Genetic Algorithm of appropriate in the investment portfolio

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Abstract: Investors who have sufficient knowledge and expertise in this field are classified. Organizations can choose the appropriate methods for optimum portfolio investor interested in working in the financial markets, especially the second group of investors (people lack information and knowledge) contribute. In this study mean - half of the variance model for the portfolio is used and optimal model using genetic algorithms. For this reason, companies are examined in population in several stages and eventually selected 70 companies as research samples and data are needed (efficiency and risk-quarter) collected for research. As well as to assess Half of the variance Mean- model Markowitz model for portfolio Mean- variance efficient frontier models are used and the results are compared with each other. The results show that the model in the form of portfolio risk Mean- Half of the More risk adverse Mean- variance model.
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Key word: Mean- variance model, frontier models, Markowitz model, Markowitz model.

Introduction

The two main issues in the discussion of investment risk and return, and in this case there are two important perspectives In which the first investors to bear risk only when they earn additional returns and secondly, the risk is reduced by diversification. Securities with variable yields and the level of volatility is measured by the variance and standard deviation. Decisions about funding are integrated, so that the highest returns in the same risk or low risk at the same efficiency, one of the most complex and Challenging issues of securities and investment analysis. As a result, if possible, taking into account market factors The factors and conditions that cannot be supervised by the investor to choose the appropriate model and optimize the investment in conditions of uncertainty Investment portfolio selection problem can be solved by decision makers to take action.

Literature

Raei (2008) in an article entitled "Venture investment portfolio for comparison of neural network and Markowitz 'portfolio optimization problem is funding. In 2008, Gholamreza Eslami Bid goli and Ahmad Talangy in his article jointly models to select optimal portfolios studied and they came to the conclusion that the most appropriate framework for portfolio selection, portfolio analysis model is based on multiple criteria techniques.

Shah Alizadeh and Memariani (2003) in an article entitled "Portfolio Selection mathematical framework for multiple purposes," to examine the investment portfolio using goal programming began. In our model the proportion of stocks generally are mixed together so that grape seed portfolio returns given the low risk or high risk for certain, have the highest efficiency.

Is one of the two models, the CAPM is expressed in terms of expected return Risk relationships while single index model is a statistical model to explain the process efficiency. Then people like to go, Meckel Roll and Edwin in 1986 and 1988, articles in the multivariate models developed by Chen, Roll and Ross was introduced in 1986, is displayed. In 1986, Solomon and his colleagues designed a model that was used in the seven variables. The results show that the use of Multivariate models can best describe the relationship between historical data and choose the investment portfolio will be better. The main objective of the multi-factor models to find some non-market influences that led to the movement of stock to each other is combined. The covariance's between stock returns from a one-factor model (usually a market index) of lead, while multi-factor model are covariance of two or more of the factors.

Harry. M. Markowitz in 1952 to select their model portfolio produced. Model means - variance of Markowitz, the most famous and the most common approach is to invest in a selection problem. Markowitz model of the most outstanding points of interest in considering the risk not only based on the standard deviation of a stock, but is based on the risk of investment. Mean- model Markowitz variance with the fundamental problem is the question of funding. First difficult to estimate the number of parameters and also solve technical problems, including devices with different assumptions, and solve the equation with many unknowns, too.

CAPM is the most practical model portfolio. The CAPM predictions about the expected return of risky assets balance is that 12 years after Markowitz simultaneously and independently by Sharp (1964), Lintner (1965) and Masin (1966) was developed. Because of the limitations and lack of extended CAPM and CMT on individual securities and inefficient collection and limitations in experimental Sharp in 1963 to explain the sensitivity coefficient (β) as a risk, a single model released its index. CAPM model is a temptation to say that a single index.

A multi-criteria decision-making is models goal programming (GP). Charenz and Cooper for the first time in 1955 published an article on the goal programming. They minimize the sum of absolute deviations from certain destinations studied. The detail of this technique was studied by Ejiri later. In 1973, Lee and Larvo first GP model to solve problems in their previous models. Lee and Chiser GP in 1980, a more comprehensive model was proposed. The Tapo and Finstin Konoha and Yamazaki in 1993 with the conversion of linear model to model GP took an effective step in the selection of the optimal portfolio. Although some models of GP have been able to overcome the problems of the previous models, but these models also borders because of its ability to provide better performance than classical models were shown some weak points.

Bosn Aksia, Boding Li, Wang and Li Shoiang in 1999 in an article entitled "Investment portfolio selection model for arranging the expected rates of return" to study the problem of optimal investment portfolio with their own model. In this paper, the optimal investment portfolio, based on genetic algorithm was developed using existing algorithms. In other words, the genetic algorithm was designed based on the selection of the fittest (evolution), only shares in the basket could be the best in terms of utility are not removed by other shares in the portfolio offered, stocks showed to Available stocks are more evolved.

In 2007 Rhib Audio and M. Mency in an article entitled "Portfolio selection under fuzzy environment using genetic algorithm" to study the optimization of their portfolio and their model tested in the Istanbul Stock Exchange. They aim to minimize the risk function and the degree of desirability considered as a limitation considered. The results of selected performance model portfolio show the fuzzy environment. In 2008, Hwang's article Half of the variance criteria for measuring risk and the criteria for measuring the efficiency of the fuzzy environment. He also expressed Half of the variance three properties and then using a genetic algorithm to select the best portfolio. The results of his research showed that the algorithm was effective for solving models Mean-Half of the variance in phase.

Mousavi Zadeh in 2007 a study on the risk of common stock over a period of three years to determine the portfolio in Tehran Stock Exchange (2002 to 2004) has done. Finally, portfolio performance by a portfolio of randomly selected comparison and the results indicate a positive effect on the ratings model stock portfolio is forming. Model mean - variance portfolio Markowitz to form a secondary uses linear programming. However, this model requires complex calculations computer and cannot be resolved easily.

Reza Tehrani and Alireza Siry mean-variance model of Markowitz Browse mentioned problems, the use of portfolio models to choose Mean- Half of the variance studied and found that the distribution of returns is non normal Mean- model Half of the variance the difference Mean- variance model; and using better Half of the variance Mean- can be selected on the portfolio decisions.

Research Methodology

Study by decision makers to select the investment portfolio, is carried out. Portfolio Optimization model to model is half of the variance Mean-. This study is based on the purpose of application of the strategy implemented with the aim of facilitating cross because the decision-making process used.

Research questions

The basic question raised by this study is that given the uncertainty of the Tehran Stock Exchange, selection of optimal investment portfolio using half Mean- What will it be?

Data

This information and data will be collected both library and field studies. Studies in the library of resources including books and technical articles; Domestic and foreign magazines and other publications related to the topic and also to collect information in the field of data relating to companies listed on Tehran Stock Exchange will be used.

The research used data from 70 companies. Companies are required to collect information about the research study result of the new software is used. In order to perform computational activities packages SPSS and EXCEL and MATLAB software will be used for genetic algorithms.

Society & sample

The study sample consisted of all firms listed in the Tehran Stock Exchange to date is 01/10/2009. Among the companies making up the population, the number of 70 companies selected to be in the end how to choose these companies is presented in detail in Chapter.

Table 1. Shows the descriptive statistics of the selected companies.

Company code	mean	Half Variance	Half a standard deviation	Standard deviation	Variance	skewness	Elongation
A1	0.1178	0.147821	0.021851	0.29528	0.087	2.603	10.652
A2	0.0706	0.17307	0.029953	0.31540	0.099	1.576	3.479
A3	0.2759	0.342748	0.117476	1.21749	1.482	5.066	28.358
A4	0.0446	0.126146	0.015913	0.19456	0.038	0.489	1.193
A5	0.1018	0.136328	0.018585	0.22527	0.051	0.663	-0.185
A6	0.0870	0.1104	0.012188	0.24760	0.061	3.366	15.647
A7	0.1314	0.173903	0.030242	0.60632	0.368	5.170	29.434
A8	0.1277	0.121674	0.014805	0.34680	0.120	3.540	12.907
A9	0.1073	0.112763	0.012716	0.41643	0.173	5.584	33.350
A10	0.1508	0.174175	0.030337	0.49945	0.249	3.726	16.210
A11	0.2089	0.202136	0.040859	0.70813	0.501	4.495	22.116
A12	0.0463	0.061251	0.003752	0.12489	0.016	1.771	3.446
A13	0.0509	0.098114	0.009626	0.18866	0.036	1.867	6.386
A14	0.0615	0.106855	0.011418	0.15387	0.024	-0.101	0.426
A15	0.1370	0.134228	0.018017	0.22835	0.052	1.122	1.746
A16	0.1008	0.069797	0.004872	0.16507	0.027	2.898	10.087
A17	0.1223	0.132004	0.017425	0.24584	0.060	1.473	2.228
A18	0.1128	0.122231	0.01494	0.23252	0.054	1.854	5.488
A19	0.1036	0.113806	0.012952	0.22109	0.049	1.881	4.350
A20	0.1092	0.121485	0.014759	0.20199	0.041	0.726	-0.308
A21	0.1885	0.272843	0.074443	1.02108	1.043	5.590	33.540
A22	0.0657	0.102963	0.010601	0.24969	0.062	2.952	9.986
A23	0.0743	0.133443	0.017807	0.30812	0.095	2.653	9.622
A24	0.1054	0.141474	0.020015	0.23177	0.054	0.864	2.500
A25	0.1281	0.225463	0.050834	0.50219	0.252	2.414	7.104
A26	0.0455	0.087308	0.007623	0.20039	0.040	3.150	13.457
A27	0.0854	0.11215	0.012578	0.30643	0.094	4.289	22.282
A28	0.1188	0.157206	0.024714	0.27667	0.077	1.040	0.381
A29	0.1385	0.188774	0.035636	0.33809	0.114	1.222	1.473
A30	0.0882	0.130125	0.016932	0.23667	0.056	1.188	1.010
A31	0.1123	0.101765	0.010356	0.23510	0.055	2.442	6.312
A32	0.1146	0.131365	0.017257	0.28992	0.084	2.588	8.954
A33	0.1276	0.139046	0.019334	0.27583	0.076	1.841	4.015
A34	0.1281	0.198243	0.0393	0.36378	0.132	1.477	3.101
A35	0.1020	0.1033	0.010671	0.21303	0.045	1.921	3.889
A36	0.1277	0.157992	0.024961	0.23837	0.057	0.226	-0.009
A37	0.1423	0.203185	0.041284	0.65586	0.430	4.307	21.070
A38	0.1051	0.084436	0.007129	0.17026	0.029	1.834	3.607
A39	0.0960	0.127574	0.016275	0.20934	0.044	0.666	-0.210
A40	0.0994	0.148358	0.02201	0.29402	0.086	2.187	6.869
A41	0.1283	0.153714	0.023628	0.33468	0.112	2.506	8.499
A42	0.2033	0.192181	0.036934	0.87422	0.764	5.931	36.267
A43	0.0681	0.118834	0.014122	0.17745	0.031	0.209	1.296
A44	0.0824	0.119662	0.014319	0.24026	0.058	1.821	4.768
A45	0.1035	0.129199	0.016692	0.21746	0.047	1.070	1.757
A46	0.1914	0.217116	0.047139	0.55344	0.306	2.461	5.669
A47	0.0797	0.116389	0.013546	0.21073	0.044	1.322	1.768
A48	0.2025	0.23738	0.056349	0.87116	0.759	4.746	24.414
A49	0.0594	0.163613	0.026769	0.25855	0.067	0.528	0.540
A50	0.1402	0.212279	0.045062	0.34958	0.122	0.767	0.214
A51	0.1423	0.214477	0.046	0.57483	0.330	3.219	11.372
A52	0.0455	0.083038	0.006895	0.12167	0.015	-0.145	1.282
A53	0.0532	0.090742	0.008234	0.26283	0.069	4.335	22.883
A54	0.0558	0.097843	0.009573	0.15440	0.024	0.636	0.688
A55	0.0774	0.156744	0.024569	0.24888	0.062	0.617	0.097
A56	0.0474	0.081023	0.006565	0.13709	0.019	1.313	3.671
A57	0.0814	0.083977	0.007052	0.14650	0.021	1.807	6.748
A58	0.0908	0.159312	0.02538	0.39160	0.153	3.926	19.917
A59	0.1383	0.169445	0.028712	0.40470	0.164	3.172	12.972
A60	0.0488	0.047827	0.002287	0.15174	0.023	4.514	23.371
A61	0.0549	0.077474	0.006002	0.12599	0.016	0.499	0.918
A62	0.0736	0.127914	0.016362	0.26744	0.072	2.104	5.198
A63	0.0794	0.130589	0.017054	0.39633	0.157	4.930	27.887
A64	0.0805	0.183299	0.033598	0.38766	0.150	2.035	4.806
A65	0.0916	0.204727	0.041913	0.50080	0.251	3.337	14.267
A66	0.0764	0.121982	0.01488	0.20551	0.042	1.162	3.745
A67	0.0810	0.137214	0.018828	0.25021	0.063	1.520	3.146
A68	0.1871	0.196074	0.038445	0.48105	0.231	3.118	11.558
A69	0.0705	0.094849	0.008996	0.16866	0.028	1.346	2.207
A70	0.1052	0.102536	0.010514	0.18811	0.035	1.572	2.872

Data analysis

Descriptive statistics of the studied companies

Descriptive statistics of the studied companies were calculated using each company's quarterly performance.

As Table 1 shows the distribution of stock returns is not normal and most businesses have a positive skewness.

Forming average model - half of the variance.

Average model - half the variance of research into the relationship (1) is

$$Max\ z = \sum_{i=1}^{n} w_i \underline{r_i} \qquad (1)$$

S.T:

$$\sum_{i=1}^{n} w_i^2 (\sigma_i^-)^2 + \sum_{i=1}^{n} \sum_{j=1, i \neq j}^{n} w_i w_j \rho_{ij} \sigma_i^- \sigma_j^- \leq P_{risk}$$

$$\sum_{i=1}^{n} w_i = 1$$

$$0 \leq w_i \leq 1$$

The purpose of the model (1) maximizing the portfolio's return is a certain level of risk. To create the objective function (1) the average return on shares is under study. To form an objective function (1) Average yield data from Table 1 is used.

$$(2) \qquad Max\ z = \sum_{i=1}^{70} w_i \underline{r_i} = 0.1178 w_1 + 0.0706 w_2 + \cdots + 0.1052 w_{70}$$

As mentioned model 1) limit is three. The first limitation is that the main limitation of the model represents the maximum risk the investor takes. This restriction variance matrix to form a half the variance - Kvosmi variance is required. To create a matrix half the variance - Kvosmi variance must first correlation between the return on shares under study obtained and then multiplied by the correlation of stock i and j at half the standard deviation of stock i and j Kvosmi variance between stocks i and j obtained and matrix half variance variance Kvosmi formed.

Determine the weight of each stock in the level of risk identified in the model mean - half the variance.

Average model - half of the variance in the study identified 20 risks was formed to determine the weight of each stock in the portfolio selection techniques so that maximum efficiency is the result of a genetic algorithm was used. Table 2 shows the maximum return on the portfolio at the level of specific risks.

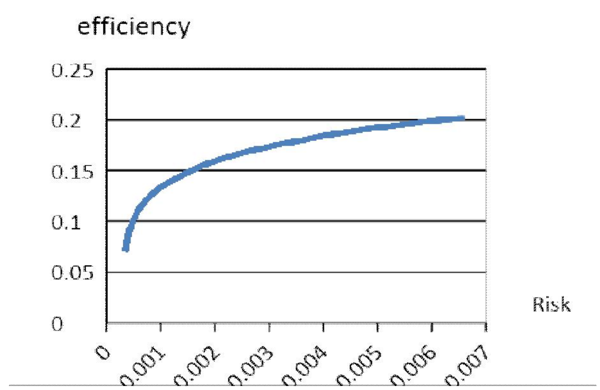

Chart 1

Table 2: expected return on average model portfolio at risk 20 - half the variance

0.061	0.051	0.047	0.040	0.035	Acceptable risk (%)
11.26	10.33	9.69	8.87	7.04	Expected return (%)
0.160	0.110	0.094	0.084	0.074	Acceptable risk (%)
15.09	13.70	13.16	12.70	12.13	Expected return (%)
0.400	0.360	0.310	0.250	0.200	Acceptable risk (%)
18.42	17.99	17.48	16.74	15.94	Expected return (%)
0.660	0.600	0.570	0.520	0.460	Acceptable risk (%)
20.22	19.90	19.69	19.37	18.93	Expected return (%)

According to the information table (2), figure out the efficient frontier model - half of the variance in Figure (1) is

Chart 1 show, the efficient frontier obtained by the average model - half of the variance

Formed model mean - variance

Model mean - variance with the aim of maximizing the return on a certain level of risk to model (2)

$Max\ z = \sum_{i=1}^{n} \quad w_i \underline{r_i}$ (2)

S.T:

$\sum_{i=1}^{n} \quad w_i^2 (\sigma_i)^2 + \sum_{i=1}^{n} \quad \sum_{j=1, i \neq j}^{n} \quad w_i w_j \rho_{ij} \sigma_i \sigma_j \leq P_{risk}$

$\sum_{i=1}^{n} \quad w_i = 1$

$0 \leq w_i \leq 1$

In model 2, 〖(σ_i)〗 ^ 2 and σ_i respectively represent the variance and standard deviation of stock returns of i ones. The rest of the parameters of the model (2) as model (1) are Variance-covariance matrix for the model variance Mean- is required.

Table 3: expected return on average model portfolio at risk 20 – variance

0. 35	0. 3	0. 25	0. 2	0. 16	Acceptable risk (%)
11.56	11.13	10.28	9.42	7.92	Expected return (%)
0. 61	0. 56	0. 51	0. 46	0. 38	Acceptable risk (%)
13.42	13.19	12.82	12.56	11.84	Expected return (%)
1.53	1	0. 91	0. 8	0. 7	Acceptable risk (%)
15.78	14.69	14.45	14.12	13.8	Expected return (%)
4.05	3.5	3.01	2.52	2	Acceptable risk (%)
18.5	18.08	17.64	17.13	16.5	Expected return (%)

Efficient frontier of the model means - variance in Figure (2)

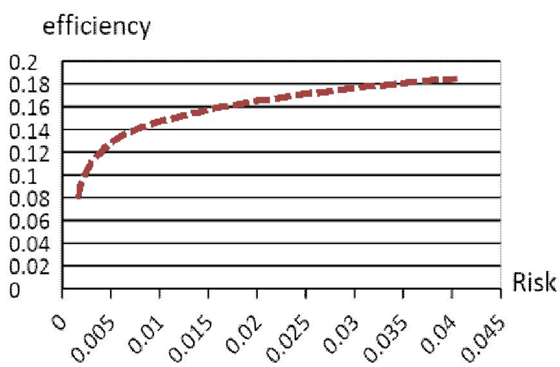

Figure 2: the efficient frontier obtained based on the mean – variance

Compare the efficient frontier average model - half of the variance and the model mean – variance.

Figure (3) the difference between the two models, the efficient frontier average - half the variance and mean - variance portfolio shows.

The diagram (3) efficient frontier model, mean - a half-variance efficient frontier model with significant differences Markowitz (mean - variance) and more efficient than it is, at the same risk models out - more than the half of the variance of returns Markowitz is. In other words, although the model mean - variance Markowitz observe the principle of risk aversion but mean - half of the variance model than the mean - variance risk Adverse and for investors who are seeking to preserve their capital to more efficient business model mean - Markowitz model works better than half of the variance.

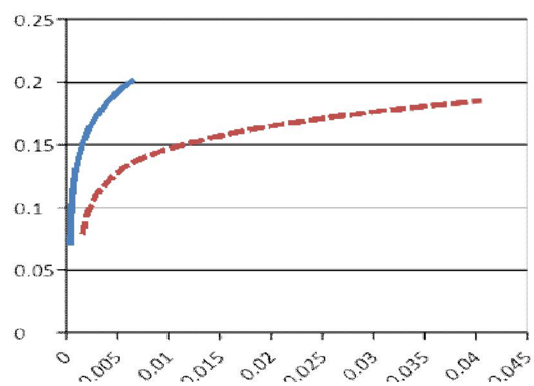

Figure 3: The difference between the efficient frontier average model - half of the variance and mean – variance

Results and findings

The main objective of this research is how to choose the optimal portfolio using average - half variance.

1. The average model - half of the variance than the mean - variance risk Adverse because the same risk in terms of return on average model - half of the variance is much lower than the average model - is the variance.

2. One of the basic assumptions of the model mean - variance of normal distribution of returns is assumed, while the non-normality of the distribution studies indicate that productivity and efficiency is the skewness in the distribution. But the flaw in the model mean - variance half over, and the distribution has a

skewness is greater efficiency efficient frontier model; mean - variance difference half the average model - is the variance.

3. In terms of risk assessment management standards than half of the variance is a measure of the variance in times of higher priority Because the variance of all positive and negative changes to the target rate of return is measured as risk While half the variance risk measure defines the risk of loss and positive changes (good) target rate of return than risk not know.

Reference

1. Balzer, Leslie A (1994). "Measuring Investment Risk: A Review," Journal of Investing, v 3(3), 47-58.
2. Bawa, Vijay S. "Optimal Rules For Ordering Uncertain Prospects," Journal of Financial Economics, 1975, v2(1), 95-121.
3. Eslami Bidgoli, GR, “theoretical relationship between return on investment and cost of capital, the fourth seminar on investment and management of the stock exchange”, Faculty of Tehran University, 1996.
4. Eiben A, E and Smith J. E. Introduction to Evolutionary computing, New York; 2003.
5. Elton, E, Gruber, M, Estimating The Dependence Structure of the Share Prices Implications for Portfolio Selections. Journal of Finance, 1973, 5, pp: 1203, 1232.
6. Estrada J. (2000); The Cost of Equity in Emerging Markets: A Downside Risk Approach; IESE Business School of Barcelona (Spain) P:2.
7. Fama, Eugene F. and Kenneh R. French; The Cross-Section of Expected Stock Returns, Journal of Finance, v47 (2), 1992, pp.427-466.
8. Iraqi Khalili, Maryam, optimal stock selection using planning Armani, the Economic Journal, pp. 214-193.
9. Holland J. H. Adaptation in Natural and Artificial Systems, Ann Arbor: The University of Michigan Press, 1975.
10. Khaki, GR, methodology and approach to writing a thesis, publications reflect, one, 2003.
11. Mao, James C. T. "Models Of Capital Budgeting, E-V Vs. E-S," Journal of Financial and Quantitative Analysis, 1970, 5(5), 657-676.
12. Markowitz, H. Portfolio selection, Journal of Finance 7, 1952, pp.77-91.
13. Roy, A. D (1952). "Safety First and the Holding of Assets," Econometrica, v 20(3).
14. Rai, R. and Talangy, Ahmad, advanced investment management, publishing side, tow, 2008.
15. Rai, Reza and Saeed, Ali, the basics of financial engineering and risk management, publishing side, tow, 2008.
16. Shah alizadeh Muhammad and Memariani Azizullah, mathematical framework stock selection with multiple objectives, Journal of Accounting and Auditing Reviews, Vol. I, No. 32, 2007, pp. 102-83.
17. Sharpe, F, Alexander, Gordon, Balley, V, Investment, Printice Hall, 2002.

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