T_{0i} = \sum_{j=1}^{k} w_j \gamma_{0i}$$

Which w_j is weight of input of $k_{th,}$ that $W_j = \frac{1}{K}$ could be used instead.

Before calculating Grey equation's coefficient, the data should be normalized. The follow method used for this purpose:

$$x_i(j) = \frac{x_i(j) - \min_j x_i(j)}{\max_j x_i(j) - \min_j x_i(j)}$$

2.4. Johnson Index

One of index for comparison operate portfolio of average efficiency (r_p) with basis portfolio r_{bp}. The difference commonly called portfolio historic alpha or differential output that is shows as α_p.

$$\alpha_p = \bar{r}_p - \bar{r}_{bp}$$

Which in above equation, if α_p for a portfolio be positive, it means that average portfolio has more output than index output. Therefore, it could be said that its operation was desirable. Negative value of α_p means undesirable operation. Historical alpha portfolio based on stock market slips SML calculate as follow:

$$\alpha_p = \bar{r}_p - \bar{r}_f - [\bar{r}_m - \bar{r}_f]\beta_p$$

After determining the value of α_p و β_p line of historical character for portfolio could be writing as:

$$r_p - r_f = \alpha_p + \beta_p(r_m - r_f)$$

In above line portfolio output and index market output explained in terms of "risk free return". Graphically line feature, will be stay on a straight line equation which r_m-r_f in horizontal axis and r_p-r_f in vertical axis. Furthermore, intended line will be across α_p and slope βp. Jonson index could be gained as follow:

$$\alpha_p = E(R_i) - \{R_f + \beta_p[E(R_i) - R_m]\}$$

Which in it R_m is market's output, βp is systematic risk index of capital fund, $E(R)_i$ is expected output average rate of total capital's fund and R_f is non-risk output rate during period of examined.

3. Methodology of research

Resent research according goal, is practical, it is exploratory and descriptive because it explained resent condition and because value judgments are highlighted here it, places among the kind of researches, the main approach of the research is to present a model for problem solving and optimizing it has aspect of mathematical description. Because the past operation of companies is analysis and past information of

companies is used, plot of the research is quasi experimental and after events. Therefore, indexes that selected for evaluating capital are gathered based on opinions of financial experts and senior experts and university professors and stock activists. Statistical Society present research is consisting of total investment companies that are active in Tehran stock contain 30 companies. Value of research sample is the method of systematic omits and is by considering the time of acceptance in exchange contains investments companies with properties, 14 companies: Industrial development Investment Company of Iran, Sepah, insurance industry, industry and mining, Mellat, investment of Alborz company, Melli bank, Pars Toshee, petrochemical industry, development of industry, Rana, pension fund, Qadir, Melli Iran.

In the research for obtain our purpose, data and information are gathered by library and field method. The first part is the title of issue and in second part needed information by using of informational sources existed in Tehran stock gathered as follow:

1- Based on available information in Tehran stock, companies audited financial statement for years 2009 to end of 2014 analysis.
2- Other information related to companies which were case of study in Tehran Stock:

Mentioned information from weekly supplies, monthly, and annually of Tehran stock which gathered by administration research group studies. Also for gathering information such as portfolio and output of investment companies from statements of intended companies during 6 years of research is used.

4. Findings

4.1 Determining of weight of criteria by AHP Technic

Ranking of active investment companies in stock is done by Johnson index. In the study of ratio in the market (P/E and M/B), profitability (PMS and ROA), liquidity ratio (QR), and leverage ratio(TDR), is used for priority of companies of case study. For weight measurement of each of financial ratio used the HAP technic is gain.

4.2 Determining priority of financial ratio based on goal

In first step financial ratio based on goal were considered as couples. Because there are four ratios therefore six comparisons are done. Ten experts also told their approach too. Table1 shows the result:

Table 1: approach of ten experts about couple's comparison of financial ratios

Liquidity of leverage	profitability of leverage	Profitability liquidity	Market's Leverage	market's Liquidity	Market's profitability	
2/1	7	5	5/1	2/1	6/1	1 Expert
6	7	6	4/1	8/1	7/1	2 Expert
5/1	3/1	6/1	4/1	9/1	7/1	3 Expert
3	2/1	9	1	3/1	4	4 Expert
2	4	5	4	3	4/1	5 Expert
5	4	4/1	6	7	6	6 Expert
6	7	7	6	4	5/1	7 Expert
4/1	3/1	4	2	3	3	8 Expert

2	6	5	2	2	4/1	9 Expert
3	7	5	1	1	3/1	10 Expert
1/663	2/575	2/881	2/218	1/016	0/502	Geometric mean

By using of geometric mean technic the values are aggregation. These values are used for matrix of couple's comparison. Respectively, by using of line normalization technic, normalized final weight of every variable is calculated.

4.3 Calculation of final weight

According to index weight and weight of main criteria to each of finial weight any of decisions indexes were calculated. These weights are used in final analysis. See Table3.

Table 2: Final weight of decision's indexes

Final weight	weight	Financial index	weight	Financial ratios
0.039	0.157	PE	0/247	Ratio of markets
0.062	0.252	MB		
0.065	0.148	ROA	0/439	Ratio of profitability
0.087	0.199	PMS		
0.025	0.129	QR	0/195	Ratio of liquidity
0.014	0.115	TDR	0/120	Ratio of leverage

4.4 Grey relational Grade

After calculating all of the coefficients grey equation $\gamma(x_{ij}, x_{ij})$ Grey relational Grade is count as follow:

$$\Gamma(x_o, x_i) = \sum_{j}^{n} w_j \gamma(x_{oj}, x_{ij})$$

The phrase shows the value correlation of reference target and comparison series. If there is a compare series for option with highest grey relational grade grey relational grade, it means that the comparison series has the highest likeness Grey relational grade; therefor this option is best choice.

Table 3: adjusted weights of decision indices

TDR	QR	PMS	ROA	MB	PE	
0.014	0.025	0.087	0.065	0.062	0.039	AHP

Based on equation of 1 to 9 of final weight of decision indexes, active companies of stock were ranking during years 2009 till 2014. Results of ranking the investments companies during these six years was

adjustment by using of calculated weight with AHP technic. Rating weighted of each of companies based on every of indexes in any year was presented in table.

Table 4: Scale less of value financial indexes of active investments companies in stock

2011						2010						2009						
TDR	QR	PMS	ROA	MB	PE	TDR	QR	PMS	ROA	MB	PE	TDR	QR	PMS	ROA	MB	PE	
0.34	0.34	1.00	0.44	0.45	0.33	0.36	0.29	1.00	0.45	0.44	0.34	0.31	0.30	0.82	0.57	0.45	0.36	Industrial development Investment Company of Iran
0.29	0.60	0.50	1.00	1.00	0.56	0.34	1.00	0.73	1.00	0.59	0.37	0.30	1.00	0.86	1.00	1.00	0.55	Sepah
1.00	0.43	0.31	0.29	0.49	1.00	0.55	0.29	0.71	0.32	0.44	0.43	0.43	0.29	0.57	0.33	0.40	0.48	Industry of insursnce
0.41	0.67	0.68	0.50	0.44	0.35	0.35	0.46	0.59	0.47	0.34	0.31	0.29	0.34	0.53	0.40	0.44	0.38	industry and mining
0.39	0.45	0.46	0.57	0.48	0.38	0.32	0.42	0.46	0.92	0.53	0.35	0.30	0.32	0.50	0.56	0.59	0.47	Mellat
0.86	0.29	0.29	0.29	0.41	0.47	0.60	0.31	0.34	0.34	0.34	0.30	1.00	0.31	0.29	0.29	0.40	0.33	Alborz
0.46	0.43	0.56	0.58	0.65	0.47	0.29	0.39	0.58	0.46	0.46	0.36	0.29	0.34	0.49	0.42	0.42	0.39	Melli bank
0.59	0.40	0.37	0.43	0.66	0.35	0.37	0.50	0.45	0.56	0.43	0.31	0.46	0.37	0.45	0.46	0.42	0.35	Pars Toshee
0.40	0.40	0.37	0.29	0.48	0.41	0.32	0.30	0.54	0.29	0.35	0.33	0.33	0.33	0.76	0.31	0.35	1.00	petrochemical industry
0.55	0.32	0.49	0.35	0.44	0.34	0.54	0.32	0.52	0.37	0.44	0.36	0.37	0.31	0.56	0.39	0.44	0.41	development of industry
0.72	0.37	0.29	0.29	0.42	0.55	1.00	0.32	0.29	0.29	0.42	1.00	0.76	0.34	0.55	0.31	0.43	0.62	Rana
0.29	0.42	0.47	0.81	0.73	0.38	0.29	0.36	0.50	0.96	1.00	0.35	0.43	0.29	0.44	0.48	0.88	0.45	pension fund
0.42	0.37	0.56	0.40	0.45	0.34	0.34	0.32	0.67	0.42	0.39	0.32	0.35	0.33	0.66	0.43	0.52	0.34	Qadir
0.59	1.00	0.55	0.61	0.46	0.35	0.54	0.44	0.53	0.60	0.34	0.30	0.34	0.43	1.00	0.67	0.44	0.40	Mellli Iran

2014						2013						2012						
TDR	QR	PMS	ROA	MB	PE	TDR	QR	PMS	ROA	MB	PE	TDR	QR	PMS	ROA	MB	PE	
0.35	0.31	0.41	0.43	0.43	0.53	0.50	0.29	0.43	0.37	0.44	0.54	0.58	0.29	1.00	0.40	0.46	0.39	Industrial development of Iran
0.41	1.00	0.54	0.97	0.45	0.45	0.30	1.00	0.78	1.00	0.53	0.25	0.51	1.00	0.68	1.00	0.61	0.46	Sepah
0.53	0.35	0.38	0.33	0.39	0.54	0.62	0.38	0.42	0.35	0.47	0.61	1.00	0.39	0.37	0.32	0.47	0.47	Insurance industery
0.74	0.29	0.51	0.29	0.41	0.57	0.94	0.30	0.82	0.37	0.43	0.26	0.62	0.33	0.95	0.34	0.46	0.39	industry and mining
0.31	0.32	0.36	0.54	0.42	0.49	0.42	0.33	0.43	0.45	0.44	0.23	0.29	0.35	0.49	0.59	0.46	0.35	Mellat
0.41	0.31	0.31	0.33	0.3	0.3	0.47	0.3	0.44	0.41	0.4	0.2	0.88		0.29	0.29	0.4	0.4	Alborz
0.49	0.34	1.00	0.70	0.44	0.55	0.30	0.39	0.99	0.68	0.47	0.26	0.73	0.42	0.82	0.75	0.51	0.46	Melli bank
1.00	0.33	0.29	0.35	0.46	0.43	1.00	0.33	0.42	0.45	0.55	0.25	0.87	0.34	0.39	0.46	0.53	0.35	Pars toshee
0.57	0.54	0.43	0.32	0.40	0.55	0.35	0.37	0.59	0.35	0.45	0.2	0.47	0.3	0.51	0.32	0.4	0.5	petrochemical industry
0.48	0.29	0.31	0.32	0.38	0.43	0.89	0.29	0.29	0.29	0.40	1.00	0.92	0.29	0.31	0.29	0.04	1.0	Industrial development of Behshahr

0.29	0.31	0.54	0.71	0.47	0.52	0.34	0.33	0.72	0.63	0.46	0.25	0.39	0.34	0.46	0.42	0.40	0.34	Rana
0.51	0.31	0.35	0.53	1.00	1.00	0.56	0.31	0.48	0.56	1.00	0.38	0.38	0.35	0.46	0.78	1.00	0.46	pension fund
0.41	0.35	0.47	0.33	0.39	0.41	0.43	0.39	0.64	0.43	0.41	0.24	0.49	0.37	0.92	0.44	0.41	0.35	Qadir
0.45	0.39	0.92	1.00	0.42	0.40	0.29	0.71	1.00	0.98	0.46	0.22	0.54	0.49	0.62	0.62	0.42	0.34	Melli Iran

The final point of every company calculated based on result inserted above.

4.1.   Different Significant Analysis of companies ranking

Operational rank of any company in duration was analyzed based on Grey Relational Grade. Therefore, at the end of every period of companies based on their operation in analyzed indexes background were ranked. Cross Cal- valise test is used for difference significant of companies ranking in every period. At first companies ranking in every year was presented separately. See table 5.

Table 5: Grey relational Grade of active investment companies in stock

2014	2013	2012	2011	2010	2009	companies
9	12	4	2	3	3	Industrial development of Iran
3	2	1	1	1	1	Sepah
12	9	12	7	5	10	Insurance industery
6	6	5	6	10	12	Industry and mining
8	13	8	8	4	6	Mellat
14	14	14	14	14	14	Alborz
2	3	2	5	6	13	Melli bank
12	8	9	9	9	12	Pars toshee
7	11	11	12	13	4	petrochemical industry
13	10	10	11	12	9	Industrial development of Behshahr
5	5	13	13	11	8	Rana
4	4	3	3	2	5	pension fund
10	7	6	10	8	7	Qadir
1	1	7	4	7	2	Melli Iran

First Hypothesis: significant difference average operation of investment companies in selected portfolio in different years based on Gray ranking

Zero hypotheses: There is significant meaning among averages investments Company's operation.

One hypothesis: There isn't significant meaning among averages investments Company's operation. The test is done for ranking company's operation in all duration. For instance, output of SPSS for Industrial development of Iran is as follow. Significant value also is. 0.416. The value is higher than 5 error level.

Therefore, there is no reason for reject zero hypotheses it means the grade doesn't exist for Industrial development of Iran in analysis years. See Table 6.

Table 6: Grade of Industrial development of Iran in analysis years and kroskal-valis test output**.**

Grade average	year	
1	2007	Industrial development of Iran
2	2008	
5	2009	
4	2010	
3	2011	
6	2012	
5.00		Chi-square
5		df
0.416		.Asymp. Sig

For other companies the test was done, the result was shown in Table 7. As it obvious in all cases significant value is more than 0/.5, therefore there is no reason for reject zero hypotheses. In other word there is no significant difference among grade of companies in different years.

Table 7: Grade of significant difference of companies in year of analyzed and Kruskal- wallis output.

Melli bank	Alborz investment company	Mellat	Industry and mining	Insurance industry	Sepah	Industrial development of Iran	
3.00	4.00	5.00	5.00	5.00	5.00	5.00	Que-do
3	4	5	5	5	5	5	Free grade
0.392	0.406	0.416	0.416	0.416	0.307	0.416	Significant meaning
Melli Iran	Qadir	pension fund	Rana	Industrial development of Behshahr	petrochemical industry	Pars toshee	
1.00	1.00	0.00	1.00	2.00	0.00	3.00	Que-do
1	1	1	1	2	2	3	Free grade
0.317	0.317	1.000	0.317	0.368	1.000	0.392	Significant meaning

Second Hypothesis: Average of Investments Company's operation in selected portfolio is equal based on Johnson index.

Zero hypotheses: Average of Investments Company's operation in selected portfolio based on Johnson index is equal.

Alternative hypothesis: Average of Investments Company's operation in selected portfolio based on Johnson index isn't equal.

Most of the operation of any company is calculated based on grey equation. By using of Wilcoxon, significant difference of grade was calculated based on Johnson and grey technic. For test periphery assumption it is used two averages from one society of couple test. Result of the test is reported in table 8.

Table 8: Grade of companies in analyzed years and Kruskal-wallis output

Total rating	Average grade	number	
50	6.25	8	Negative grade
41	8.20	5	Positive grade
		1	Equal grade
		14	total
		0/753	Significant level

Based on significant meaning which is /0753, and it is more than 0/.5, so there is no reason for rejecting zero hypotheses. In other word it could be said that different of companies grade in analyzed years is not significant based on Jonson index and grey grade.

5. Conclusion and suggestions:

In present research all of the relations are confirmed based on results. Because the used criteria in the test are contain of economic and accounting criteria of company's operation, and also because stock's criteria for declaration of top grades is liquidity, therefore results shows that criteria which used in the research are in same direction with liquidity and both means economic and accounting criteria could be appropriate and great base for investor in selecting capital fund. And also used criteria in the research are very strong and powerful criteria for determining company's operation.

Result of the research is in same line with Pendaraky et al, Habneer, Kave and et al , Vang and Hesso , Kav and et al, Hang and Jin , Hasn, Kiakan and others, Kav liang , Saffari, Safarpour and sheikh , Mohammadi , Akbarpour and Shirazi and Asadi, Kazami and others, Mohammadi and Mollaei, Jabbari and others.

5.1. Suggestion based on research hypotheses

- By confirmation of grey method's accuracy, it is suggested to use grey method for those stock activators o Tehran which has no lots of information or has no ability for use of complex technic in forecasting selected portfolio and other fields.

- According to capital productivity to portfolio managers and active investors in Tehran Stock the excess return is suggested.

- Based on results of hypotheses, selecting optimal portfolio is depended on different factors, out of these factors; the most weight is related to economic additional value which is in hands of companies. Therefore, it is suggested that companies notice to these factors for good policy and financing field. And by controlling these factors improve their position among other companies.

5.2. Suggestion for more studies

Because of limitation of the research and also because the topic for explanation in the context of oblivion, ready for change and operation innovation, is very wide and pervasive, and also it is an interdisciplinary topic which set to it here, therefore the further suggestion for more studies is as follow:

- Use of statistic method such as factor analysis for selecting operation criteria's' evaluation.

- It is suggested that for financial analysis use other decision branches such as erosion's cover and Tosses, Vicar.

- Using of expert's opinions for better thinking makes better and reliable results.

- Using of programming methods multi purposes, for optimizing and decision makers' goal.

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