Applying Genetics Algorithm to Select and Optimize Portfolio in Tehran Stock Exchange

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Abstract

Portfolio optimal choice is one of the main investors concerns in financial markets in order to maximize profit. In this regard, genetics algorithm is one of the original algorithm that can perform portfolio optimization problem with maximizing return and minimizing risk successfully.

The goal of this study is to present suitable guideline to manage portfolio and optimal combination in Tehran Stock Exchange via simulation technique of genetics algorithm model. The research is application with regard to its nature and aim, and it’s response to question in terms of research goal. So, the present study compute the risk and return rate of 50 best companies in Tehran Stock Exchange and member of different industries as a research statistics society during 1390 to 1392 via genetics algorithm simulation technique in 95 percent confidence level and with changing in algorithm choice structure. The applied variable via this paper is return rate from stock price change monthly. Finally, we show higher efficiency and accuracy of genetics algorithm model simulation method with applying Markowitz model and compare the results to portfolio.

Key words:
Genetics algorithm, genetics algorithm structure, simulation method, optimal portfolio
I. INTRODUCTION

Estrada (2008) argues that one of the most troubling problems in organizations that act in investing field is selecting optimal portfolio among economic and feasible investing plans. Of course, this combination must perform with regard to limitations and goals and strategies in organization and pay attention to goal importance degree. When the plans number is high, the number conversion that can select is very high and it is very difficult to evaluate every alternative[1]

Etemadi (2009) said that, until now many patterns was developed to solve optimal properties set problem that everyone was designed with regard to situations and limitations. Initial model in the terms was raise via quadratic planning. But this model faces to many problems when there were many variables. So, next experts tried to convert problem linearly via methods such as creating single index, absolute deviation from mean, and data cover analyze. Although these patterns, theoretically, can solve via mathematical planning methods, but practically, there are many problems in this era. This sentence about risk criteria nature prevents from creating public solution and we can’t use public method to solve non – linear problems due to target function non-convex shape. Additionally, the usual size of properties set choice problems in real world include hundreds kinds of properties that return and risks in these problems achieved via time series [2].

Therefore, it is not possible to solve it with a common software packages in solving mathematically planning problems with regard to problem big dimension. Also investment managers impose some limitations on their optimal property set, that this matter, in its turn, cause to more complicate problem. Other researchers applied mathematical planning methods to solve problem due to these problems in solving non-linearity planning pattern of property set problem.

II. LITERATURE REVIEW

Stock combination or portfolio is a suitable combination of stock or other properties, which is purchased by investor. The goal to form portfolio is to divide investment risk among several shares; so stock dividend can compensate another stock loss.

John Holland (1960) launched Markowitz stock portfolio modern theory (1959) in genetics algorithm model, which its primary stage was started from primary set of random solutions that it was reached to optimal answer via genetics algorithm path.

De Jong,K.A. (1975) : investment theory express itself under unreliability base on mean and income risk , and after that many economic problems were considered by research technique in operation and optimization methods to find optimal answer for economic –finance problem [3].

Ruddier,F (2007) in his master thesis as “optimization portfolio and genetics algorithm aimed to reach methods with power to optimize portfolio. To do this, he present multi – aim target function .we mention in this paper that we use semi – variance to compute risk that is either simple or simple to apply. This thesis tests two different views to portfolio choice improvement: 1- applying risk and return method, 2- applying re-sampling to decrease disorder effect on optimal process [4].

Fabozzi&Focardi(2007)argue that portfolio optimizing concepts and variations was used a tools to develop and perceive financial markets and financial decision. In this regard, spreading portfolio choice theory from “Harry Markowitz” was the most important success [5].

Fernandez& Gómez, S. (2007) in other research showed that there is not any efficient and effective algorithm in mathematically planning to solve optimization problems of portfolio accurately. So, in this paper, we consider identification possibility and portfolio constitution by genetics algorithm initiative techniques [6].

Lin &Gen (2007)in a research applied a two – stages algorithm to solve optimization problem of multi-purpose portfolio. They found to maximize return and minimize investment risk via Markowitz model as a base mathematical model. They followed to weight stock to investigate relative importance of several goals in portfolio [7].

Yan & Mio (2007)did a research about stock choice in America Stock Exchange among 1000 best companies and it was identified that productivity factor with ROIC index , is a positive estimator of stock to choose portfolio between two important problems .Selecting effective models are efficient, methods to reach optimal answer [8].

Lin & Liu (2008) modeling Markowitz model with a minimum purchase amount in three methods. The genetics algorithm that was proposed to solve portfolio choice problem, formulated via models .the final results showed that
Huang (2008) applied the genetics algorithm beside portfolio optimization dynamic system to develop efficiency of portfolio I a research as “improvement portfolio efficiency: methods from the genetics algorithm”. The researcher applied third approach called “Bayesian approach” beside M-V-G-A models, that is one the most common models that consider estimated risk in portfolio choice [10].

JafariSamimii&Khatibi (2009) in their research called “combined The genetics algorithm and model simulation to optimize portfolio with regard to high and low limit of percent in every share and fixed size of stock number “, solved Markowitz model as a multi-purpose model and with regard to “stock number fixed size “and“high and low limit of stock percent” limitations [11].

Aranha&Iba(2009)did a research called “tree the genetics algorithm and its application in stock optimization of the genetics algorithm to select and optimize portfolio “. In this research, they introduce a genetics algorithm and then it applied for portfolio optimization problem. In this research, smaller portfolios were achieved in determined level of performance. Generally, this method optimizes old solution method under different risk and return level [12].

Hao&Liu (2009) applied the genetics algorithm as a tool to solve their models in a research called “variance0 mean model to select portfolio with a random phase return of the genetics algorithm”. In this research, new samples of mean - variance models to select portfolio with a phase random investment return was presented base on Markowitz model in variance mean model [13].

Chang, J., Yang& Chang (2009) believed that using mathematically planning to solve portfolio problem, is a best choice. They developed a super-initiative method to solve portfolio optimization problems that genetics algorithm of different portfolio was used in a different method in it. Their main goal was investigation genetics algorithm efficiency to solve portfolio optimization problems with different models [14].

Moghadasi (2009) followed their method in different risk level in a research called “selecting and optimizing portfolio via genetics algorithm base on definition differ from risk”. In this research, they showed that there is not any meaningful different in applying these two models (mean –variance and semi – variance) [15].

Heidari (2010) in a research called” optimization investment portfolio base n multi-variables GARCH model “, estimate at first variable 0 time conditional co-variance base on variance dissimilar multi-variables models Diagonl – Bekk CCC(Diagonal – Vech) [16].

SefyanehVabnebozianeh (2012) applied genetics algorithm on simple sample including 5 shares in a research called “selecting portfolio via genetics algorithm”. They mention that the achieved results is interesting and confirm genetics algorithm efficiency to fast convergence forward better solution and also it is interesting about computational time [17].

MalekShahi (2010) in a research called “optimal choice of new portfolio approach in Tehran Stock Exchange to form portfolio “, used from Markowitz variance mean model and local search algorithm such as genetics algorithm and automata cellarto determine stock weight separately [18].

Seifi (2011) in a research called “solving portfolio optimization via community birds algorithm “did a study on community birds algorithm in Tehran Stock Exchange as one of the heuristic method to solve problem [19].

Nikzad&Zaranejad(2012) in a research called” Stock portfolio optimization via genetics algorithm “appliedTachochi experiments tests to reduce time and repetition number in portfolio optimization problem. This algorithm applied with regard to risk criteria and considering integer limitation for stock number available in portfolio [20].

Najkar(2012) in his PHD thesis as “portfolio optimization via random phase intervals to select portfolio “, consider problems such as future probably returns and uncertain expected returns that always is one of the main challenge that investors face to it[21].

HanafiZade (2012) in his article as “super – initiative approach for stock choice with multiple targets in Tehran Stock Exchange “at first determine all of answer space in portfolio and then it is feasible for decision to search this answer space interactively [22].

VafaeiJahan&Akbarzadeh (2012) in a research called a new method to solve portfolio optimal choice problem via genetics algorithm and SA”. A new method, which combines genetics algorithm and SA, was suggested to solve portfolio optimal choice problem fast and accurately [23].
Karimi (2013) in his research as “application mimetic algorithm to solve portfolio optimal choice problem with exchange minimizing limitation “tried to develop a portfolio optimal choice model base on variance risk size and consider size exchange correct limitations and maximize portfolio number via memory super –initiative algorithm [24].

Samadhi (2013) in his research called “portfolio optimization with semi-variance – mean model “investigated portfolio optimization base on stock return prediction. Here, he applied artificial neural models to predict stock return [25].

AboAlghasempoor (2013)in an article called “implementation a portfolio mover system via applied artificial neural networks “ consider portfolio choice among accepted companies stock in Tehran Stock Exchange and offering it to user , that this trend did via dynasts and neural network optimization model , as if the achieve portfolio decrease investment risk return beside the attention to history [26].

Chang, J. F., Yang & Tsai (2014) in their article around portfolio optimization via Bat algorithm, can improve stock series via share return and risk variables by Bat algorithm simulation to optimal situation [27].

Tuba &Bacanin (2014)in an article called” artificial colonization honeybee (hybrid algorithm) with a firefly algorithm “consider limit cardinality via risk and return variables in portfolio optimization [28].

Liu &Zhang (2014) in optimizing phase network with high squares and low interactions optimized its least. The mentioned model researcher was neural networks and portfolio optimization [29].

III. RESEARCH QUESTIONS

We use descriptive research method to develop mathematically modeling in order to determine optimal portfolio and applying census method to collect data. Instead of design and test in this research, the main goal was to answer following questions:

Main question: what is stock optimal combination if we use genetics algorithm model?

Subsidiary questions:

1- What are effect factors on stock combination optimal choice?
2- What is the resulted following by using genetics algorithm?
3- What are the results following analyzing model sensitivity in research domain?

IV. GENERAL METHOD RESEARCH

4- The present research method is applicable from target, and is post-event from research plan and using historical data. The inference method is descriptive.

5- This research was done as following in regard to statistical society, sample, sampling method, data analyzing method and research model:

A) Statistical society, sample size and sampling

With regard to this fact that in this paper, the researcher apply optimal model to select stock series, so the statistical society was time domain in 1390 to 1392 in Tehran Stock Exchange, and 50 companies were studied in order to verify portfolio.

B) Data analyzing method

In this research, we applied statistical and non-statistical methods (depend on case) to describe and analyze data:

1- Statistical descriptive methods: including accounting parameters such as mean, variance, and using summarization table and classification and graphical diagrams (bargraph, linear graph and etc.).
2- Optimization method: We used genetics algorithm in software setting MATLAB 2013 to optimize portfolio and reach to least risk and more expected return.

C) Research model: In this research, general relation is as \( Y = f(X_1, X_2, X_3 \ldots \ldots X_{50}) \), where \( (X_j) \) is a independence variable as a determined percent from stock of every company to general portfolio and \( Y \) is dependent variable referred to model output to reach an optimal portfolio. The relation between variables and also identified goals for target function that is equal to fitness function. they are: \( Z_1 \) for maximizing portfolio, \( Z_2 \) for least non-systematic risk, \( Z_3 \) for least systematic risk, \( Z_4 \) for maximizing portfolio skewness coefficient, \( Z_5 \) for maximizing liquidity risk, \( Z_6 \) for maximizing Sharp criteria, that finally are a follow:

Target function and fitness function

\[
F(x) = \left[ \frac{n_1 - z_1}{h_1} + \frac{z_2 - p_2}{h_2} + \frac{z_3 - p_3}{h_3} + \frac{n_4 - z_4}{h_4} + \frac{n_5 - z_5}{h_5} + \frac{n_6 - z_6}{h_6} \right]
\]

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

\[
x_i \leq U \quad i = 1, 2, 3, \ldots, n
\]

\[
x_i \geq 0 \quad i = 1, 2, 3, \ldots, n
\]

\[
r_t = \frac{D_1 + (P_t - P_{t-1})}{P_{t-1}}
\]

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

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

\[
\text{min} Z_2 = \sum_{i=1}^{n} x_i^2 \delta_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j \delta_{ij} \delta = \sqrt{\frac{\sum (r_i - \bar{r})}{n}}
\]

\[
\text{min} Z_3 = \sum_{i=1}^{n} x_i \beta_i
\]

\[
\text{max} Z_4 = \sum_{i=1}^{n} 3(x_i s_{ii})
\]

\[
s_{ii} = \frac{n}{(n-1)(n-2)} \sum_{i=1}^{n} \frac{(x_i - \bar{x})^3}{\delta}
\]

\[
\text{max} Z_5 = \sum_{i=1}^{n} x_i e_i
\]

\[
\text{max} Z_6 = \sum_{i=1}^{n} x_i s_i
\]
\[ h_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{n} a_{ij}^2}} \]

Where formulates variables in above relation is as follow:

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

V. RESEARCH FINDINGS

In this, target function model is based on mentioned goals in research model with following limitation.

5-1: Systemic limitations
This limitation referred to purchase share must accurately equal to general available resources:

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

5-2: Limitation maximize investment in stock
To determine a high limit for decision variable, we can increase portfolio constitutive share. Determining high limit for decision variable depend to investor opinion. And it determines with regard to minimum number shares that investor invest it.

\[ x_i \leq U \quad i = 1,2,3,...,n \]

5-3: Borrowing selling limitation
Banned borrowing selling is shown as following limitation in model. This limitation considers least weight per share in portfolio equal to zero, and reject negative numbers:

\[ x_i \geq 0 \quad i = 1,2,3,...,n \]

A) Modeling
Optimal solution was achieved after first designing, via computation in Excel setting and coding in software Matlab2013. 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 Esfand92. 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 17/5 percent (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>Pasargadae</td>
<td>X₁</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>X₂</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</td>
<td>X₄₉</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>X₅₀</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>

B) Optimal solution

In this paper, we used binary genetics algorithm. In other word, genetics algorithm does not place directly on self-variables, but also it applied coding on basis2. Also, generation production was done randomly. Primary population size in this research is 100. Stop condition in applied algorithm is fixed target function or maximizing generation number, which in this method are 200. Elite chromosomes number that will enter next generation, 3.5 percent of population. We used rating scale in order to scaling fitness function amount. Also, we applied selection Roulette Wheel and Selection Tournament to determine how the chromosomes select. Intersection rate that shows population percent effect on intersection operator is considered in best portfolio choice condition equal to 0.8. Best amount for fitness ratio for every selection is .011 and 0.047 respectively, which finally it was used for portfolio optimization due to low least target in selection Tournament. Mutations in chromosomes perform via Arithmetic Function method, which created changes length in gene depend on problem limitations. Mutation ratio that shows population percent affected mutation operator is equal to 0.1.

1) Choosing optimal portfolio with genetics operator Tournament

In this stage, the mentioned method is implemented via MATLAB software. Simulation for building optimal portfolio was done too. Figure 1 shows fitness function rate, figure 2 shows best and worst and average fitness function amount and figure 3 shows selected chromosomes (optimal portfolio) via genetics algorithm in 25 generations.

Figure 1: changes amount of fitness function in 250 generations
Figure 2: best and worst and average fitness function amount

Figure 3: selected chromosomes (optimal portfolio) via genetics algorithm

2) Choice operator change to Roulette Wheel
Due to choice is one of the most important factors in operator genetics algorithm operation, so, to confirm choice operator in proposed method, we applied other operator called Roulette to optimize share portfolio. The results from this simulation with portfolio was selected and was shown in related figures in the rest. Figure 4 shows fitness function changes amount, figure 5 shows best and worst and average fitness function amount, figure 6 shows selected chromosomes (optimal portfolio) via genetics algorithm in 250 generation.

Figure 4: fitness function changes amount in 250 generations with Roulette operator.
C) 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.

![Monthly Return Average](image)

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

![Selected Chromosome](image)

Reliability level 99 percent  
Reliability level 95 percent

VI. 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.
Diagram 3: Comparison return of two proposed two genetics algorithm and Markowitz model

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>
<th>Xi</th>
<th>Company arm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.07</td>
<td>Vbseder</td>
<td>2.52</td>
<td>Be trans</td>
<td>3.8</td>
<td>Labs</td>
<td>1.01</td>
<td>Vassar</td>
</tr>
<tr>
<td>6.53</td>
<td>Sharks</td>
<td>2.84</td>
<td>Shades</td>
<td>3.48</td>
<td>Shanna</td>
<td>2.21</td>
<td>Valet</td>
</tr>
<tr>
<td>2.7</td>
<td>Affair</td>
<td>3.46</td>
<td>Madden</td>
<td>2.39</td>
<td>Bashar</td>
<td>4.35</td>
<td>Shiraz</td>
</tr>
<tr>
<td>1.22</td>
<td>Vaasa</td>
<td>3.28</td>
<td>Khwarizmi</td>
<td>4.7</td>
<td>Vatic</td>
<td>2.65</td>
<td>Dab our</td>
</tr>
<tr>
<td>1.69</td>
<td>Safaris</td>
<td>1.55</td>
<td>Va chador</td>
<td>1.88</td>
<td>Vasa do</td>
<td>3.11</td>
<td>Vesper</td>
</tr>
<tr>
<td>93</td>
<td>Fikias</td>
<td>5.19</td>
<td>Sherman</td>
<td>4.87</td>
<td>Dashiki</td>
<td>2.02</td>
<td>Ham rah</td>
</tr>
<tr>
<td>1.98</td>
<td>Amid</td>
<td>3.6</td>
<td>Rampant</td>
<td>2.66</td>
<td>Kalgan</td>
<td>2.4</td>
<td>Fooled</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>
<td>1.59</td>
<td>Hahnamen</td>
</tr>
<tr>
<td>2.52</td>
<td>Vasine</td>
<td>3.19</td>
<td>abhorrent</td>
<td>2.02</td>
<td>Female</td>
<td>3.36</td>
<td>Cached</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>0.54</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.

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