An Improved Genetic Algorithm Method for Selection and Optimizing the Share Portfolio

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Abstract
In financial subjects, portfolio can be considered as a combination or a collection of investment which is kept by a person or an organization. Portfolio selection in order to maximize the profit is one of the most fundamental concerns of investors in financial markets.
Methods that are based on linear regression in optimal selection of portfolio have not necessary efficiency and therefore, initiative algorithms have been noticed to solve this problem. Genetic algorithm is one of the ultra-initiative algorithms that can be a matter of portfolio optimization with regarding risk and efficiency.
Minimizing non-systematic risk and maximizing skewness of portfolio efficiency is one of the main goals for optimal portfolio which is compared to classic (Markowitz model)
It has been tried in this research, in order to select the optimal portfolio among 50 superior companies of share market in Tehran multi-purpose model is designed to optimize the efficiency goals, systematic risk, non-systematic risk, cash ability skewness coefficient and sharp ratio.
Comparing the result of genetic algorithm with classic Markowitz model to linear and non-linear goals second rank is better than classic Markowitz model and also, resulting portfolio, has more variety than the other models.

Key words:
Genetic algorithm structure, simulation method, optimal portfolio

1. INTRODUCTION
Suitable selection of designs in capital market such as stock exchange is the most important daily affairs. Correct selection of designs needs in one hand, suitable basis for investment and in other hand, means and techniques for suitable analysis.
Hirt, & Block (1990) one appropriate selection can has investor's confidence and increase the efficiency in the market. In the most cases, there are useful investment projects but there is no possibility to reach financial researches for
them. In one efficient capital market, from operational aspects, the capital possessed by the best investment options and next priorities allocate the other resources. So, in investment designs, in addition to estimate and select the designs individually, we should pay attention to interaction and mutual effects of designs selection with this view, that we do not think of it as an activity which is done in a vacuum and a part from other goals, but all of the important and interfering issues, considered to select one design[1]

II. LITERATURE REVIEW

CoelloCoello, C. A. (2006) in their article, firm approach in selecting optimal financial portfolio: case study of Tehran share market, the firmness price of the most efficiency for the matter of portfolio selection optimization has been evaluated. Moreover, most of managers prefer to manage small, portfolio of capital limitations that are used in this model allow to the investors that select a certain number of present properties to adopt in portfolio. This model by increasing amount of parameter T or firmness price showed that the amount of difference efficiency of all selected portfolio is decrease. Numerical results show that performed modeling can used well versus non-definiteness in selection issue of portfolio[2]

Michaud& Michaud, R. O. (2008), in his article with the title of selecting optimal portfolio by multi-purpose planning, pays attention to all determined goals without compromise over the main goal namely efficient portfolio formation. Among statistical community that includes all of the companies which are member of Tehran’s share market in 1391, 193 companies have been selected randomly, then through applying limitations and some conditions, for selecting superior share, finally statistical sample has been reduced to 29 companies. Investigation and analysis method of information including quantitative methods of research. One of the problem subjects in organizations that have an activity in investment, is to select optimal portfolio among possible and economic investment designs, of course this composition should be done in regard to limitations and goals and organization strategies and considering the significance of goals[3]

AbdelazizAouni, &Fayedh, (2007). When the number of designs are alot, the number of conversions which can be select will be alot and each converted estimation is a very hard work in regard to the criteria which should be considered in selection process. In the case of optimal portfolio selection of share, some foals that are being noticed are : to maximize efficiency, to minimize risk and to maximize liquidity, that these goals must be optimized in regard to functional and political limitation. Functional limitation is that very budget limitation, and political limitations are those that are imposed on the model on the basis of management, environmental and legal conditions. For example, maximum and minimum determination for share and emphasizing that a certain share must be selected[4]

Ruiz-Torrubiano& Suarez, (2011, July). has done a research named “Evaluation of investment optimization, reviewing models of investment in the securities portfolio”. The result of this study manifests the possibility of usage of MM, MAD and MV models in Iran market. In addition to those investors who wish to invest in lower levels of risk MM model and for investors with a medium to high risk MV model is proposed[5]

BermúdezSegura&Vercher (2012). While he has determined inverse correlation test between the number of portfolio constituent stocks and it’s risk, he has also determined portfolio diversification optimal range to minimize risk for investors in stock. In this study for the numbers of slightly stocks 100 different portfolios are made. In this study, to minimize the risk of short-term investment portfolio has been reached to number 39, and for the long-term investors has been reached to number [6]

Dastkhan, H., Gharneh,&Golmakani, (2011).of linear programming to evaluate risk and return, analyzed the strengths and weaknesses of Esperanza model. Accordingly designed a new model in the framework of linear programming to portfolio optimization, taking into account the expected rate of return and minimum risk[7]

Huang, C. F. (2012). In the study of “Based on the Markowitz model with cardinality constraints and Sector values and solve it using a genetic algorithm” evaluated optimal mix of stocks[8]

Gupta, P., Mehlawat& Chandra, S. (2014)Formedportfolio based on fundamental variables and ranking them based on the Beta and return. They showed that between rating baskets based on risk factors and return in the pattern with 9
baskets there is more correlation than the pattern with 12 baskets. And also the rate of correlation between the ranks of the baskets based on performance indicators is more than rating based on Beta index[9]

Kamali, S. (2014) indicated the effective measures on selecting stock in pharmaceutical companies. They showed that applying multi-criteria methods leads to different rankings of competitor options. So to reach consensus and also as well as more comprehensive ranking of options, integration method is proposed as the best method[10]

Vazhayil, & Balasubramanian, R. (2014) Used multivariate models to optimize portfolio based on time conditional covariance matrix. Then optimization is done by minimizing the risk of stock portfolio based on Markowitz's portfolio theory. And optimization results showed that more priority is given to industries where there are less volatility in Stock returns industries[11]

Sabar & Kendall, G. (2014, July). Optimizing stock portfolio by using cumulative particle motion method, they conclude that Markowitz optimization and determining the efficient frontier of investment, mathematical methods are simply not possible When real-world conditions and limitations be considered. Therefore, techniques such as neural networks and evolutionary algorithms have better results in portfolio optimization[12]

Tang, K, Chen & Yao (2014) Designed a Multi-objective model in order to select the optimal portfolio among the top 50 stocks in Tehran Stock Exchange, to optimize aims, return, Systematic risk, Unsystematic risk, Liquidity, Coefficient of skewedness and Sharpe Ratio. The model is non-convex, and it cannot be optimized by algorithms in operations research so the genetic algorithm is used to optimize the model. The results of study showed that although the portfolio yield of the genetic algorithm is lower than other models, however, efficiency decreases were offset by a reduction in the risk level and adjusted criteria based on risk confirms on better answer of Genetic algorithm. The resulting portfolio, has more variety than other Portfolio models[13]

Bermudez & Voucher (2012) to select the optimal portfolio has introduced a fuzzy, nonlinear, programming model. And the coefficients of the objective function are including: Expected profit rate, Risk and Liquidity and they are fuzzy parameters. This model includes three models, 1) Maximizing profits 2) Maximizing liquidity 3) Minimizing risk of portfolio. The proposed model is transformed into a fuzzy linear programming model with the change of variable. Finally, to solve the model, ranking of fuzzy numbers is used to equivalent of these numbers with the real numbers[14]

Gupta, P., Mehlawat & Mittal (2012) studied all aspects of portfolio. They analyze portfolio classical theory model that is presented by Markowitz. And then they facilitate the process of obtaining the inputs of this model using single index model[15]

Gupta, P., Inuiguchi & Mittal, G. (2013) Selecting Multi-objective portfolio in Tehran Stock Exchange with the optimal approach is an innovation. The developed model appropriates cardinality constraints, minimum number of purchase, liquidity and trading costs. The algorithm combines the Ad-Cluny optimization and simulation community, the gradual refrigeration Pareto. Validation of the optimization algorithm is done by the real data of the Tehran Stock Exchange and similarly, random data.[16]

Tupia, M., Cueva & Guanira, M. (2013) has been studied different portfolio management models in indeterminate space, using optimization techniques. In this study the quadratic model with four other linear models with their same firm is provided to minimizing the tracking error considering uncertainty in the input data. In the final step the validity of the proposed models has been evaluated. In each part the proposed model was performed using actual data and their results have been analyzed. [17]

Ponsich, A., Jaime’s, & Coello, C (2013) said that rate of return on each asset is associated with indicators of economic and the best indicator to predict stock returns, is market capitalization. He determined the degree of sensitivity of stock returns toward changes in the stock index with the concept called Beta. The results of three researchers, created a paradigm of finance named capital asset pricing model. (CAPM) Sharp presented his single index model by determining Beta sensitivity coefficient as a risk. And it can be said that the single index model is the CAPM experiment instrument. The basic concept of this model is that all securities are affected by the general market volatility.[18]
III. RESEARCH QUESTIONS

The descriptive research method is used to determine optimal portfolio shares and data census to use mathematical modeling. Accordingly, rather than design and test, the study aims to answer the following questions:

Main Question: What are the including results of appropriate model for optimal stock portfolio and its sensitivity analysis?

Other Questions:
1) How does portfolio Optimization formulate using Markowitz in the realm of research?
2) What are the including results of optimal solution of defined model in the realm of research?
3) What are the including results of sensitivity analysis of the model?

The main purpose of this research is: (( selecting one portfolio among the share of accepted companies in Tehran's share market, by using genetic algorithm so that the resulting portfolio, in addition to meet different investment criteria, considers preferences with minimum risk and maximum efficiency.

IV. RESEARCH METHODOLOGY

The type of this research according to its purpose is applied. Furthermore the research plan is Expose-Facto because it used historical performance data. The research type is descriptive because it did not use random sampling.

A) Sampling

According to this study, we used mathematical models for selection a set of stocks as an optimal investment. The statistical community was defined as 6 industries and 12 existing companies in them. The performance of these firms has been studied according to information of Tehran Stock Exchange during 2010_2013.

B) Methods of data analysis

Descriptive statistical methods: Is including Calculating average parameters, variance, and using summary tables and classification and graphics diagram (bar chart, linear chart, etc.)

Optimization methods: Integer nonlinear programming model is used to determine the contribution rate of each company in the industry with achievement of expected return with minimal risk. The software that was used to optimize was lingo.

C) The research model

in this study, the overall relationship defined as \( Y = F (X_1, X_2, X_3 \ldots, X_{12}) \) which independent variable X is defined as the percentage of shares of each company relative to the overall portfolio and the dependent variable y is the risk of the portfolio selection. And the relationship between the variables is defined as an integer programming as following

V. OPTIMUM SELECTION

With attention to the research subject and its goal to select portfolio, by using genetic algorithm, the method used in this research is a type of mathematical- prescribed method. Information needed for applying this study was collected from different kind of field methods, library methods and review of past data and interview, and then by using obtained data, it has tried to design a mathematical model to select the portfolio issue. In this research in regard to the entity of the subject being analyzed multi-purpose planning model has been applied as one of the effective techniques of research in operation and in modeling natural and non-natural systems. This modeling technique is one of definite models that have the ability to prepare the basis to reach favorite level among several purposes.

In order to do this research, data from active companies in Tehran's share market for 72 months ended to 1386. Esfand, was designed with efficiency goals systematic risk, non-systematic risk, cash ability, sharp ratio, and skewness coefficient to select portfolio among 50 superior companies of Tehran's share market and then the model was solved by genetic algorithm.
Sinha, P & Sinha, T. (2013) For this purpose multi-criteria decision-making methods have been used such as Tapsis and by using of one developed model from risk efficiency model, tries to form one variable social-ethical portfolio.[19]

1. Investors are seeking efficiency with balanced risk. They are risk phobia and have expected additive desirability.
2. Portfolio investors select themselves based on minimizing the amount of fitness function.
3. Every investment option is dividable to infinity.
4. There is not transactional cost and tax limitation.
5. There is not market limitation and borrowing selling.

Cao & Shan D. (2013). In regard to being multi-purpose of the issue, model parts (decision variables, goal functions and limitations) has been describe below in order to design a multi-purpose model.[20]

1-5) Decision variables:

From system point of view, main part of mathematical model outputs, its decision variables. In this research, decision variables of the mathematical model based on defined specifications is \( x_1 \) that shows the amount of investment in first share.

2.5) Constant values of mathematical model (model parameters)

In each mathematical model planning, specified values are needed, that have a direct effect on final result of its solution as an input into model. Technical (coefficients of limitations and applied variable coefficients in functions of end, are from input parts into mathematical model constant values which should be determined by evidence.

Where formulates variables in above relation is as follow:

\[
\begin{align*}
Z_1 &= \text{portfolio return function} \\
Z_2 &= \text{systematic risk} \\
Z_3 &= \text{non-systematic risk} \\
Z_4 &= \text{skewness coefficient} \\
Z_5 &= \text{liquidity risk} \\
Z_6 &= \text{Sharp criteria} \\
P_k &= \text{fitness rate for K th goal (minimizing)} \\
R_i &= \text{1 th stock return average} \\
\sigma_i^2, \sigma_{ij} &= \text{1 th stock variance and covarion between I th and j th} \\
\beta_i &= \text{systematic risk of I th stock} \\
E_i &= \text{liquidity risk of I th stock} \\
S_i &= \text{Sharp index for I th stock} \\
S_{ii} &= \text{return skewness coefficient for I th} \\
H_k &= \text{non-scaling index for K th} \\
N_k &= \text{fitness amount for K th goal (maximization)}
\end{align*}
\]

VI. SYSTEM LIMITATIONS

1-6) Budget limitation: This limitation means that purchase share must exactly equal to total present sources. This limitation I shown in the model as following:

\[
\sum_{i=1}^{n} x_i = 1
\]

2-6) Maximum investments in share limitation: By determining one high limit for decision variable, we can increase share variety of portfolio and obtain one portfolio of higher variety. In determining of high limit for decision variable, investor's idea is determinative and it is determined in regard to the number of shares that investor tends to invest in it.
3-6) borrowing sale limitation: In developed investment markets, investor can present sharp sale suggestion that he is not its owner. This is called borrowing sale. When borrowing sale has been forbidden, it is shown as following limitation.

\[ X_i \geq 0 \quad i=1,2,\ldots,n \]

This limitation considers minimum weight of each share in portfolio equal to zero and refuse negative numbers, when borrowing sale is allowed, this limitation is removed.

VII. DESIGNED MODEL PURPOSES

1-7) Maximum Portfolio efficiency

In regard to this fact that investment is made to obtain efficiency, and investor tends to invest his budget in a manner to get highest efficiency, correspondent purpose to Portfolio efficiency is defined as:

\[ \text{Max } Z_1 = \sum_{i=1}^{n} x_i r_i \]

Investment efficiency in share is one period includes each type of received cash in addition to price changes during the period divided by document price or property in purchase time that used for calculating efficiency price from following relation.

\[ R_t = \frac{D_t + (P_t - P_{t-1})}{P_{t-1}} \]

2-7) Minimum non-systematic risk

Since we defined risk as efficiency variability, therefore more limited efficiency distribution, investment risk will be less. In practice, we use (efficiency rate standard deviation) that shows possibility distribution features, to use risk measurement.

In regard to this fact that, variance shows data distribution around mean. Therefore minimizing variance a purpose to reduce the variability of Portfolio efficiency.

\[ \text{Min } Z_2 = \sum_{i=1}^{n} x_i^2 \delta_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j \delta_{ij} \]

3-7) Minimum systematic Portfolio risk

Sensitivity coefficient \( \beta \), is the criterion for measuring systematic risk of securities. This coefficient measures a part of general risk that doesn’t reduced by variety.

\( \beta \) (Beta) is a relative criterion of a share risk in regard to market Portfolio of all shares, that we can use following relation to measure it.

\[ \beta_i = \frac{\text{Cov}(r_i, r_m)}{\text{Var}(r_m)} \]

The purpose is to minimize systematic risk that can be defined as following.

\[ \text{Min } Z_3 = \sum_{i=1}^{n} x_i \beta_i \]
4-7) maximizing the share efficiency success

In regard to this fact that, investor follows to obtain positive efficiency and tends to select a share that its efficiency distribution is toward to positive, also analyzable companies have positive efficiency skewness, so following purpose is defined to choose a Portfolio with positive efficiency.

$$\text{Max } Z_4 = \sum_{i=1}^{n} S_{iii}^3 X_i^3 + 3 \sum_{i=1}^{n} \left( \sum_{j=i}^{n} X_i^2 X_j S_{ijj} + \sum_{j=1}^{i} X_i X_j^2 S_{jjj} \right) \quad i \neq j$$

5-7) maximizing the Portfolio cashability

The amount of share cash ability shows share change ability to other kinds of investment such as money. Since, investors tend to sell their own share easily of one company, we use the ratio of the days that share has been transacted to the days when the market has been worked. Therefore the purpose of minimizing Portfolio cash ability is defined as below:

$$\text{Max } Z_5 = \sum_{i=1}^{n} x_i e_i$$

6-7) the aim of maximum sharp ratio of Portfolio

Sharp, introduced additional efficiency criterion to risk as criterion to perform Portfolio. Additional efficiency us efficiency difference without risk and share efficiency and investors tend to invest in a way that this ratio maximum produced and obtain a higher efficiency in exchange for a risk that they suffer.

$$\text{Max } Z_6 = \sum_{t=1}^{n} x_t S_t$$

VIII. MODELING

Optimal solution was achieved after first designing, via computation in Excel setting and coding in software Mat lab 2013. In first stage, we computed accounted data for 50 best companies in Tehran Stock Exchange, which is shown in table 1. First column is considered companies and second column is decision variable ($X_i$) defined for every company. The third column is predicted monthly for company, which was attained via return mean of 36 months end to Esfand 92. To compute non-systematic risk in fourth column, we applied return variance in considered period. Fifth column is for systematic risk (Beta sensitivity ratio) and sixth column is for share return skewness coefficient in considered intervals (whereas the target is maximizing portfolio skewness, so in this research, we applied 50 better companies in Tehran Stock Exchange that had a positive skewness ratio). Seventh column is for liquidity risk and the last column is for Sharp ratio, which shows Excess Stock Return to non-systematic risk. To compute Sharp ratio without-risk, we preserved 17/5percent (average commercial paper return rate).
Table 1: accounted data of 50 best companies in Tehran Stock Exchange for 36 months end to Esfand 1392

<table>
<thead>
<tr>
<th>Company name</th>
<th>Decision variable</th>
<th>Maximum return</th>
<th>Non-systematic risk</th>
<th>Systematic risk</th>
<th>Return skewness ratio</th>
<th>Liquidity risk</th>
<th>Sharp ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasargad X</td>
<td>$X_1$</td>
<td>2.960694</td>
<td>0.658197</td>
<td>0.87602</td>
<td>0.841743</td>
<td>1.084765</td>
<td>0.729087</td>
</tr>
<tr>
<td>Abyssal</td>
<td>$X_2$</td>
<td>8.88889</td>
<td>3.098836</td>
<td>1.188526</td>
<td>0.867034</td>
<td>0.415375</td>
<td>0.692199</td>
</tr>
<tr>
<td>Trans for X</td>
<td>$X_{49}$</td>
<td>3.983551</td>
<td>1.387301</td>
<td>0.067634</td>
<td>0.312772</td>
<td>0.086072</td>
<td>0.67244</td>
</tr>
<tr>
<td>Naftbehran</td>
<td>$X_{50}$</td>
<td>10.27509</td>
<td>2.761972</td>
<td>0.317904</td>
<td>1.589176</td>
<td>0.495449</td>
<td>0.70354</td>
</tr>
</tbody>
</table>

IX. SENSITIVE ANALYZE

Genetics algorithm searches answers regardless to particle style of problem due to their evolution nature. Then one of the most important tests that we should do is to consider algorithm fix amount and sensitivity analyze in 95 percent and 99 percent level. To accreditation and genetics algorithm fix amount, we must obtain nearly similar answer in every algorithm performance. Whether this answer is unique or not, is an important point. For this reason, designed genetics algorithm was performed several times foe portfolio optimization model with non-linearity targets, that results from algorithm repetition is shown in table 2.

Table 2: considering fix results from genetics algorithm in ten-times algorithm performance

<table>
<thead>
<tr>
<th>Monthly portfolio return average</th>
<th>Fitness function amount</th>
<th>Algorithm performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.247</td>
<td>.01132</td>
<td>1</td>
</tr>
<tr>
<td>2.158</td>
<td>.01171</td>
<td>2</td>
</tr>
<tr>
<td>2.221</td>
<td>.01123</td>
<td>3</td>
</tr>
<tr>
<td>2.101</td>
<td>.01292</td>
<td>4</td>
</tr>
<tr>
<td>2.241</td>
<td>.01197</td>
<td>5</td>
</tr>
<tr>
<td>2.249</td>
<td>.01137</td>
<td>6</td>
</tr>
<tr>
<td>2.216</td>
<td>.01138</td>
<td>7</td>
</tr>
<tr>
<td>2.188</td>
<td>.01144</td>
<td>8</td>
</tr>
<tr>
<td>2.115</td>
<td>.01159</td>
<td>9</td>
</tr>
<tr>
<td>2.245</td>
<td>.01139</td>
<td>10</td>
</tr>
</tbody>
</table>

The results show minimal difference among answers obtained from different repetition. Variance 0.0031 for portfolio monthly return average obtained from 10 designed genetics algorithm repetition that shows high stability of genetics algorithm in different performance, which is shown in diagram 1.
Diagram 1: considering results stability obtained from genetics algorithm in 10 times algorithm performance.

Whatever is considered about sensitive analyzing in this paper is that parameter (numerical) to consider research model and its results. In sensitive analyzing, the reliable level was changes from 95 percent to 99 percent and again we obtained optimal portfolio. Diagram 2 shows selected chromosomes in two reliable levels after passing 250 generation. Fitness function amount in two reliable levels is 0.01132.

Diagram 2: selected chromosome in two reliable levels

Reliability level 99 percent
Reliability level 95 percent

X. CONCLUSION AND SUGGESTIONS

In this section, to conclude and perform selected portfolio with genetics algorithm, we compare selected portfolios return with genetics algorithm and Markowitz model together. As shown in diagram 3, portfolio return in 36 months end to Esfand 1392 was used to compare optimal portfolios.
After performing simulation technique via genetics algorithm Selection Tournament, we select share optimal portfolio that share (percent) of every companies from investment amount, as shown in table 3.

Table 3: optimal investment percent in portfolio (36 shares in portfolio)

<table>
<thead>
<tr>
<th>Xi</th>
<th>Company arm</th>
<th>Xi</th>
<th>Company arm</th>
<th>Xi</th>
<th>Company arm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.07</td>
<td>V based r</td>
<td>2.52</td>
<td>Be trans</td>
<td>3.8</td>
<td>Labs</td>
</tr>
<tr>
<td>6.53</td>
<td>Sharks</td>
<td>2.84</td>
<td>Shades</td>
<td>3.48</td>
<td>Shanna</td>
</tr>
<tr>
<td>2.7</td>
<td>Affair</td>
<td>3.46</td>
<td>Madden</td>
<td>2.39</td>
<td>Bashar</td>
</tr>
<tr>
<td>1.22</td>
<td>Vaasa</td>
<td>3.28</td>
<td>Khwarizmi</td>
<td>4.7</td>
<td>Vatic</td>
</tr>
<tr>
<td>1.69</td>
<td>Safaris</td>
<td>1.55</td>
<td>V a chador</td>
<td>1.88</td>
<td>Vasa do</td>
</tr>
<tr>
<td>93</td>
<td>Fikias</td>
<td>5.19</td>
<td>Sherman</td>
<td>4.87</td>
<td>Dashiki</td>
</tr>
<tr>
<td>1.98</td>
<td>Amid</td>
<td>3.6</td>
<td>Rampant</td>
<td>2.66</td>
<td>Kalgan</td>
</tr>
<tr>
<td>2.46</td>
<td>Kigali</td>
<td>1.53</td>
<td>AK Haber</td>
<td>3.85</td>
<td>Parson</td>
</tr>
<tr>
<td>2.52</td>
<td>V a sine</td>
<td>3.19</td>
<td>abhorrent</td>
<td>2.02</td>
<td>Female</td>
</tr>
</tbody>
</table>

Because, here, we use simulation or mathematical modeling, so, sampling is non-random and base on inference – descriptive method. So, the research plan target is not making hypothesis and test, but also is answer the research questions.
First question: what are the factors affected on share combination optimal choice?
In response to first question, we mention to obtained results from accounting targets, which is presents as a fitness function equation in third chapter.
The results from applying 6 factors in fitness function are shown in fitness function via two choice structures (R &T) in MATLAB software as following:

Table 4: the results of accounted 6 factors

<table>
<thead>
<tr>
<th>population</th>
<th>Generation number</th>
<th>combination</th>
<th>Mutation rate</th>
<th>Z6</th>
<th>Z5</th>
<th>Z4</th>
<th>Z3</th>
<th>Z2</th>
<th>Z1</th>
<th>operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>250</td>
<td>0.8</td>
<td>0.1</td>
<td>0.78</td>
<td>0.70</td>
<td>4.72</td>
<td>9.61</td>
<td>7.32</td>
<td>3.11</td>
<td>T</td>
</tr>
<tr>
<td>150</td>
<td>250</td>
<td>0.75</td>
<td>0.15</td>
<td>0.78</td>
<td>0.69</td>
<td>4.05</td>
<td>10.30</td>
<td>9.11</td>
<td>3.64</td>
<td>R</td>
</tr>
</tbody>
</table>

Second question: what are the results followed by formulating genetics algorithm in investment optimal combination selection in research domain?
With regard to risk and return amount obtained in simulation via two choice operators Tournament and Roulette, we identify in genetics algorithm that although return regard to Roulette operator has 0.61 higher than Tournament operator, but non – systematic risk and systematic risk from selected portfolio in Roulette operator are 1.79, and 0.69
higher than non–systematic risk and systematic risk from selected portfolio in Tournament operator, that shows better performance of Tournament operator.

With regard to this matter that significant section if risk and return of share is due to non-systematic factors (with emphasis on Iran Exchange condition), which considering effects of these variable and factors are very important in determining share price, so we suggest the benefits in, as an example, inflation rate, currency, world gold price, petroleum in genetics algorithm model with regard to their effects on share price trend.

REFERENCES


